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THE PSYCHOLOGY OF NORMAL PEOPLE

Joseph Tiffin, Frederic B. Knight
and Eston Jackson Asher

Purdue University

Revised Edition

D. C. HEATH AND COMPANY

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Preface

No TEXTBOOK which introduces the student to the subject of psychology can, with competency, serve equally well all types of students, all types of first courses, all interpretations of psychological fact, or all types of instructors. Every one will agree that students vary greatly in their legitimate purposes in taking a course in psychology. Courses of presumably equal merit differ markedly from college to college, not only in topics considered, but also in the relative emphasis given to the topics. Equally competent instructors make different uses of a text, varying from hardly any use at all (if the students cannot or will not read it) to welcoming the book as a partner if the nature of the text has earned this confidence.

This book is written for students who expect their four years at college to prepare them for acceptable service in business, industry, and the professions. The content has been determined not only by what fellow psychologists believe should compose a first course in psychology, but also by what alumni now meeting the problems of business and industry wish they had studied while they were in college. The authors have taken advantage of deliberate counsel with superintendents of steel mills who hire young engineers; with personnel managers of large department stores who buy, in young graduates, psychological training received in college; with resident physicians in large hospitals who use young psychological clinicians; and with superintendents of schools who search for English and social science teachers possessing insight into human nature as well as mastery of their subjects. It is hoped that this union of counsel between fellow psychologists

who prepare, and men of business who use, the products of our colleges and universities has created a text which will be useful as well as scientifically sound.

More than conventional acknowledgments are genuinely given to the growing number of scholars and scientists whose contributions to the field have been used in writing this book. Those to whom we are especially indebted are identified in the footnotes, which have been grouped by chapters after the text.

Preface to the Revised Edition

The second edition of *THE PSYCHOLOGY OF NORMAL PEOPLE* differs from the first edition in several respects. A considerable amount of new material including important research published during the past five years has been incorporated in the text. This new material is primarily concerned with the fields of aptitude and ability measurement, personality measurement, and evaluation, emotion, thinking, and intelligence. The experience of several years in using the book as a text has shown the desirability of certain changes in order of presentation to make the instruction more effective with beginning students. To accomplish this purpose, the two chapters on personality have been placed together following the chapter on individual differences. At the suggestion of many users of the text, the illustrations have been distributed so that each one appears near its place of reference.

A continuation of the work of the authors with business and industrial men as well as with educators has amply justified and even reemphasized the soundness of the purpose of the text as stated in the preface to the first edition — to give students the insight into human nature which will prepare them for acceptable service in business, industry, and the professions.

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The Psychology of Normal People

CHAPTER ONE

What Is Psychology?

WHY is one man habitually honest and another not? Why is one man punctual in keeping his appointments and another invariably late? Why do some people accomplish much with little effort, while others, busy from morning to night, accomplish little or nothing? Why are some persons embarrassed and awkward in the presence of strangers, while others are poised and self-possessed? The clues to such questions as these lie in the principles that have emerged from the study of psychology. Psychology helps us to understand why men (and women) have different habits, different hobbies, different ideals. It helps us to discover the forces that form our likes and dislikes, our urges and impulses, our feelings and fears, our abilities and disabilities. It helps us, in short, to understand our own personalities and behavior and the personalities and behavior of other people. This is the chief purpose of psychology.

The study of the forces that move men is an absorbing study. But, for the average person, the reason for studying psychology is not that it is absorbing or even fascinating. The reason is that *it pays handsome dividends.* College students, who are destined to manage men in industry, business, and the professions, need powers of control over human nature. Self-control is founded upon self-insight, control of others upon the understanding of others. And it is this practical value of understanding human nature that makes the study of psychology really profitable.

Psychology has been defined in different ways. It has been called the science of the activities of the individual,[1] the study of conscious behavior and of the conditions under which that be-

havior takes place,[2] the study of the development of activity, including both its internal and external phases.[3] There are yet other definitions, and a beginner on noting their variety might be confused and even led to complain that psychologists do not know what their field is. This complaint, however, would be unwarranted. In spite of the variety of ways in which they have defined psychology, psychologists are in close agreement regarding their objective, which is to learn more about human nature and human activities. Using this common objective as a basis, we may define psychology as the systematic, scientific study of human activity, in order to understand and predict the behavior, emotions, and drives of ourselves and others. It should be noted that psychology seeks not only to *understand* human behavior, but also to *predict* it and to *control* it.

All men and women have some interest in predicting and controlling behavior. This interest has led some of them to such foolish practices as the consulting of astrologers (who claim to predict human affairs from the stars), phrenologists (who claim to analyze character from the shape and the "bumps" of the head), and fortune tellers (who claim to see into the future by means of cards, tea leaves, or lines of the hand). But fortunately this interest has led many to more valuable efforts to gain a better understanding of themselves and others. This is indicated by the popularity of books and articles on such subjects as the development of character and personality, making a success of marriage, and the prevention of crime and delinquency. There is further evidence of it in the number of consulting psychologists who find occupation in our larger cities, and in the demand for psychologists in our larger school systems and in a rapidly growing number of industries.

Interest in psychological problems has been greatly stimulated by recent advances in psychology, but it is by no means new. From the earliest times man has felt the need of knowing more about himself. The Greeks felt this need so deeply that they wrote above the Delphic Oracle: "Know thyself"; and no teachers among them were more popular than those who promised youth understanding of human nature and aid in self-improvement. The literature of other ancient peoples, also, indicates a profound interest in these matters. All language is replete with psychological concepts. If a large sample of words is taken at

random from an English dictionary nearly half will refer directly or indirectly to psychological ideas: love, hate, ambition, worry, dreams, wishes, attitudes, and emotions.

Because of the universality of the interest in the prediction and control of behavior, every one gains, as a matter of course, considerable knowledge of psychological phenomena. Infants learn to interpret the responses and attitudes of others and to modify their behavior accordingly. Wider contacts add to the knowledge acquired in the nursery. Later, the reading of fiction, biography, history, and current news increases our understanding of human nature and of its problems. The student, therefore, upon beginning the study of psychology, has already accumulated a fund of apposite information which should stand him in good stead. A formal course in psychology should help him to organize and make more exact the knowledge he has already acquired, and to extend that knowledge by acquainting him with the work of those who have specialized in the study of human nature and behavior.

Knowledge of human nature picked up incidentally, without system or critical examination, may be called common-sense or naïve psychology. All of us know of persons who possess almost uncanny insight into human nature, gained without benefit of college courses in psychology. If you are a Lincoln or a Shakespeare it would be better for you to have written this book than to read it. If you are not, an effort to extend and verify your knowledge by careful, controlled observations and to profit from the studies of trained psychologists will be of real value to you.

Opinion differs as to when the beginning of this scientific psychology, in contrast to common-sense psychology, should be dated. Some hold that it began with the establishment of psychological laboratories. In that case, scientific psychology would be less than sixty years old. Others regard Aristotle or Buddha as the first empirical psychologist. Without attempting to settle this controversy, we can all agree that the last two decades of the nineteenth century were important for the advance of scientific psychology. During those years the development of psychology as an empirical and experimental science was stimulated by the founding of many independent departments of psychology and many psychological laboratories in colleges and universities. Every large university now has a psychological laboratory in which experimental investigations of human behavior are con-

ducted. A typical room in such a psychological laboratory is equipped with a great variety of delicately adjusted devices and instruments for amazingly precise measurement. Unlike the machines of business and domestic use, which are manufactured and distributed commercially, these instruments are often designed and constructed for their own special investigations by the men who use them. Many of them are electric devices that magnify and record physical reactions of the human organism so small and so commonplace as ordinarily to go unnoticed. They thus enable the investigator to accumulate a series of minute and careful measurements which, when tabulated and studied, often reveal important facts. By laboratory methods the psychologist can measure certain personality traits and abilities with fully as much accuracy as the physician can measure body weight or temperature.

Another development which fostered the progress of psychology was the increased interest of physicians in the psychological bases of mental disorders. This in turn caused teachers, social workers, and parents to take a scientific interest in the development of children. As a result of the wider interest in human behavior and development, journals of psychology were established in England, France, Germany, and the United States. These tended to increase further the interest in the study of man; and by acting as channels through which scientific workers could make known the results of their research, they did much to promote the development of psychology as a science.

A COMPARISON OF NAÏVE AND SCIENTIFIC PSYCHOLOGY: WHAT PSYCHOLOGY IS *NOT*

The knowledge of human nature acquired incidentally is not without value, and should be utilized by the student; he should, however, recognize its defects and limitations. These may be briefly described.

(1) *Naïve psychology is uncritical of its problems.* One of our leading newspapers once published an article entitled "Why Men Prefer Blondes," which was an example of uncritical consideration of a problem. In this article it was *assumed* that men do prefer blondes. If a psychologist had undertaken a study of the subject, he would have begun by attempting to discover what

percentage of men actually do prefer blondes and what percentage prefer brunettes. Undoubtedly he would have found that some men prefer blondes, others brunettes; that still others prefer at one time a blonde and at another time a brunette; and even that some men are unable to decide which they prefer. Only after gathering data about the preferences of men, would he have attempted to explain them. Similarly, before attempting to explain the alleged superiority of women in making intuitive judgments, he would first determine whether they actually are superior in this respect. After their superiority had been established (if such proved to be the case) would be the time to seek an explanation of the superiority. In general, we need to establish facts before attempting to explain them.

(2) *Naïve psychology indulges in hasty generalizations.* We make a hasty generalization when, on the basis of a few instances, we make a statement regarding all instances. For example, to say that all men prefer blondes because the first few questioned indicate a preference for blondes would be a hasty generalization. A distinguishing mark of a trained thinker is the ability to restrain the tendency to rush to conclusions. Common sense, generalizing on the basis of a few cases, frequently opposes one hasty generalization to another. For instance, it says, "Absence makes the heart grow fonder." But it also says, "Out of sight, out of mind." The scientific psychologist cannot sanction attempts of this sort to offset one hasty generalization with another. Instead of jumping from dubious statement to dubious statement he attempts to discover the kernel of truth in each of the opposing statements. This procedure leads him to seek the conditions under which the alleged situations exist. For example, he asks, "Under what conditions does absence make the heart grow fonder?" By virtue of his discoveries he modifies the original statement into a less comprehensive but more accurate one. He finds, perhaps, that absence increases affection, *if* the affection already rests on some substantial foundation.

(3) *Naïve psychology lacks organization.* Every science seeks to organize its observed facts. It makes facts intelligible through inclusion in a system. Take, for example, the saying, "Unworthy offspring brag most of their ancestry." Assuming for the moment that this statement is true, we wish to know further why it is true. By relating it to our knowledge of the general

tendency of man to seek social recognition and to compensate for feelings of inferiority, we can make it intelligible; for those who are successful do not need to bolster their self-esteem and bid for social recognition by bragging of their ancestors, since they are not likely to suffer from feelings of inferiority.

The illustration just given indicates the nature of scientific explanation. An event is explained when it is properly related to other events. The individual timbers of a building cannot stand alone; yet, joined together, they form a solid structure. In the same way, no single event in isolation is intelligible, but becomes so when related to other events. We cannot explain any event or condition until we see how it fits into our general body of knowledge and beliefs. Hence science is frequently defined as a body of organized knowledge.

(4) *Naïve psychology lacks an exact terminology.* The lack of an exact terminology in a science is a serious handicap. If men are to coöperate in the development of a science, they must be able to understand each other easily. They therefore need an exact language. Unfortunately, psychologists, like other scientists, have not completely succeeded in meeting this need. Considerable progress has been made, however, and when scientific psychologists use terms that do not have definite meanings, they define them as clearly as possible to avoid ambiguity. In the rough approximations of naïve psychology, no such need is recognized. For example, until mental diseases were studied scientifically, the term *insanity* was a glittering generality which covered many different kinds of mental breakdown, some as different from others as typhoid fever from yellow fever.

(5) *Naïve psychology possesses no technique of research.* Science is fundamentally an outgrowth of the effort to discover how things came to be as they are. Such knowledge frequently enables us to remake things as we desire them to be. In physics, for example, we attempt to learn more about physical phenomena and to extend our control over them. Similarly, in the field of psychology we make a systematic effort to increase our knowledge and control of human nature. The *deliberate* effort to do this is perhaps the sharpest distinction between naïve and scientific psychology. As soon as we seek knowledge systematically, we are no longer naïve; we are scientific, and aware that our present knowledge is insecure or inadequate.

CHARACTERISTICS OF PSYCHOLOGICAL RESEARCH

When we feel the inadequacy of our knowledge, we naturally seek means of improving it. Psychologists in their efforts to extend their knowledge of human nature conduct investigations which involve four methods of operation: observation, experimentation, mathematical analysis, and interpretation.

(1) *Observation.* Little progress can be made in any science without careful observation. It is extremely important for the psychologist to be a trained observer, since the tendency to see what we like to see is especially strong when we make observations that affect our theories of human nature or any of our cherished beliefs. In their opportunity for observation psychologists enjoy a privileged position. They can observe the nature of the phenomena in which they are interested from within as well as from without. In this respect psychology is unique. A physicist may observe the changes that occur when a drop of water becomes a snowflake, but he has no knowledge of its inner states, if there are any. Similarly, a botanist may observe the unfolding of a rose, but the plant itself can give no additional information. Psychologists, however, can observe such inner states as purposes, desires, and feelings, as well as such overt behavior as walking, blushing, and helping another. We observe overt behavior by means of sensory end organs: the eyes and ears, the nose, and the sensory end organs of the skin. We observe our internal bodily states by means of other groups of sensory end organs, which provide us with the so-called organic, kinaesthetic, and static senses. Observation of mental processes, however, such as our purposes and ambitions, our anxiety and thought, depends largely upon imaginal cues; and upon such observation, carefully controlled, we rely for much of our understanding of behavior.

There are thus two kinds of observation. Observation which can be verified by some one else as well as by the subject is called *objective observation.* For example, any one can observe how fast or how accurately an act is performed, and such observation is consequently objective. On the other hand, states or processes such as pain, fatigue, hunger, thought, and mental imagery involve, in addition to any outward manifestations, an awareness by the person experiencing them. When this awareness, which

psychologists call consciousness, is studied, we are relying upon *subjective observation.* Most, if not all, mental processes have both objective and subjective phases. Thus, hunger shows, on the objective side, a series of contractions of the stomach, which may be observed and recorded with relatively simple apparatus. At the same time, hunger consists also of the typical hunger experience, which must be felt subjectively if it is to be appreciated or described at all.

Both kinds of observation are needed in psychology: without objective observation we could not discover such causal relationships as the influence of drugs on behavior, or of family relations on personality; without subjective observation we should know far less about desires and fears than we can discover when we add skillful self-observation to objective observation. But if the scientific study of psychology relies equally on objective and subjective conditions, a knowledge of the subjective states is needed in every walk of life. The salesman must know the *desires* and *thoughts* of a prospective customer; the physician seeks to discover the *pains* and *aches* of his patient; the lawyer desires to learn the *prejudices* of his witnesses or of the jury. To know even in an elementary way what a person is doing, we must frequently have at least some idea of his inner states. Perhaps he is running to a fire; perhaps he is running away from the police; perhaps he is training for a race — perhaps he is just running. Only when we know his *purpose* do we know what he is really doing.

When it is careful and detailed, observation of mental processes or subjective states is called introspection. If some one should ask you how you feel and you should reply that you are tired, you would be making a report about your feelings that would be simple subjective observation. If he should continue, and ask you to observe how it feels to be tired — in other words, if he should ask you to attend carefully to the sensations involved in fatigue — you would then make the state of fatigue itself the object of your observation, and this would be introspection. Psychology, especially in the past, has made much use of introspection as a method of study. We should bear in mind that this method becomes valuable only after long and intense training. For even a trained introspectionist finds it difficult to get impartial reports from self-observation about matters of real concern to

himself. He may be able to report brilliantly on the muscle strains in the back of his neck after golf and be quite confused in his reports of why he toadies to his boss or is irritated when he is not seated beside the president's wife at a faculty dinner. This book will ask the reader to engage in little introspection. Only as the student comes to realize the importance of accuracy and courage in introspection does this method have much value.

(2) *Experimentation.* Both objective and subjective observations are most valuable when obtained under experimental conditions. When all relevant conditions except one are kept constant, this one being varied by the experimenter, and when the effects of varying this single condition are carefully recorded, we have the essential features of an experiment. For example, some students make better grades than others. If the question is raised as to the cause of these differences, it may be suggested that the differences are due to the way in which the students distribute their time. How can we learn whether this is true? There is no need to speculate idly, for we can control conditions so that no condition varies except the distribution of the time spent in studying. We should arrange two sets of material of equal difficulty, to be studied, one at one two-hour sitting, the other at four half-hour sittings. The amount that a student learns by each of the two methods would be carefully measured. Assuming that all other conditions affecting the learning had been kept constant — that is, controlled — any significant differences in the amount learned would be attributable to the distribution of study time. Actual experiments have indicated that several spaced periods of study are usually more efficient than a longer single period. In like manner, carefully conducted experiments have revealed how learning efficiency is affected by age, intelligence, motivation, sex, race, psychological organization of material, and other factors.

Many experiments have been performed in nearly every phase of psychology. These experiments deal with such diverse subjects as the type of magazine advertisement most likely to attract the attention of a typical reader, the effect of rest periods on the production of factory workers, and the relative legibility of different kinds of type and widths of column. Figure 1 shows the results of an experiment on the effect of rest periods on the output of factory workers. This experiment is illustrative of the experi-

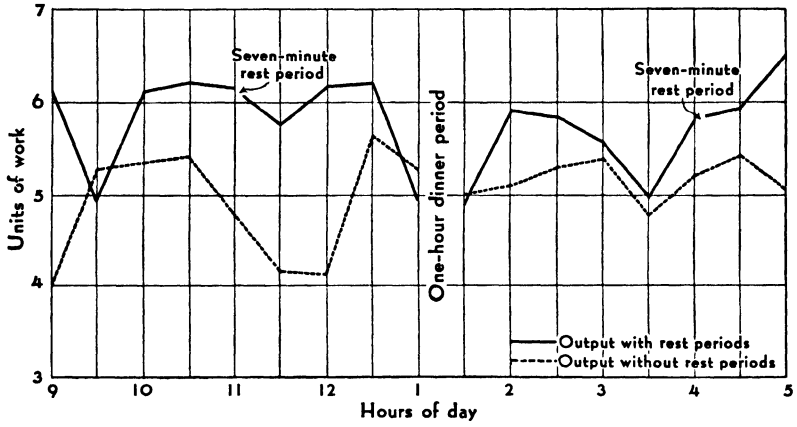


FIG. 1. THE RESULTS OF A TYPICAL PSYCHOLOGICAL EXPERIMENT PRESENTED GRAPHICALLY

The thing to note is not that the rest period increases output (in some work it has little effect) but that by experiment we can tell just what effect there is. (Adapted from E. Farmer and S. M. Bevington, "An Experiment in the Introduction of Rest Pauses," *J. Nat. Inst. Indust. Psychol.*, I, 1922, 89–92.)

mental method, which has been mainly responsible for the tremendous growth of psychology during the past fifty years.

(3) *Statistical analysis.* Quantitative analysis is used not only in tabulating results of experiments but also in solving numerous problems which cannot be experimentally investigated. For example, what is the relation between intelligence and the order of birth in a family of children? Again, is an only child more or less likely than others to have his marriage end in divorce? Or, is there any connection between respect for religion and adequacy of social adjustment? The factors here involved cannot be isolated in an experiment. A person is an only child, or a first-, second-, or third-born child, as the case may be. We cannot manipulate these conditions. We can, however, make numerous comparisons of siblings (children of the same parents) in order to see whether there is a tendency for the first-born or the later-born to be more intelligent. Similarly, we can, after allowing for variation caused by other factors, such as economic level, learn whether only children furnish more or less than their share of

divorces. By such methods as these it has been determined that later-born children tend to be slightly more intelligent than first-born children, and that only children are responsible for more than their share of divorces.[4] All psychological investigations, both the strictly experimental and those of the type just described, use mathematical analysis wherever possible. Analyses vary all the way from simple counting of instances to the use of complicated formulas far beyond the proper attention of a beginning student.

(4) *Interpretation of psychological data.* Mere accumulation of facts, however, does not constitute a science. The Chaldeans gathered many facts regarding the movements of the planets, but they left the creation of the science of astronomy to the Greeks. The Egyptians discovered many mathematical truths, but they too left to the Greeks the creation of the science. For a science to exist, there must be not only a body of facts; the facts must also be explained, even if today's explanation gives way to a better one tomorrow. To explain the facts, we must organize them into an intelligible whole. Why, for example, are distributed periods of study more efficient than an undivided period of study? Why are only children more apt to be divorced than those who have brothers or sisters? To answer these questions we must knit fact with fact. To illustrate, divided periods of study are more effective because there is a perseveration of mental processes between practice periods (see page 372).

The search for explanations or relationships frequently demands an analysis of many phenomena which appear superficially to have little in common. For example, there may be no obvious connection between a feeling of inferiority and bombastic, self-assertive behavior. But when we understand that the feeling of inferiority is unpleasant and that one way of fighting against it is to assume an aggressive air, the relationship becomes clear.

In order to find the underlying cause of a certain kind of behavior, we must sometimes analyze a variety of types of phenomena. Clinical work with school children gives numerous illustrations of this principle. For example, a pupil may be a poor reader and a poor speller, have a small vocabulary, be unable to concentrate on work which involves reading, rank low in intelligence tests which involve reading and writing, and show a generally poor attitude toward his school. Analysis of

these various types of phenomena in a child frequently shows that he is suffering from a single specific disability, such as faulty coördination of the eyes. When this single defect is corrected, improvement in his work and attitude may and often does follow. The explanation of mental disorders also involves searching for an underlying pattern. For example, one person may walk about in a trance-like condition and act queerly (somnambulism); another may write without conscious control (automatic writing); another may be unable to get rid of a persistent idea (obsession); another may alternate between extreme happiness and sadness (manic-depressive psychosis). Analysis shows that all such behavior has one cause, a splitting of the personality, and we are able to classify all these separate conditions under that one general condition. Discovery of a single principle operating in a number of seemingly different situations obviously gives an added understanding of the conditions and a greater possibility of prediction and control.

BRANCHES OF PSYCHOLOGY

(1) *General psychology* is the trunk from which the various branches of psychology have grown. It deals with such general subjects as: (a) what we do, (b) how we do it, and (c) why we do it. It is interested in the universal characteristics of behavior, such as perceiving, desiring, imagining, reasoning, and enjoying. It seeks to describe these experiences, to indicate as fully as possible how we perform these activities, and to show under what conditions and why we perform them. Because of the breadth of the field and of the advantages of specialization, a number of specialized fields or branches of psychology have developed. Some of these may be regarded as kinds of approach to the field of general psychology; others are subdivisions of the larger field. We shall describe first those branches which are approaches to general psychology and then list some of the specialized fields of psychology.

(2) *Comparative psychology*, as the term suggests, is a study of the differences and similarities of behavior between men, and also between men and animals. The former is frequently referred to as individual psychology. Many of our statements about one another imply a comparison. We say that a person is tall, but

how can we tell whether he is tall unless we know where he stands in relation to other men? Similarly, we cannot describe a man as intelligent or brave unless we know where he stands in relation to other men in respect to these traits. The more we learn about the range of individual differences, the more accurate our statements about any person become. The observation of differences leads eventually to attempts to determine the causes of the differences. In this way the comparative approach has set many problems for psychology. To the credit of comparative psychology must also be placed the knowledge of behavior gained through experiments on animals — experiments that would not be tolerated on human beings. By such experiments, psychologists have learned much regarding such things as the functioning of the nervous system, the factors of motivation, and the conditions of efficient learning.

(3) *Genetic psychology* studies the development of mental life. It may trace this development from the simple organisms to man, or it may trace the development of mental life in an individual. To watch the development of children during their period of immaturity, to observe how they are affected by conditions in the home and school and on the playground, and to trace the expansion of their interests and the development of their capacities add so much to our knowledge of personality that this approach to psychology has become justly popular. Its popularity has been further stimulated by popular interest in childhood and in the behavior problems of adolescents. By tracing human development from infancy to adulthood, we learn much regarding the source of many irrational fears and anxieties and regarding the determinants of character, personality, and even intelligence.

(4) *Abnormal psychology* deals with individuals who have in some respect deviated markedly from the norm or average. In the normal person there is a blend of many interests and activities, so that no single aspect of the individual stands out in isolation. In the abnormal person this blending or integration of interests is broken down, with the result that a particular interest or activity stands out clearly. For this reason abnormal psychology has been spoken of as the "microscope of psychology." It enables us to see a single aspect of the individual in an enlarged or exaggerated form; and we can better understand our own fears, prejudices, likes, and dislikes after the study of the exaggerated

but similar experiences of abnormal or psychopathic persons. Genetic psychology deals primarily with the growth, the maturing, and the development of personality. Abnormal psychology is mostly concerned with breakdowns, degenerations, and serious difficulties in personality organization and effectiveness. In genetic psychology we study the building up of a personality; in abnormal psychology we study the breaking down of a personality.

(5) *Physiological psychology.* Since in psychology we study the nature and behavior of the *whole* organism, we need to understand something of the physiological processes which directly or indirectly affect behavior. Physiological psychology meets this need. It is a study of physiological processes in their relation to mental life. This branch of psychology is especially valuable in throwing light on *how* we perform various acts, as, for example, how we see, or hear, or smell. It also throws valuable light on individual differences. The extreme excitability of a person may, for example, be due to a physiological condition, such as excess of thyroid secretion.

(6) *Applied psychology.* In addition to the foregoing branches of psychology, which not only have their own subject matter but also are approaches to the study of general psychology, there are several branches which deal with various separate phases of human activity. There are social psychology, the psychology of religion, educational psychology, child psychology, the psychology of adolescence, the psychology of advertising and of business management, and industrial and vocational psychology. The nature of each is sufficiently indicated by its name. The successful study of these branches depends upon a knowledge of general psychology, and knowledge of the branches, in turn, enriches our knowledge of general psychology.

SCHOOLS OF PSYCHOLOGY

Modern psychology has grown out of several different approaches to the study of human behavior. Although these points of view are rapidly merging, they still retain, to some extent, their individuality. There have been many battles royal among the protagonists of the different schools of psychology. These disputes are of no pressing interest to the beginner, dear as they

may still be to the hearts of some psychologists. However, some knowledge of a few major movements is of interest to us.

(1) *Structuralism, or the study of consciousness.* Without trying to define consciousness at this time (we shall find it difficult enough to define when we make the attempt to do so on page 102), we can say briefly that consciousness is what is going on in our minds, that is, what we are experiencing or thinking about. Of interest to the structuralist are such problems as: What spots on the hand can be stimulated to give the sensation of warmth, cold, or pain? How does looking at one color affect what we see when we look at another? When we try to solve a problem, do we think in terms of words, pictures, numbers, or of something else?

It is obvious that these questions focus our attention upon interesting problems. Knowledge of what goes on in the mind is not only of interest but is of some value in understanding behavior. But we know now that many things we do cannot be explained by even a complete knowledge of what is going on in our minds. We may leave our work to play golf "because we need sunshine and exercise"; yet tomorrow, when it is raining, we may leave our work again, this time to go to a moving picture or to play cards. We may lend money to a friend "because he really needs help" and find that within twenty-four hours we have told a dozen people how we befriended poor Sam. Obviously the real explanation of such behavior (and more of our activity than we realize is of this sort) cannot be found in what we "think" is the explanation. In other words, the study of consciousness, though helpful, may lead us into many a blind alley if accepted as the sole means of understanding behavior.

(2) *Behaviorism, or the study of behavior.* Early in the twentieth century a few psychologists, headed by John B. Watson, began to feel that psychologists were too greatly interested in consciousness and not sufficiently interested in what men do. Not content to emphasize the importance of behavior, they urged psychologists to abandon the study of consciousness and to rely wholly on the observation of behavior, which can be objectively observed. Though behaviorism should be given credit for giving needed emphasis to the importance of behavior, few psychologists are strict behaviorists. To understand why a man is running, we must know whether he is trying to get *to* something or *away* from something. We can never learn this from simply observing him

run. Knowledge of one's behavior, of his consciousness, and usually of his past experience are all necessary if our explanations are to be complete and correct.

An interesting illustration of the frequent need of combining subjective and objective observation is afforded by the studies by Travis of the electrical waves in the brain that accompany different kinds of mental processes. Travis had his subjects, to whose heads wires had been attached, recline on a couch. The electric current coming from the subject's head was amplified and its pattern recorded on an ink-writing undulator. Occasionally, and without warning, the subject was asked to give a report of his mental processes. It was found that the pattern of the current was different when the subject was thinking, from what it was when he was relaxed or merely looking at something.[5] Such experiments, which lead often to important objective measures of mental processes, obviously require introspection as well as objective observation.

(3) *The Gestalt school.* A problem that once aroused heated argument among scholars is whether there would be any sound if a clap of thunder occurred in the middle of a desert with no living thing to hear. We know that the physical sound wave would be in the air, but for a sound to be *heard*, some one obviously must hear it. This suggests the viewpoint of the Gestalt school of psychology. To explain any situation or behavior, one has to know the whole situation in which it occurs. The figure 6 has an entirely different meaning in 6, in 60, in .6, and in .06. The meaning is carried not by 6 alone but by 6 in relation to other factors. If one believes that three 10's always have more value than four 2's, as he learned in the third grade, he had better not play poker; for there four 2's are more, not less, in value. Wherever we turn, the meaning of what we see or feel or do is determined by the whole situation. Acts of kindness presuppose not only some one who is kind but some one to be kind *to*. Robinson Crusoe (before the savages came) could not have been a thief, or a murderer, or a liar, or a swindler, or an outlaw. Neither could he have been kind or generous or self-sacrificing or affectionate (except in so far as, like some people today, he succeeded in expressing these feelings toward his dog). Most of our behavior grows out of a whole situation — a complicated set of relations involving the behavior and thoughts of ourselves and others.

To the Gestalt school belongs the credit for emphasizing the necessity of studying a whole situation before attempting explanation.

(4) *Functionalism.* A fourth point of view, which emphasizes the study of the activity of the organism but does not reject subjective observation as a method, is known as functionalism. Instead of studying mental states, as does the structuralist, or objectively observed behavior only, as does the behaviorist, the functionalist is interested in *activities*, both mental and bodily. For example, in studying memory, the functionalist emphasizes such problems as: How can we remember most effectively? What methods of study are most effective? Why do we forget names more readily than faces? In his study of perceiving, judging, thinking, imagining the functionalist always emphasizes the activities involved, rather than the conscious states.

(5) *The psychoanalytic school.* Near the end of the nineteenth century, a group of physicians became interested in the psychological approach to the study of mental disorders. This interest grew out of the fact that no physical basis for many mental disorders could be discovered. It was reasoned that their origins must be of a mental nature, and efforts to discover the mental conditions causing the disorders and to eliminate the causes led Freud and others to develop a theory of mental disorders and a technique designed to help the sufferer. Thus was born the psychoanalytic school. It is chiefly interested in emotional disorders and their many forms of expression. This interest has led it to stress both the purposive aspect of behavior and the fact that behavior is often due to sources of which we have little or no awareness.

These varying points of view have proved to be fruitful approaches to the study of behavior, and there is little reason for those who favor one to condemn the others. Here, as with objective and subjective observation, all have proved useful in the development of psychology.

PSYCHOLOGY AND RELATED SCIENCES

(1) *Psychology and physiology.* Both psychology and physiology study human behavior, but they do so from different points of view. One is interested in the action of *the organs* as such; the

other, in the activity of the *total organism* as it makes its adjustments to the world, and in its mental life. This difference may be illustrated by comparing the physiologist's interest in digestion with that of the psychologist. The physiologist is interested in digestion because it is a bodily activity necessary to organic life. To be sure, the physiologist takes note of mental states, such as fear, worry, and joy, but this is wholly because these influence the bodily activity. The psychologist is interested in digestion because disorders in this process influence thinking, emotions, and disposition and therefore the behavior of the individual as a whole, and also because emotional experiences can disturb the digestive process. It is often necessary to get far more than a skin-deep view of a person to know whether indigestion is making him sad, depressed, and weary or whether an upset emotional condition is causing his indigestion.

Since the activities of the individual always involve some physical activity, all activities may be described in terms of bodily processes. Even such an activity as reasoning has a physical basis, a description of which would constitute the physiological account of reasoning. This account would call attention to the stimulation of some sensory organ (such as the eye, ear, or other organs discussed in Chapter XII), to the activities in the nervous system, and finally, to muscular activity. It would also refer to the chemical composition of the blood and its possible influence on mental processes. Obviously this account has its place and value, especially in accounting for disorders of reasoning. The psychological account of reasoning would stress such conditions and processes as the interests and prejudices of the thinker, the problem felt, the rise of suggestions, the mental images fleeting through the mind, and the relation of all of these to the experience of the individual. The psychologist might also call attention to the fact that some individuals have fertile imaginations and are more capable of thinking in abstract terms than others. Locating the nervous processes that are involved in reasoning is, to the psychologist, a matter of secondary importance, unless some defect of reasoning has been caused by deterioration of the nervous system. In such cases, a knowledge of the functioning of the various parts of the brain becomes of primary importance.

Of these two accounts of reasoning, the psychological is of greater value in our everyday living. In dealing with others,

we are ordinarily not interested in the nervous processes that accompany their thinking; rather, we are interested in knowing the biases, prejudices, and values which color their thoughts. Consider, for example, a public speaker. Of what concern to him are the nervous processes that accompany thinking? He wishes to bring into the consciousness of his audience sentiments that are in harmony with the cause he is advocating. He knows that if he can accomplish that, he will encounter no great difficulty in persuading his audience to follow sympathetically his train of thought. Our present knowledge of the nervous processes is far from complete. Except for disorders due to lesions and injuries, and the known effect of a relatively few drugs, we have little insight into what is actually going on in the nervous system when we think, recite a multiplication table, or wish we could write with twice the clarity that we have at our command. Something must happen in the nervous system when one learns a new telephone number, but exactly what happens is not known. In fact, with certain notable exceptions, our millions of nerve cells might just as well be microscopic squash seeds for all the insight into human nature our present knowledge of them yields. Sometime this may not be true. But at the present writing, in practically all our dealings with each other and in our efforts to improve ourselves, the psychological account of behavior is more important than the physiological.

(2) *Psychology and sociology.* Sociology is the science of social phenomena. Because human beings live together, group practices and institutions inevitably arise. The sociologist is interested in these and in their changes. In his studies, human nature figures large. He cannot understand social behavior without understanding man, but he cannot hope to understand social phenomena by relating them only to man. Social phenomena are outgrowths of a complex whole which includes climate, natural resources, cultural contacts — many other factors as well as man. There is, therefore, much in this field that does not belong to psychology. On the other hand, there is much in psychology that is of little interest to the conventional sociologist: the laws of learning, the nature of perception, the disorders of memory, the physiological processes that accompany emotional experience. To a sociologist well trained in dynamic psychology, many serious social phenomena, such as a red-hot labor strike or

a stone-cold labor lockout, are symptoms of psychology working out into a sociological condition rather than sociological pressures working in on men and women.

In his effort to understand human behavior, the psychologist must recognize the reality of social forces just as he must recognize the reality of physical objects. How, for example, can we understand the present strength of the desire to acquire wealth, apart from the social situation? Or how, apart from social conditions, can we account for the divorce rate? Or for women buying their spring hats in January? So important are social conditions in influencing behavior and character that a branch of psychology, called social psychology, is devoted to the study of the interactions between society and the individual. Man is a social being, and his behavior is colored through and through by that fact. Psychology occupies the territory between physiology on one hand and sociology on the other. Physiology studies the behavior of organs or parts of the individual; psychology, the behavior of the individual; and sociology, the behavior of groups of individuals.

(3) *Psychology and biology.* Biology is the science of the nature of organisms. Since psychology deals with the mental life and behavior of organisms, it might be regarded logically as a branch of biology. Historically, however, psychology and biology have never been regarded as constituting a single science. There is ample justification for this division of labor in such a broad field. No one can hope to master the whole field of biology or of psychology, much less both. The field of biology, as it is usually conceived, deals largely with the universal characteristics of life, such as reproduction, heredity, regeneration, cellular activities, growth, and degeneration. Psychology, on the other hand, is interested principally in a group of activities of a different kind — in thinking, desiring, imagining, in courage and intelligence, and in the influence of social factors upon the individual. One may, however, take unnecessary risks in his attempts to understand himself and others unless he gives more than a passing glance at the broad biological basis of life.

(4) *Psychology and ethics.* Both psychology and ethics study human behavior, but from different points of view. Psychology seeks to describe and explain human behavior; ethics seeks to evaluate it as right or wrong. Psychology is a descriptive and explanatory science; ethics, a normative or evaluative one. The

difference may be simply illustrated. Suppose a boy is caught lying. The psychologist is interested in knowing why he lied. Did he lie because of poor observation or from confusing day-dreams with reality, from fear or from a desire to impress others with his importance, or merely from a desire to deceive and injure? If the cause was a desire to injure, why the desire? Did it arise from jealousy, from love of showing power, or from cruelty? The ethicist is interested in these only secondarily. His chief interest is in the moral quality of the act, but since this can be determined only when the questions mentioned have been answered, he is therefore indirectly interested in them also.

(5) *Psychology and philosophy.* At one time philosophy included all rational knowledge. It is therefore commonly regarded as the mother of all sciences. As knowledge increased, specialization became necessary. Hence arose the various sciences, each taking as its province a selected body of phenomena. Philosophy, on the other hand, continues to seek a comprehensive and unified view of all things with special emphasis on man and his values. It draws, of course, upon all sciences for help in constructing its view of the world. On the other hand, from its more generalized point of view it criticizes and checks the tendency of the various sciences to regard themselves as complete.

In practice, psychologists tend to study only problems that can be investigated by scientific methods, and to be content with hypotheses that can be empirically verified. Hence they prefer to deal with such questions as: What is the effect of environment on intelligence? How can intelligence, attitudes, and other personality traits be measured? What is the influence of motion pictures on behavior? Why are some men better automobile drivers than others? To philosophy they leave such problems as the nature of consciousness, freedom, individuality, the relation of body and mind, and other problems which cannot be empirically investigated.

THE VALUE OF PSYCHOLOGY

The value of learning more about ourselves and human nature is obvious. Our social, political, and economic theories rest ultimately upon our understanding of human nature. Upon sound knowledge of human nature depends the possibility of directing social changes, so as to make social institutions and

practices better suited to human needs. As citizens, then, we need to make our beliefs about human nature as sound and rational as possible. The nineteenth century was marked by great achievements in engineering. Advances in psychology, sociology, and physiology should lead to as striking advances in "humaneering" during the twentieth century.

Psychology has already contributed much to sound social practice. By unearthing some of the conditions that produce sound character and those that produce criminals it has helped create wiser treatment of boys and girls and given us a greater realization of the duty of society to provide for all its members conditions that promote adequate adjustment and mental health. The more humane attitude of modern society toward the criminal and the mentally sick, and the present emphasis on the importance of individual differences and on adapting the school to the needs of the pupil are in no small measure the result of advances in psychological insight.

The beginning student in psychology should find in his study other values of a more personal and immediate character. In the first place, knowledge of the range of human capacities, and ability to compare his own potentialities with those of men engaged in different lines of work should aid him in choosing a vocation. A person who enters a profession of which the successful members are far more intelligent than he only invites failure. To avoid this, one needs reliable knowledge of his capacities and of the capacities of those working in the occupation which he is considering. Psychology gives him this information.

Knowledge of one's capacities is also helpful in taking a more objective attitude regarding oneself. Many people go through life uncertain regarding their abilities. They stagger under a load of anxiety and tension. They are afraid that they may do something that will reveal a lack of ability to themselves and to others. Being uncertain regarding their capacities, they become dependent upon others for praise and commendation. If this is withheld, they feel depressed. It is far more conducive to peace of mind and efficiency to know one's good points and weak points, and to act accordingly. Such knowledge increases one's chances of using his strong points to the greatest advantage and of reducing the liability of his weak ones. "Know thyself" is as sound a motto today as it was in the days of ancient Greece.

Knowledge of human nature should also be of value to the student in helping him make a success of his life. Some human beings have attained a high level of moral, aesthetic, and mental development. Their lives are ordered and balanced. They enjoy poise and emotional maturity. Others have made a failure of their lives. They are creatures of impulse and are given to emotional outbursts on the slightest provocation. Many break down mentally so completely that they require hospital care. To learn some of the principles of living that make for ordered and harmonious development and some of the pitfalls into which many unfortunates slip should help the student preserve his mental health and make the most of his life. Knowledge of what constitutes success in living should increase one's chances of living successfully.

Knowledge of psychology should also enrich one's life by increasing his understanding of others. There are individuals who take a cynical and embittered view of human nature. Others take a romantic view. The former blind themselves to the beauty and nobility to be found in human living, and thus deprive themselves of experiences necessary for their own highest development. The latter close their eyes to the weakness and meanness to be found in human beings and thus allow themselves to be taken advantage of by the unscrupulous. Knowledge of human nature, of its good points and weak points, of its great variety of interests and tastes, and knowledge of the factors that bring and those that destroy the possibilities for complete development are safeguards against these blights. Knowledge substitutes understanding for prejudice, and with understanding should come a greatly increased capacity for social living. There is a saying that to understand all is to forgive all. Whether or not this is true, it is certain that a great many tragedies of human life arise from our inability to understand one another. Parents, through failure to understand their children, create needless difficulties both for themselves and the children. Husbands and wives, from the same failure, make difficulties for each other. The same is true in less intimate social relations. Psychology, more than any other field of human knowledge, helps us to develop understanding and thereby to improve our own lives as well as those of others with whom we live.

SUMMARY

All students begin the study of psychology with a fund of knowledge regarding human nature, which may be called naïve psychology. Though this knowledge is of value, it is unscientific in five respects: (1) it is uncritical of the problems it raises; (2) it is guilty of hasty generalization; (3) it lacks organization; (4) it lacks an exact terminology; and (5) it has no technique of research. Psychologists, in seeking knowledge that will throw light on their problems, make use of observation, experimentation, mathematical analysis, and interpretation. Psychologists observe mental processes as well as overt behavior and physiological states. To be understood, facts must be organized. Hence comes the importance of theories and hypotheses in science.

General psychology has to do with the *what*, the *how*, and the *why* of behavior. The main branches of psychology are: (1) comparative psychology, (2) genetic psychology, (3) abnormal psychology, and (4) physiological psychology. These branches are approaches to the general subject of psychology and also fields of specialized interest. There are other fields of specialized interest, such as educational psychology, the psychology of advertising and of business management, the psychology of religion, child psychology, the psychology of adolescence, social psychology, and industrial and vocational psychology.

Different schools of psychology represent different interests and theories as to the best way of increasing our knowledge of human nature. The structuralist is chiefly interested in conscious states; his chief method is therefore introspection. The behaviorist is interested only in overt activity; he therefore relies on objective observation. The Gestalt psychologist is interested in the wholeness or pattern of things. The functionalist emphasizes activities. The psychoanalytic school is interested in probing below layers of experience to find out what urges and drives underlie behavior. All schools, except the psychoanalytic, have done much to perfect experimental techniques in psychology.

Psychology is closely related to a number of other sciences that deal with human nature. Physiology is the study of behavior in terms of the organs of the body; psychology, of the behavior of the individual as a whole. Sociology is a study of group behavior; psychology, of individual behavior. Biology deals with the uni-

versal and inherited characteristics of organisms; psychology, with behavior that is either learned or influenced by experience. Ethics seeks to evaluate conduct; psychology, to describe and understand it. Philosophy is concerned with man's ultimate nature; psychology, with the problems of behavior that can be empirically investigated.

Some of the values that should result from the study of psychology are: (1) improved social relations, (2) better mental health, (3) greater vocational efficiency, and (4) better understanding of ourselves and others.

QUESTIONS ON THE CHAPTER

1. Give a general definition of psychology which includes the major points brought out in this chapter.
2. What are the differences between scientific psychology and naïve psychology?
3. What are the characteristics of psychological research?
4. Show the difference between objective and subjective observation.
5. Why does a science require interpretation in addition to sheer discovery of facts?
6. Define the following branches of psychology: (a) comparative psychology, (b) genetic psychology, (c) abnormal psychology, and (d) physiological psychology.
7. What is a school of psychology? What are the distinguishing characteristics of the following schools: (a) structuralism, (b) behaviorism, (c) the Gestalt school, (d) functionalism, and (e) psychoanalysis?
8. How is psychology related to the following subjects: (a) physiology, (b) sociology, (c) biology, (d) ethics, and (e) philosophy?
9. What are the main values which one may expect to obtain from a study of psychology?

QUESTIONS FOR DISCUSSION

1. Evaluate the following definitions of psychology:

(a) "Psychology is a study of conscious behavior and of the conditions under which that behavior takes place." — Wheeler.[6]

(b) ". . . psychology is limited to those interests in human behavior that take the form of true scientific inquiry." — Dashiell.[7]

(c) "Psychology is the science of the activities of the individual." — Woodworth.[8]

(d) Psychology is "that science which seeks to understand the behavior, motives, and feelings of people in order that they may better

predict and control their own lives and more effectively influence those of others." — Ruch.[9]

(e) "The study of psychology may . . . be defined as the development of activity, including both its internal and external phases." — Goodenough.[10]

(f) "Psychology . . . is the science of mind." — Titchener.[11]

2. Give examples from everyday life of three problems which would be attacked in one way by naïve psychology and in another way by scientific psychology.

3. How would the sociologist, the psychologist, and the physiologist differ in making a study of the effects of alcohol?

4. How would the psychologist and the student of ethics differ in studying the problem created by a boy stealing money from his parents in order to replace a window broken by his chum?

5. Does the psychologist, in conducting an experiment, encounter difficulties different from those of a chemist? Can the psychologist put the same confidence in his results?

SUGGESTED READINGS

F. L. Goodenough, *Developmental Psychology* (D. Appleton-Century Company, 1934), Chapters I and II. Elementary psychology presented from the genetic and developmental viewpoint. Very interestingly written.

J. H. Griffiths, *The Psychology of Human Behavior* (Farrar and Rinehart, 1935), Chapters I and II. A further discussion of what modern psychology is all about and is trying to do.

Bernard Hart, *Psychology of Insanity* (4th edition; The Macmillan Company, 1931). A short book, but a classic treatment of the main contributions of psychoanalytic concepts to our understanding of human behavior.

R. S. Woodworth, *Contemporary Schools of Psychology* (Ronald Press Company, 1931). A brief but accurate picture of the points of view and contributions of the various schools of psychology.

MORE ADVANCED READINGS

On structural psychology: E. B. Titchener, *Text-Book of Psychology* (The Macmillan Company, 1910).

On behaviorism: John B. Watson, *Psychology from the Standpoint of a Behaviorist* (3d edition; J. B. Lippincott Company, 1929).

On Gestalt psychology: Wolfgang Köhler, *Gestalt Psychology* (Liveright Publishing Corporation, 1929).

On psychoanalysis: Sigmund Freud, *Basic Writings* (translated and edited by A. A. Brill; Modern Library, 1938).

CHAPTER TWO

Differences between People: How They Affect Our Behavior

In 1637 Descartes, one of the greatest scientists of his time, began his famous book, *A Discourse on Method*, with the statement: "Good sense [by which he meant intelligence] is, of all things among men, the most equally distributed; for every one thinks himself so abundantly provided with it, that those even who are the most difficult to satisfy in everything else, do not usually desire a larger measure of this quality than they already possess. And in this it is not likely that all are mistaken."

This is an interesting statement of a discarded point of view in psychology. Experiments have shown that people are not alike and that no trait is equally distributed among men. The fact that most (if not all) people believe themselves to be as intelligent as any one else, and even more intelligent than many, is no proof that they are correct. The common practice of overestimating one's ability is psychologically significant, but it is not good evidence of any real superiority at all. The tests and other instruments which psychologists have devised to measure personality traits have shown that no two people are exactly alike in any trait yet studied. Indeed, the universal existence of individual variation is one of the most thoroughly demonstrated principles of modern psychology. Our ability to understand human behavior rests largely upon recognition of individual differences. When, for example, we try to understand a man's blunder, we commonly explain it by some special circumstance; we say that he was irritated or depressed, or perhaps that he was

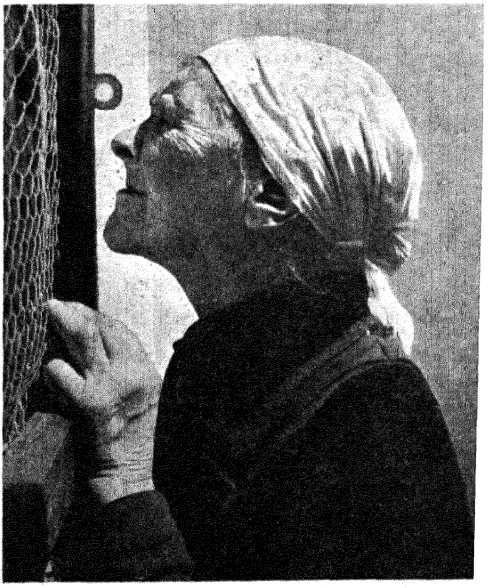


FIG. 2. THE PSYCHOLOGICAL TRAITS OF THESE PERSONS DIFFER NO LESS THAN THEIR PHYSICAL CHARACTERISTICS

(Photos: left, Lambert; right, Pix.)

too stupid to understand what he was doing. When we select a person for a special task, we look closely into special qualifications; we reject one man because he is too old, another because he is too young, a third because he is too small. We disqualify a candidate because he lacks ambition, or because he is not sufficiently intelligent (or perhaps because he is too intelligent) for the task at hand. All this is not only common sense; it is also sound psychology. If we improve our understanding of people's traits and of their differences, we can make the behavior of those about us much more intelligible. Already you and your classmates are differing in your mastery of psychology. One of you will read this discussion of individual differences and never let it shake his conviction that the fortune of men is largely determined by luck; another will ponder over the facts of individual differences until they become important tools in his daily life.

THE INFLUENCE OF AGE

It is obvious that age is a rough measure of maturity. The changes that take place in psychological traits between birth and extreme old age are as great as (if not greater than) the corresponding changes in outward appearance shown in the pictures in Figure 2. The circumstances which caused the delight of the small boy were probably complex: pleasure in the ownership of his tricycle, pleasure in his ability to ride it, satisfaction in the companionship of his playmates, the unconscious joy of health. Obviously the same psychological combination could in no way be injected into the experience of the infants to relieve their distress. Nor, whatever happiness or despair the old woman might know, would her "state of mind" approximate that of either boy or baby. Children ten years old are regularly more mature than those five years old; persons twenty years old, than those ten years old. It is obvious that this increasing maturity has much effect on behavior. No one expects an infant to act like a child, or a child to act like an adolescent, or an adolescent to act like an adult, or an adult of thirty to act like a man of seventy — although, of course, a man of thirty may sometimes act with no more emotional maturity than a ten-year-old. In a normal lifetime we pass through many stages, sometimes making abrupt transitions, sometimes almost imperceptibly drifting from one

stage to another. Each stage has its own characteristic physical structure and behavior. The human being begins as a single, relatively homogeneous cell. After this simple beginning there takes place a rapid multiplication of cells, which become constantly more and more specialized. The first two weeks following the fertilization of the ovum is known as the period of the ovum. At the end of two weeks the ovum attaches itself to the uterus and becomes a parasite drawing its sustenance from its mother. From then until the parts of the body are formed is the period of the embryo. This lasts about eight weeks and is followed, in turn, by the fetal period, by birth, and by the neonatal period, during the last of which the infant becomes adapted to a new world and overcomes the shock of birth. All of these periods together cover a space of approximately nine months. The rapidity of development during this time is indicated by the fact that before birth there takes place the formation of all the bodily parts which the adult human being later possesses. At birth, however, the bodily structures are not fully developed. Nor do they have in early infancy the relative importance which they have later. After birth, some parts of the body develop rapidly and some parts slowly. Throughout childhood and adolescence development continues to be uneven. Figure 3 shows the rate at which the different parts of the body develop. Figure 4 shows changes in physique as the individual passes from the fetal stage to adulthood. Note that in the fetus the head is approximately half the size of the body, and that in the adult its proportion to the size of the body is very small. Changes in the relative size of the legs are in the opposite direction.

As might be expected from the early development of the head, the nervous system undergoes early development in human beings. At birth the brain of the average infant accounts for about a tenth of its total weight. During the first year after birth the brain increases in size 115 per cent, in the following year, 25 per cent, and the next year, 10 per cent.[1] This growth in size and weight is accompanied by a remarkable increase in complexity of nervous organization. Figure 5 shows the increasing complexity of certain nerve cells, and Figure 6 shows the increasing conductivity of the cerebrum and the cerebellum from just before birth to the age of two and a half months. All these changes are due mainly to sheer inner growth, the living

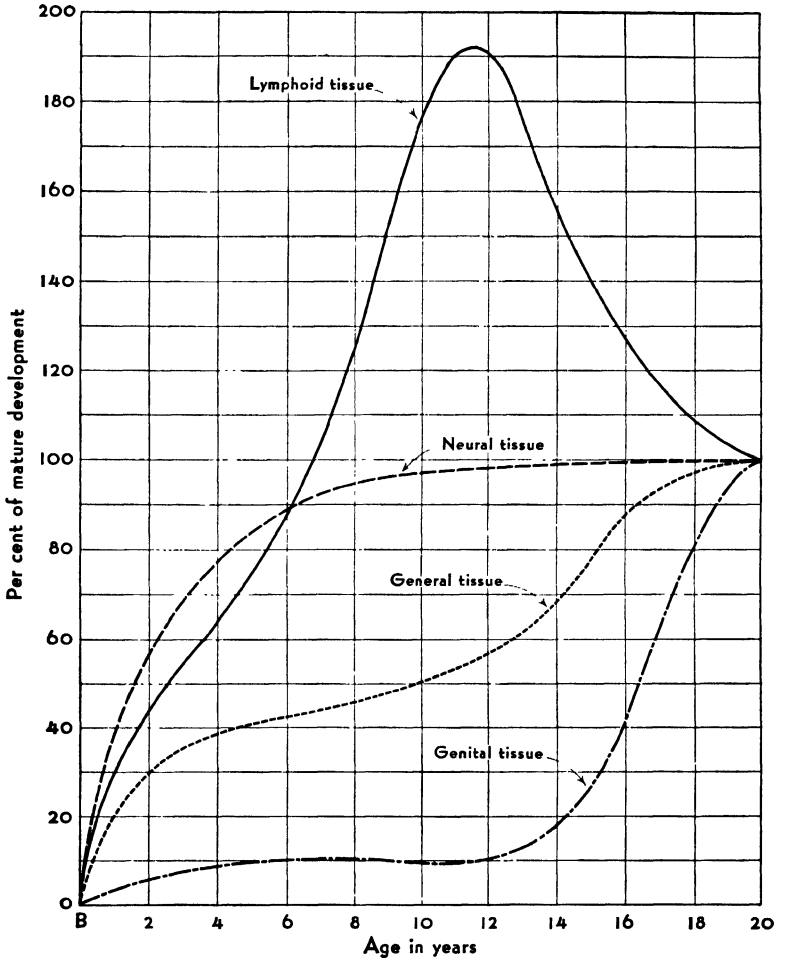


FIG. 3. THE DEVELOPMENT OF DIFFERENT PARTS OF THE BODY AT DIFFERENT AGES FROM BIRTH (*B*) TO TWENTY YEARS

(From R. E. Scammon, "The Growth of the Body in Childhood" in J. A. Harris and others, *The Measurement of Man*, 1930, p. 193; by permission of the publisher, The University of Minnesota Press, Minneapolis, Minnesota.)

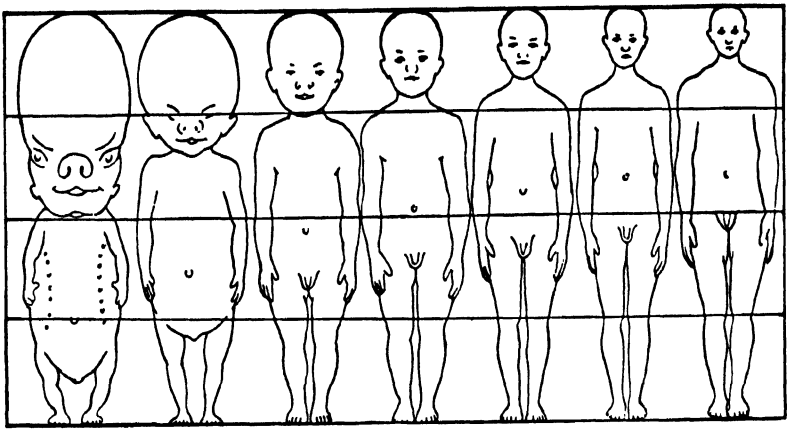


FIG. 4. CHANGES IN BODILY PROPORTIONS FROM FETAL STAGES TO ADULTHOOD

(From R. E. Scammon, "Developmental Anatomy" in H. Morris, *Human Anatomy*, 9th ed., Fig. 24; copyright, 1933, The Blakiston Company, Publishers.)

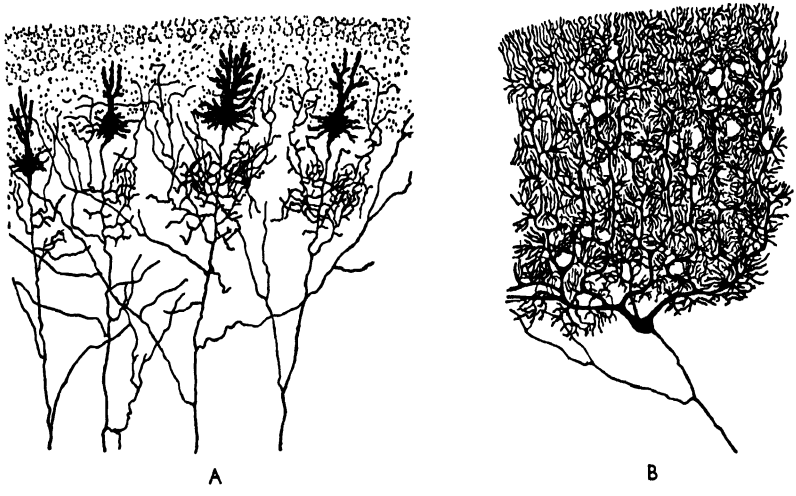


FIG. 5. DIFFERENCE IN COMPLEXITY OF CERTAIN BRAIN CELLS (PURKINJE CELLS) IN A NEWBORN CHILD (*A*) AND AN ADULT (*B*)

(From G. W. Crile, *The Phenomena of Life*, Norton, 1936, p. 110; after Cajal.)

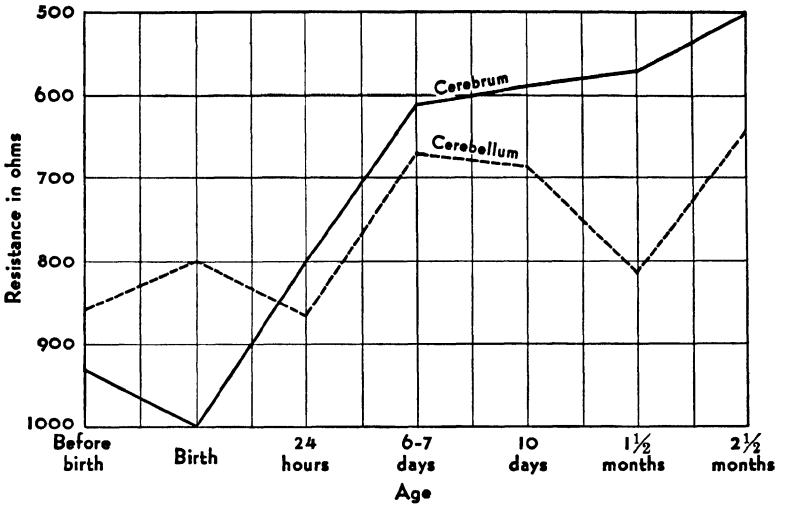


FIG. 6. CHANGES IN CONDUCTIVITY OF THE CEREBRUM AND THE CEREBELLUM FROM BIRTH TO THE AGE OF TWO AND A HALF MONTHS

This graph is plotted in terms of resistance per cubic centimeter of tissue to a thousand-cycle current. (Modified from G. W. Crile, *The Phenomena of Life*, Norton, 1936, p. 111.)

tissue assuming its own mysterious destiny relatively unaffected by experience, activity, or effort.

Growth and development, or *maturation*, as they are called, bring with them many other changes. The newborn infant is unable to differentiate emotional expression beyond showing pleasant and unpleasant excitement; but as development proceeds, he comes to differentiate emotional expression and does so to such a degree that an observant adult can tell pretty well what he means. With maturation comes also the power of localizing a response. If a prematurely born infant is pricked with a needle, he will make a gross massive movement of the whole body; but when he becomes older, his actions tend to involve only those parts of the body that are needed to make an effective response. Because of maturation a child of two can perform many acts he could not accomplish when he was only a year old. As he grows still older, operations become possible and easy which could not have been mastered earlier, even by the greatest effort.

Cutting with a pair of scissors, writing with a pencil, reading, and solving arithmetical problems require powers which, at a certain age, do not exist.

The demands generally placed upon the developing child correspond roughly to his stages of maturity. Adults possessed of ordinary common sense accept only with great reservation the testimony of a young child, especially if he is under stress. Within the last decade teachers have given careful consideration to what knowledge we have concerning the degree of intellectual maturity which school tasks demand. In competent schools a child is not taught to read merely because he has reached a certain chronological age, since age by itself is known to be a highly unreliable measure of mental development. He learns to read when, in "reading-readiness" tests, he has shown himself sufficiently mature. One reason why so many adults, perhaps the reader of this page and certainly the writer of it, "hated" long division was that they were forced into its complexities before they were mentally old enough. Knowledge of the psychology of childhood is used extensively in directing elementary education today. You studied long division in the fourth grade; your younger brother will study it in the fifth grade; your children, if they study it at all, may not attack it until the sixth grade.

While growth proceeds extremely rapidly in early childhood, it slows down somewhat in later childhood. Yet between the ages of twelve and seventeen the average boy increases as much in weight as in the previous ten years. Some adolescents grow as much as six inches in a single year. The internal organs also, such as the heart, liver, stomach, and especially the sex glands, are developing rapidly through this whole time. Because so much of the strength and energy of the adolescent is used in growth, he frequently has insufficient energy for strenuous activity and, if incited to too great effort, he may injure himself permanently. Many a sagacious football coach, successful in the savage conflict of college athletics, looks doubtfully at the high-school star, wondering whether he has burned himself out in adolescence so that dynamically he is a "has-been" before he approaches college competition.

Under the best circumstances, such rapid growth would be sure to create difficult problems for the adolescent; but to make his plight more uncomfortable, growth occurs in a very uneven manner

and thus is the cause of the typical awkwardness of adolescents. Sometimes the bones grow faster than the muscles, and "growing pains" result. Sometimes the muscles grow faster than the bones. Many adolescents are anxious about their general health because of this uneven growth. Others are concerned over the development of their sexual organs. In brief, the rapid and irregular growth provides all the materials for the storm and stress that frequently descend on the adolescent. Childhood is no paradise except in retrospect; nor is adolescence. The youth, worrying about his too big nose, his squeaky voice, or his impossible hands and feet, is in real misery. It is hard for him to realize that in due time his face will catch up with his nose.

The psychological changes that accompany increasing maturity are as striking as the physiological ones and call for even more careful management. One important change is the broadening of interests. The infant is interested only in those things that affect its immediate physical welfare. The young child becomes interested in the attitudes of others, and in his possessions and his play; he begins to love his parents and other members of his family. When he leaves his home for school, his interests continue to widen, until, with the dawn of adolescence, he becomes absorbed in the group of friends and acquaintances that surrounds him. He has his special group of friends to which he is devoted. In addition, definite interest in the opposite sex usually becomes pronounced, and love affairs, sometimes of great intensity, are not uncommon. For an adult to tease or badger one who is often literally suffering from "puppy love" is unfortunate and may be tragic. It is to be remembered that puppy love is very real — to the puppy. If development continues to adulthood, there will follow an interest in community projects and in human welfare, as well as in vocational success and the welfare of the immediate family.

It is possible to measure carefully the development of various aspects of behavior. People can be graded by so-called "social maturity scales." An example of such a scale is the Vineland Social Maturity Scale for children.[2] Such scales as the Willoughby Emotional Maturity Scale [3] and the Pressey X-O Test [4] are designed to measure emotional maturity.

As one develops, he finds it easier to learn and to make use of what he has learned. It is sometimes stated that young children

can memorize better than older ones and adults. As a matter of fact, while a child of six may be able to memorize the multiplication table, it will be easier for him to do so two years later. In general, learning ability increases until the early twenties and remains practically constant until about the twenty-eighth year. Then follows a slow decline until about the forty-fifth year. After that, decline is more rapid. It has been suggested that the undue conservatism of the old person is possibly as much a matter of his increasing difficulty in mastering new situations or assimilating new ideas as it is of genuine wisdom born of long experience.[5] The ability to concentrate also increases with age. A child will stay absorbed in a pastime for only a few minutes; a ten-year-old boy will play contentedly with his toys very much longer; while an adult will work at a task for hours, and even days, at a time. Bickersteth has shown that growth in capacity for sustained attention roughly parallels the general growth of mental functions.[6] Complaints on the part of college students that their lectures are uninteresting or that their textbooks are dull are a subject for interesting analysis. The psychologist will realize that, while the complaints may possibly be true, there is also a further possibility: that the students, through poor education, have failed to acquire the powers of concentration ordinarily expected of people of their age. Birthdays may have outrun psychological development.

Normal development results in the growth of self-reliance. This rests partly on increased physical and mental power, partly on the habit of success and on the encouragement given by others. At adolescence the compulsion to become self-reliant increases more rapidly than before. This explains much of youth's radicalism and protest against authority, social and parental. Many parents and teachers, failing to recognize this disguised effort to achieve adulthood and independence, try to curb it by treating the adolescent like a young child. Extravagant restraint by a parent indicates something about the parent himself. He may be uncomfortable in the presence of equals and happy only in the presence of those who, like children, are clearly inferior to him. So, unconsciously, he may attempt to keep those in his charge permanently childish and dependent. The battle between the young and the old has lasted for countless generations. No truce is predicted. Like most battles it ends in disaster, whichever side wins. If the parents win, the growing freedom and self-

reliance of the adolescent is nipped in the bud. If the adolescent wins, he does so at the price of great unhappiness for himself and his parents; for a chasm is dug between those who should be the closest and most understanding of friends. A college campus is an excellent laboratory for the study of the conflict between the "rising-up" tendencies of youth and the "pressing-down" tendencies of age. You will hardly go through college without being a witness to, if not a participant in, a skirmish where faculty members complain of a student editorial, or of a radical play, or of new fashions or new customs, and where students retort that "professors don't understand how things are done nowadays." One of the writers of this book (without benefit of psychology at the time) remembers discussing with his dean the matter of the proper closing hour for a freshman dance for which he was chairman. Now, after years have passed, he finds himself assuming somewhat the attitude of that dean, and he confesses that he does not understand why a junior "prom" does not begin until ten o'clock. Dances did not begin so late when he was young! The student should be a little tolerant of musty middle age — he will be there himself before long.

An intensification of group loyalty and the birth of a serious purpose in life are other outstanding developments during adolescence. A rapidly approaching maturity forces upon the youth the fact that he will soon have to make his own place in society. It is this realization, this influx of new interests and drives, and the rapid and uneven physiological development that make adolescence a period of storm and stress.

Perhaps many of the emotional problems encountered during these years are due to the cultural influence of our particular society. Mead has suggested, from her study of a primitive people, that this is the case.[7] Whatever may be the ultimate cause, however, we know that during the adolescent years many, if not all, of our youth experience these problems and changes; and their behavior at this age can only be understood in the light of these facts. It must be kept in mind that the successful and unsuccessful meeting of problems in childhood and adolescence permanently affects the personality. These periods are far more important than is commonly supposed. Serious maladjustment in early life is the direct cause of even more serious maladjustment during the long years of maturity. "The child is father to

the man" — Wordsworth's line contains profound insight. We should not forget it.

But adolescence is not the only period of great physiological and psychological change. During adolescence nature assembles her reproductive resources, and, as we have seen, this and other changes entail considerable stress and strain. But between the ages of forty and fifty the reproductive equipment is demobilized, and this, too, necessitates a difficult adjustment.[8] "In middle life there is often an acute decline, a quick transition in vigor, and the threat to the ego in this change sets the mind a-brooding, plunges the individual into an introspection, which has been foreign to his nature." [9] There is usually a gradual recovery from this shock, and life is continued on a lower plane of energy. Many, however, develop high blood pressure, a condition which means a reduction in the blood supply of the brain. Because less blood is sent to it, the brain becomes less active, and the judgment is impaired. High blood pressure causes many successful men to begin to make such errors of judgment as may contribute to the failure of a business.[10] Not all old people suffer this impairment of judgment, but enough do to cause many corporations, most universities, and the army to require retirement at a certain age. This practice would suggest the wisdom of developing a critical attitude toward one's own decisions, especially if one has passed middle age or is afflicted with high blood pressure.

The decline, with advancing age, of physical strength and of the acuity of the senses is much greater than the decline in mental vigor. Indeed many men have done their best mental work in old age. According to Thorndike, 331 leading scientists and men of affairs accomplished the work for which they were noted at an average age of forty-seven.[11] Dorland has found that the average age at which 400 noted men produced their masterpieces was fifty.[12]

Shakespeare, with his customary insight, has divided life into seven ages. Accepting this number, we might make the following classification of the stages of human life: (1) from conception to birth, (2) from birth to development of language, (3) from development of language to entering school, (4) from entering school to adolescence, (5) from adolescence to adulthood, (6) from adulthood to middle age, and (7) decline. The significance of each of these periods is obvious.

PHYSIOLOGICAL CONDITIONS

The importance of the rapid and uneven development during adolescence and of the changes of demobilization that accompany old age has been indicated in the preceding section. It is generally agreed, also, that fatigue, drowsiness, and illness influence a person's behavior. Though we recognize the effect of illness on behavior, we frequently fail to realize that its consequences are sometimes prolonged. The time allowed for convalescence is frequently too short, especially for manual workers. No doubt fear of losing their jobs causes many to return to work before they have regained their strength. But in the end they gain little or nothing; for, attempting to work before they have the proper reserve of energy, they exhaust themselves and suffer further from fear, anxiety, and insomnia. Myerson suggests that a person should not return to his work until his appetite is good, his sleep refreshing, his attitude cheerful, and his interest in things in general revived. Otherwise he may suffer from a prolonged period of inefficiency and lack of interest.[13]

More persistent and less noticeable physiological conditions also profoundly influence behavior. Laird, Levitan, and Wilson found that a significant improvement in general self-management follows upon feeding school children during the morning. The improvement was almost doubled when a concentrated food containing calcium, phosphorus, and vitamin D was given.[14] On the other hand, hunger does not seem to retard learning. Wada, by means of a stomach balloon, has been able to measure the hunger contractions of the stomach. When the subject is hungry, there are many strong contractions. She discovered an interesting relation between these contractions and both intelligence-test scores and the strength of grip. During hunger contractions the subjects made higher scores and had a stronger grip than when they were not hungry.[15] Elliott and Treat have found the same to be true of white rats. Seven rats who had no hunger contractions required from thirty to seventy-five trials to learn to avoid an electric shock when a signal was given. Seven who had hunger contractions required from eighteen to thirty trials. The slowest learner in the hungry group was as fast as the fastest learner in the well-fed group.[16]

Though brief periods of hunger may increase efficiency for the

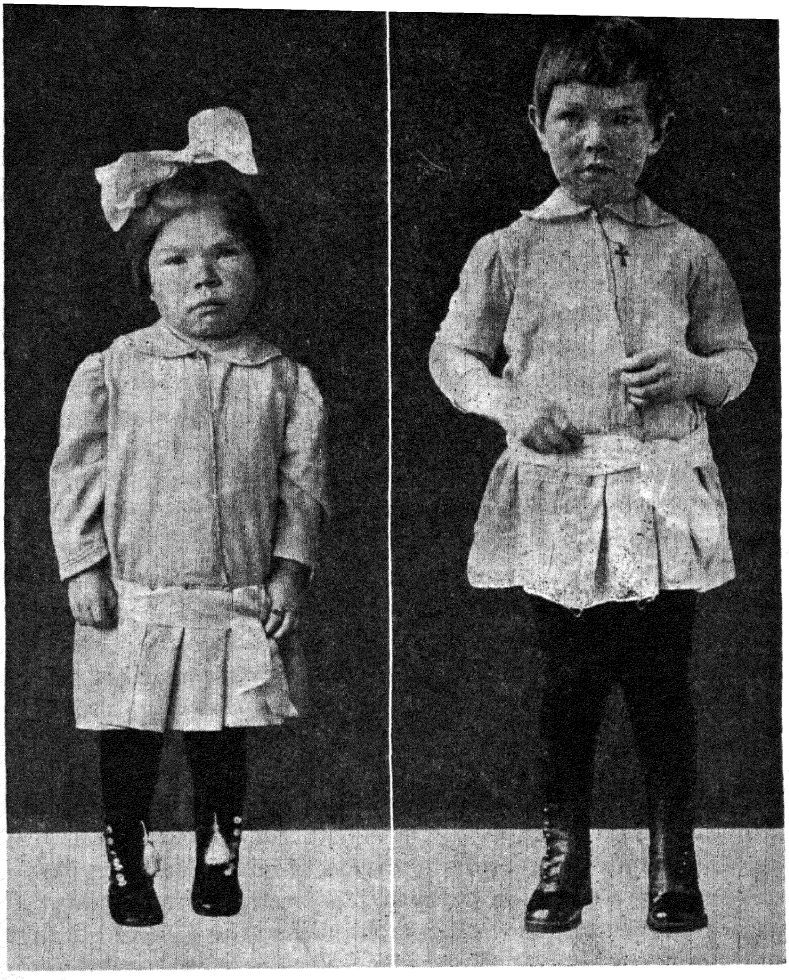


FIG. 7. THE EFFECT OF THYROID TREATMENT

The difference in the physical appearance of this cretin child before and after taking thyroxin is no greater than the difference that took place in her mental development. *Left*, before, *right*, after treatment with thyroid extract. Thyroid extract should never be given except under the supervision of a competent physician. (By permission, from E. C. Kendall, The Harvey Lectures, 1919–20, p. 46.)

moment, persistent states of malnutrition, however, have the opposite effect, and probably affect mental development adversely. Smillie and Spencer, examining children of the same cultural level and from the same type of home, found that individuals heavily infested with hookworm are less intelligent than those not so heavily infested.[17]

More remarkable than the effect of hunger on nervous habits or of hookworms on intelligence is the effect on mental development of an inadequate secretion of the thyroid gland — a ductless gland consisting of two lobes, near the larynx or Adam's apple. A marked under-secretion of this gland from birth or very early infancy results in a condition of arrested mental and physical growth known as *cretinism.* Cretinism is remedied by giving thyroxin, which supplies the chemical needed for normal development. The difference in the physical appearance of the child in Figure 7 before and after taking thyroxin is no greater than the difference that took place in the child's mental development. A still more striking example of the remedial effect of thyroxin in cases of thyroid deficiencies existing from birth is seen in the case history which follows.

At birth, Sam Curtis seemed a normal baby. His mother did notice that he slept more than other babies and that he did not awake and start crying for food, but she told herself only that "Sam is a good boy; he's going to be the kind of child that doesn't give much trouble."

But after nine months, the family noted that Sam hadn't developed like most babies. For one thing, he hadn't any teeth — only a thickening of the gums. His tongue seemed to be too large, and it interfered with his breathing because it stuck out of his mouth at all times. His skin was yellow and dry and scaly; his eyes watered; he showed no interest in his surroundings; he was pugnosed and thick-nostriled. His hair was thin and brittle, and his eyebrows were scanty. He did not get his first tooth until he was more than a year old, and then it decayed quickly. He was all trunk, with tiny arms and legs; he was as pot-bellied as an alderman and had a fat, padded bull neck. Nor could Sam recognize either of his parents. And he would indicate his desire for food or water by grunting or by a scream. He never smiled or laughed; in fact, he seemed not to live, but to *vegetate.*

His parents became alarmed and began to look at each other with suspicion. Was their child to be a hopeless idiot? And whose fault was it? Each began a hasty search of his family tree, and at last they breathed a sigh of relief when they could recollect no insane or men-

tally abnormal ancestors. But they finally became impatient with their family physician who kept assuring them that "Sam will outgrow it." They became convinced that the physician was behind the times and unable to diagnose the condition. So they took their child to a specialist in a large city.

The specialist needed but a glance to see that the child was a cretin, due to a lack of thyroid secretion. Both parents, he noticed, had enlargements of the neck that suggested a tendency to goiter. In addition, they had lived all their lives in the "goiter belt," which comprises the states of the Great Lakes section.

So Sam was fed small doses of thyroid substance. And within several months a miracle seemed to have happened. His skin became warm and moist, several teeth were cut, he grew several inches; and, best of all, the cranky and irritable child disappeared; in its place there was a new Sam. His dull eyes became bright, and his vacant expression gave way to a cheerful face. He became active and seemed to discover suddenly all the possibilities for play in this new world. He learned to talk and became interested in everything that went on around him. Of course, the Curtises were overjoyed at the miracle which had converted an apparently irritable imbecile into a normal child, and they marvelled at the wonders of science.

But a few months later they became tired of continuing the thyroid feeding and stopped it. Why not? "Sam is getting along fine now: no need for medicine." And they were right — for a week.

Within ten days, Sam became listless, dull, lost interest in things; his skin began to take on a dry, bloated appearance, and he became again the hopeless and helpless thing he had once been.

Frightened, the Curtises returned to the specialist and confessed their neglect. He advised them to begin the feeding of thyroxin again and never to discontinue it for even one day of Sam's life. Within a week, Sam became normal again. He has developed into a normal boy. At present he attends school and shows average intelligence. No one would ever suspect that he had been a cretin.[18]

The physiological basis of many mental disorders has long been recognized. Less serious disorders, such as irritability, nervousness, and unwillingness to play, may also have a physiological basis. They may be caused by diseased tonsils or teeth, imbalance in the endocrine system (glands, like the sex and thyroid glands, which secrete their hormones directly into the blood stream), or defective ears or eyes. The child who has defective vision finds it hard to excel in games with other children, and he finds less to attract him outdoors. As a result, he is deprived of social

contacts and of outdoor exercise, two things necessary for normal and healthy development. To make up for this deprivation, he becomes, perhaps, a bookworm. Such undesirable conditions can, in many instances, be corrected by very simple methods — by fitting the child with glasses, for instance, if his eyes are the source of the trouble.[19] Defective hearing has, perhaps, even more serious consequences. The following account of the experiences of a deaf child named Lena, given by Baker and Traphagen, makes this clear.[20]

She was a big girl who sat in the back seat in school. She saw the teacher talking to the other children but thought she was just addressing her favored few, and that all the rest had to guess as to what she said to them just as Lena herself did. Always she hoped it would soon be her turn to come up and hear the interesting remarks that made the other children smile and raise their hands. When the teacher said something directly to Lena, she only smiled back as the others had done. After this happened a few times, the teacher considered her silly, inattentive, and stubborn. This treatment persisted more or less throughout her school career. She was put back or failed because she could not keep up with the group. Her mates pointed to her as the biggest and dullest pupil in their group. She was punished at home for her poor school marks, because she did not come when called, and because she did not follow directions properly. Not unnaturally she became bitter, hateful, and unsocial. It was not until long after she had left school at fourteen years of age that she discovered that she was deaf.

In dealing with any behavior problem, we should keep in mind that the defect may be caused by some physiological disorder. In such cases, the elimination of the bodily defect is the logical first step in correcting the behavior problem. In some instances it may be the only thing needed. In those cases where the behavior difficulty has become habitual, retraining may be required, since the habit may persist in the absence of the original cause.

The effect of physiological conditions may frequently be counteracted by strong motivation. A mother who is worn out physically may continue to nurse her sick child; a football player may think nothing of his bruises, and continue to play a brilliant game. Students who are uninterested in their work will stop studying on the first symptoms of fatigue, whereas those who are really interested will carry on and get their "second wind."

The power of strong motivation to overcome the effects of prolonged loss of sleep and of fatigue has been shown by a study of Knight and Remmers. A number of "pledges" in a fraternity who had not been permitted to sleep more than two hours a day for a week and who had otherwise been brought to a condition of unusual fatigue were required to add page upon page of figures, working under the direction of fraternity members who had made them believe that their election would, in part, be determined by their scores. Later, a group of juniors was given the same task in the usual manner. The pledges, in spite of the fatigue caused by a grueling week and great loss of sleep, did better than the fresh, though less highly motivated, juniors.[21] But in the long run, one cannot accomplish much of importance if he is suffering from too great a drain on his strength. "Energy commandeth the world," and the sick or tired man is half defeated before he begins. It is worth while to do everything within reason to keep yourself perpetually ready for your championship battle, which is likely to come without giving you time for special preparation.

PHYSIQUE

Physique has an important influence on one's attitudes and behavior. This is especially true of adolescents. Many adolescent girls have stayed away from dances or have been miserable at them, merely because they were taller than the boys of their own age. Many adolescent boys who are undersized become "grinds" because they cannot compete successfully with other boys in physical activities. In this connection Cole says: "Anyone who doubts the importance of variations from the average in either height or weight should listen to adolescent nicknames: 'Shrimp,' 'Fat-pants,' 'Skeeter,' 'Bug,' 'Cow,' 'Fatty,' 'Whale,' 'Big Bertha,' and many others." [22] Baker and Traphagen, in their diagnostic chart of behavior problems, treat being undersized as less serious than being oversized.[23]

Any blemish which mars one's looks may also become a source of worry and embarrassment. Adolescents often suffer from pimples on the face and try in many ways to hide them, instead of taking really practical measures to improve their physique. More serious, though fortunately less frequent, are such blemishes as harelip, cross-eyes, and hunchback. These may be a source of

great unhappiness and bitterness. Only by skillful handling can such physical blemishes be prevented from causing character and personality defects. If the victim of these handicaps is given too great protection and assistance in youth, he is taught to expect special favors and to feel (with some justice) that he deserves more than his normal share of the breaks.

SEX

Many of the differences which have been observed to exist between the sexes are possibly due to the society in which we live, rather than to inherited physiological differences. Whatever be the causes of sex differences, however, popular belief conceives valor, courage, loyalty, and honor to be masculine traits, and kindliness, sympathy, and endurance of pain to be feminine ones. Differences in tastes and preferred activities are too generally recognized to require elaboration. There are also important differences in the rate of development. Girls develop faster than boys physiologically, anatomically, and mentally. Girls reach puberty somewhat earlier than boys. The difference is set forth in Figure 8.[24] In the early years of adolescence girls are an inch taller than boys of the same age.[25] They get their permanent teeth earlier, and their bones ossify earlier. The results of mental tests and scholastic records indicate that the mental development of girls also proceeds more rapidly than that of boys. This is shown in Figure 9, which indicates the average I.Q. (or intelligence quotient, a measure of intelligence discussed on page 195) for girls and boys of various ages between five and fourteen. It is interesting to note that at the age of thirteen the curves cross, which means that though the boys develop more slowly, they eventually reach at least as high a level as girls. Perhaps the dislike boys frequently manifest toward school work is due to being called on to compete with girls who are actually more mature, and who also excel especially in the two traits most essential to school success, memory and language power. Boys, however, need not be greatly disturbed because girls develop faster. Girls get their teeth earlier, but boys get as many; girls at twelve may be heavier than boys, but the reverse is decidedly true at seventeen. Likewise, girls at six may be more advanced mentally than boys, but this does not mean that they

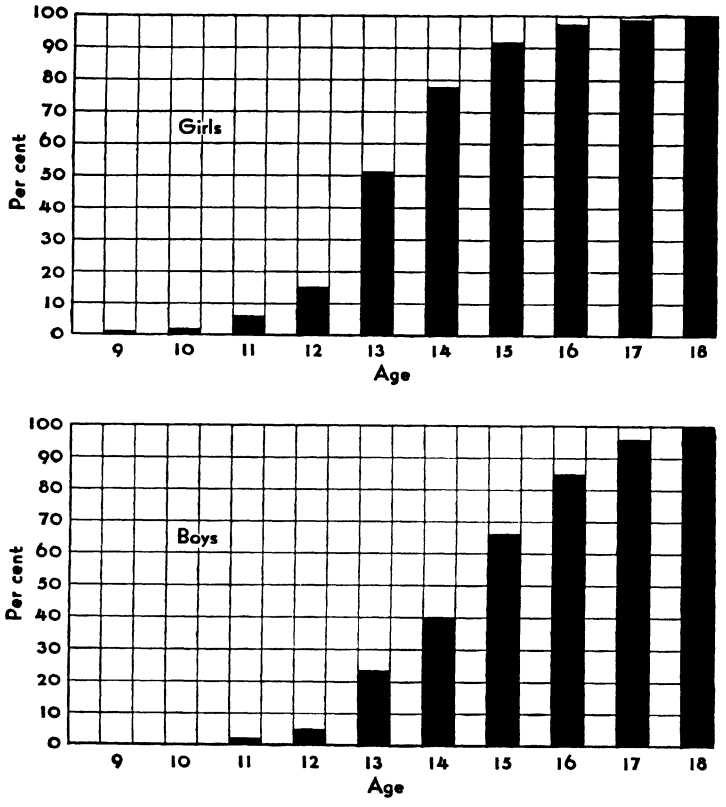
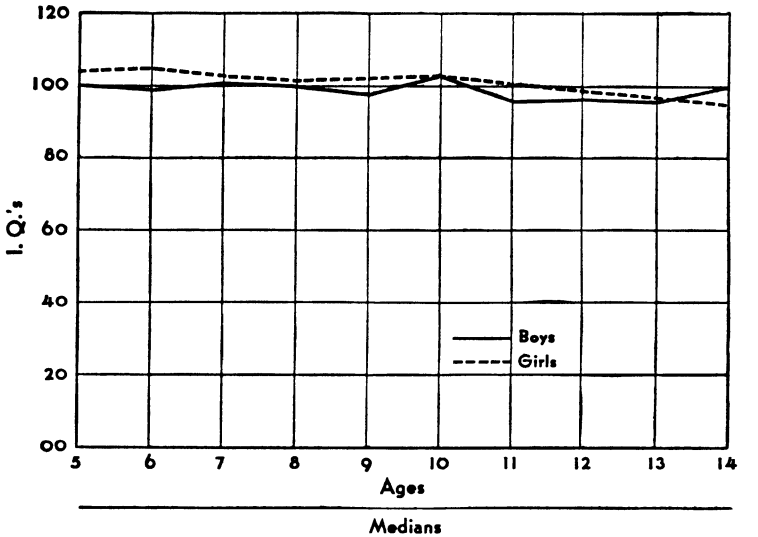


FIG. 8. DIFFERENCES IN THE AGE OF BOYS AND GIRLS AT THE ONSET OF PUBERTY — EVIDENCE THAT GIRLS MATURE EARLIER THAN BOYS

(From Luella Cole, *Psychology of Adolescence*, p. 36; copyright 1936; reprinted by permission of the publishers, Farrar and Rinehart, Inc. Original data by Crampton, Baldwin, Boas, and Atkinson.)

are so at twenty. The evidence indicates that they are not. Social conventions, and even laws, have put a certain premium on *maleness*. This is still a man's world — though far less so than when women could not vote. In short, to be a man rather than a woman or a woman rather than a man makes a great deal of difference in a great many ways. Sex differences as shown by tests given by professors are not impressive, but sex differences in real life are very much so.



Medians

Boys	100	99	101	100	98	103	96	97	96	100
Girls	104	105	103	102	102	103	101	99	97	96

FIG. 9. MEDIAN I.Q. OF 457 BOYS AND 448 GIRLS FOR THE AGES OF FIVE TO FOURTEEN YEARS

The I.Q. (intelligence quotient) is a measure of intelligence described on p. 195. (After L. M. Terman, *The Measurement of Intelligence*, Houghton Mifflin, 1916, p. 69.)

INTELLIGENCE

Intelligence is the ability to use one's knowledge to solve problems, or, in more concrete terms, the ability to perceive goals and to attain them. The person who can clearly see his objective in any situation is more intelligent than one who cannot. The student who perceives clearly that four years at a university or college can contribute valuable assets to his life is more intelligent than one who is vaguely aware of half-defined possibilities. Furthermore, the student who can attain the goals of a university course when he sees them is more intelligent than one who perceives the goals and lets them "take care of themselves." Obviously the possession or the lack of this ability profoundly affects our behavior and our success in living.

Later we shall devote a chapter to the subject of intelligence and shall consider, among other things, methods which have been

devised to measure it. Such measurement shows, in direct opposition to the statement of Descartes with which we began this chapter, that differences in intelligence among men and women are very great. As Thorndike has pointed out, people differ in mental traits by much greater amounts than they do in physical traits. If one person is twice as tall, or twice as heavy, or can run twice as fast as another, we regard the difference as extreme. But a very bright person is much more than twice as intelligent as a stupid one; he may be many times as intelligent. A problem which a bright person can solve in a few seconds will require minutes or hours of a stupid one — if, indeed, he can solve it at all.

INTERESTS AND VALUES

Individuals differ greatly in the range and intensity of their interests. Some, principally those who have suffered numerous disappointments, live in a state of apathy; others never rise beyond the level of desiring things that minister to their physical nature and to their desire for freedom from interference; others desire knowledge, beauty, and justice.

Obviously these differences are important in understanding behavior; for a person's interests and values not only reveal what he is but indicate what he will be. To value friendship, beauty, and wisdom reveals in no uncertain way the basic elements of a desirable personality and of a desirable direction of growth. Equally true is it that to value money, fame, or power at any price points to a narrow and stunted personality. Vernon and Allport have devised a method of measuring the relative strength of a person's values. In their scale they make use of Spranger's classification of men into six groups:[26] (1) those who are predominantly theoretical in their interests, (2) those who are predominantly economic, (3) aesthetic, (4) social, (5) political, and (6) religious. The test consists of a number of imaginary situations and questions as to what the person tested would prefer in certain specified situations. Here are two samples from the test:

(1) Would you prefer to hear a series of popular lectures on: (a) the progress and needs of social service work in the cities of your part of the country; (b) contemporary painters?

(2) When you go to the theater do you, as a rule, enjoy most:
(a) plays that treat the lives of great men,
(b) ballet or similar imaginative performance,

(c) plays with a theme of human suffering and love,
(d) problem plays that argue consistently for some point of view? [27]

After the test has been scored, the results are plotted so as to show at a glance the relative strength of the subject's values. Figure 10 represents the interests of seventeen college teachers of language and literature and forty-three students of economics and business.

Note that in teachers of language and literature aesthetic in-

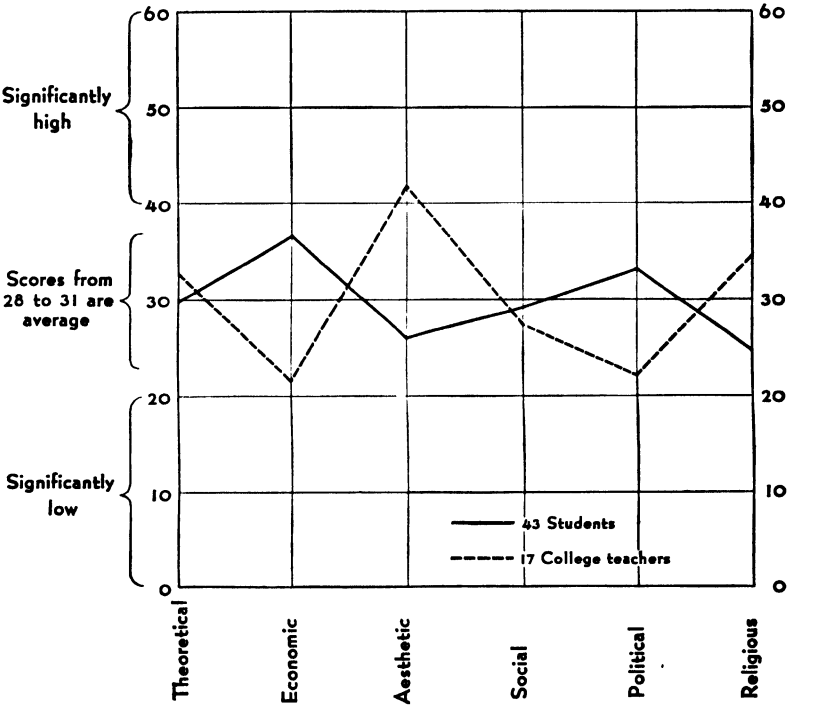


FIG. 10. DIFFERENCES IN INTERESTS OF COLLEGE TEACHERS OF LANGUAGE AND LITERATURE AND COLLEGE STUDENTS OF ECONOMICS AND BUSINESS

(After J. H. Griffiths, *Psychology of Human Behavior*, p. 487; copyright 1935; reprinted by permission of the publishers, Farrar and Rinehart, Inc.; student line added from data in G. W. Allport and P. E. Vernon, *A Study of Values: Manual of Directions*, Houghton Mifflin, 1931, p. 7.)

terests are predominant and that economic interests are weak. The reverse is true of the students of economics and business. Men and women have, as one might anticipate, somewhat different values. The three strongest fields of interest of 463 male college students are, in order of strength, the political, theoretical, and economic. For 313 female college students the corresponding fields are the aesthetic, social, and religious.

The Strong Vocational Interest Test (see page 250) and the Kuder Preference Record (see page 251) are instruments that have been devised to measure interest patterns for the purpose of aiding in vocational guidance and job placement.[28] A similar test intended for use with women has been developed by Manson.[29] Tests of this type reveal striking differences in the general pattern of interests from one person to another. Clearly these differences must be considered in explaining differences in behavior.

It is difficult for us to believe that others may have different interests and values from ours. Yet to accept this truth, which is abundantly supported by observations of behavior and by tests such as those just mentioned, is as important as it is to recognize differences in intelligence and age. If differences in values were properly appreciated, there would, no doubt, be fewer efforts to explain all behavior as the effect of a single force, such as the economic motive, or the sex drive, or the will to power. To understand why people act as they do, we need to know their dominant values. Those who value money most will seek money; those who value power will seek power. One element in competent and shrewd self-management should be a frank investigation of one's interests and their relative strengths. It is possible to manipulate one's interests if he finds himself possessed of some that simply hinder him. To maintain a sort of self-respect, almost every one will profess an interest in "good" objectives. But the real strength of that interest is quite another story. Let us say that Jones wishes to be known for habits of honesty. We are sure that he will not steal fifty cents if the chances of being caught and of escaping are about even. Suppose, however, that it were a matter of ten thousand dollars and that Jones knew the chances to be a thousand to one against any possibility of detection. From Jones's assertions of honest principles could we predict accurately his behavior? We should clearly need to consider not only

what his interests were but also their relative strength and the degree to which they could withstand competition.

DISPOSITION

Differences in the strength of values constitute what we call *disposition.* We say of the person whose dominant values are aesthetic that he has an aesthetic disposition; of a person who likes to tease or torment others, that he has a cruel disposition; and of one who greatly enjoys music, that he has a musical disposition.

We also use the word *disposition* in connection with the relative strength of the universal propensities. All men have the propensity to strive for self-preservation, the propensity to grow and develop, the propensity to preserve the race, and the propensity to seek companionship and membership in a group, but these propensities vary in strength. In one person the propensity to self-preservation may be so dominant as to cause too great concern over his safety. As a result, he may fail in the long run, because he is never willing to take a chance. The urge for self-development may be so powerful in another as to make him unduly venturesome and cause him to seek constantly the new and the novel. It has been suggested that the term *disposition* be used exclusively to refer to such differences as these.[30] In that case, we should say that an individual had a timid or an aggressive disposition, that he had a fatherly or a selfish disposition, but not that he had an aesthetic disposition, since this would not directly involve a fundamental propensity.

It is interesting to note that the strength of the fundamental propensities differs in lower animals as well as in man. Moss conducted some experiments in which he placed an electric grill between rats and food. To obtain food, the rats had to cross the grill and endure the pain of an electric shock. Some rats were willing to cross the grill after going without food for one day; others would not cross even after five days without food. He also separated rats from their mates in a similar way. Some rats were willing to cross the grill to approach a rat of the opposite sex; others were not. Under the same conditions, some rats were willing to go to their young when molested, and others were not. Moss is convinced that the sex drive is three or four times

as strong in some rats as in others. He found that the hunger drive, intensified by not eating for seventy-two hours, is stronger in most rats than the sex drive. Figure 11 is a schematic representation of the strength in two rats of the three drives: for food, sex, and offspring. Rat A has a lustful disposition, rat B a gluttonous disposition. There is every reason to believe that human beings differ in the strength of their drives in much the same way as the animals tested in these experiments.

It should be clearly recognized that man has not only drives that he expresses as simply and clearly as any animal, but also drives that he expresses in very complicated ways. Thus a man,

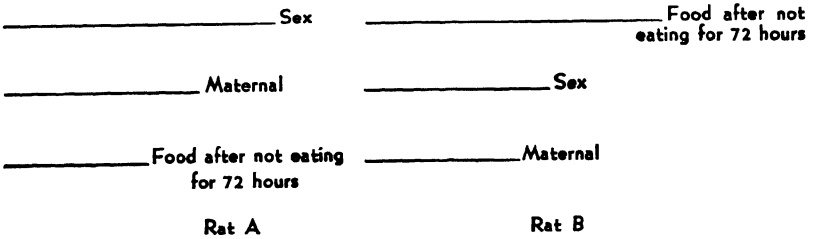


FIG. 11. THE RELATIVE STRENGTH OF THE SEX, MATERNAL, AND HUNGER DRIVES IN TWO RATS

(From Fred A. Moss, "A Study of Animal Drives," *J. Exper. Psychol.* VII, 1924, 165–85.)

if hungry enough, will wolf his food. But in the complicated, language-laden behavior of polite society the meaning of conduct is often masked and considerably removed from easily explained drives. Nevertheless, to try to understand what a man is really aiming at without considering fundamental drives gives one only a pink-tea view of human nature.

SENTIMENTS

The activities and strivings of a person must be given direction and an organization about some definite object if they are to be effective. For example, a boy may be motivated by the desire to become socially important, but unless that motive takes a more specific form, it is entirely ineffective. As the boy develops, it does become more specific. He names to himself occupations which he thinks he should like to take up. One day he plans to become a

physician; another, he wants to be an aviator; on a third, a banker or a lawyer. In boyhood he seldom, if ever, realizes the sharp divergence that separates these various goals from each other, but as he grows older, he comes to realize that he must make a choice. The career decided upon becomes the channel through which he finally seeks the social recognition he always wanted; if he persists, he will deepen the channel by making his other interests flow in it also. Let us suppose that he decides to become a banker merely because he thinks that profession will offer an opportunity to win a position of leadership and social prominence. In other words, the decision is chiefly a response to the urge for social recognition. Once having successfully engaged in banking, however, he discovers that it also makes for general self-development, that it satisfies his desire for security and self-preservation, and that it makes possible marriage and a family. Thus all of his fundamental interests eventually become organized around his profession. Such an organization of interests around a common center is called a *sentiment.*

Sentiments are formed because activities tend to enlist the support of interests other than the one that originally prompted them. A consideration of some of the more important sentiments will make this clear. Let us examine the sentiment of love between a man and his wife. At first, interest in her may have been prompted, and certainly should have been supported, by sex attraction. After marriage he may discover that his wife does much to increase his physical well-being; accordingly, his interest in self-preservation strengthens the sentiment of love. As the sentiment of love grows, he comes to enjoy more and more the companionship of his wife, especially as they stand shoulder to shoulder in meeting and conquering emergencies. Thus, his gregariousness, or desire for companionship, also comes to support and enrich the originally simple sentiment.

Sentiments may also be developed for abstract ideals, such as justice and truth. When this is true, these abstract concepts become emotionally charged. For example, all of us have an *idea* of justice. By it we mean giving every one his due, or acting so as to make for the greatest possible good of all parties concerned. But so far we have an idea merely. The *concept* becomes a *sentiment* only when our fundamental drives cluster around it. This may occur in a number of ways. As children we may have found

protection in justice. For example, our accusation that some one was acting unjustly may have caused him to show greater consideration for our rights. Or an adult may at some time have come to our defense in the name of justice. Later, when called upon to meet an issue, we may have realized that we could permit our jealousies and fears to decide, or that, alternatively, we could try to act with justice. If we took the latter course, we enjoyed the satisfaction of being true to our ideals. By not being a weakling, we gratified our desire for self-development and mastery. Moreover, since acts that are just are socially approved, we gained, by acting justly, the goodwill of our fellows, and our desire for social approval was also gratified. Finally, an appeal to the ideal of justice may sometime have helped us to protect another. In this way our interests in self-preservation, self-development, social approval, and race preservation may all gather around the concept "justice" to make it a powerful sentiment. In similar ways we develop sentiments of courage, honesty, and loyalty.

DEGREE OF ORGANIZATION

The behavior of some individuals is expressive of their total personality; that of others, merely of a passing impulse or fancy. A given person may vary in this respect from time to time. Occasionally, the normal integration of any one may break down because of fatigue, prolonged emotional excitement, or group contagion. We may then say with some truth that such a person is no longer himself. His behavior, instead of being an expression of his whole personality, becomes an expression of a small part, such as his hatred, his fear, his desire for money, or his impulse to reform society.

There is a story told of a New England village which well illustrates how disintegration may be produced by group contagion. A missionary, returned from his field, was seeking to raise money for missions. He pointed out the goodness of God to believers and the awful fate of unbelievers. When he had succeeded in convincing his audience that nothing mattered so much as expressing their gratitude to God and their pity for unbelievers, he solicited pledges for money with which to send the gospel to the lost. So effective was his appeal that, had the pledges been kept, the town would have been bankrupt. To

understand such liberality we must believe that those who made the pledges were not animated by all of their interests. *All* would have included success in business, competency for old age, education of children, community improvement, as well as "saving the lost." All except that of "saving the lost" were for the time being swept away. Behavior was no longer an expression of the whole individual; it became the outgrowth of a single interest, intensified by group pressure and contagion. In the same way should be understood the behavior of normally peaceful and law-abiding citizens who take part in the excesses of a mob. Ordinarily no good citizen would participate in mob behavior. But, as a result of great emotional shock and group feeling, general disorganization of individuals may occur; and behavior, instead of reflecting the complete nature of the persons, then reflects only one of their interests. The excessive influence of some fragment of personality, if caused by a passing element in the environment, cannot be counted on for very long. Thus everything seems possible in the heat of an indignation meeting. But, as the citizens scatter, and time brings, perhaps, the thought of possible loss of trade, the power of the unusual excitement fades and dwindles. Many an antisocial politician, soundly defeated a month before election, has sat tight, hoped for a snowstorm on election day, and finally been reëlected after all.

Disorganization may be long continued and severe. There are many pathological states which are interpretable in terms of such disorganization. This is especially true of the great variety of diseases grouped under the general term *hysteria.* Hysteria is a mental disorder involving extreme emotionalism and, frequently, the symptoms of some physical disorder. For example, a person may be unable to use his arms or legs or eyes or ears, not because of a structural defect, but because the integration of the organism has been broken down. Similarly, the person who feels a strong compulsion to perform a given act — to touch, say, every lamppost he passes, or to wash his hands incessantly — is suffering from a state of disintegration. Exciting experiences cause at times a disorganization for which society makes more or less generous allowances. If one can believe the newspapers, New York City is quite beside itself (or underneath itself) on New Year's Eve. A person stricken with the sudden loss of a near relative is usually excused from work for a few days because of

emotional incapacity. However, society does not tolerate the chronic mourner. A few days after the funeral even the widow or widower is expected to return to normal activities and bear the grief alone.

TEMPERAMENT

Temperament is the word that has been used for those modes of action which are due to the chemical condition of the body. According to the Greek physician Hippocrates (400 B.C.), there are four temperaments: the sanguine, the melancholic, the phlegmatic, and the choleric. Sanguine people are those who always look upon the bright side of life. The melancholic are just the opposite; they always see the dark side. The phlegmatic are emotionally cold; they are hard to excite, but when aroused they may be persistent. The choleric are quick to respond emotionally, but their responses are apt to be of short duration. The ancients thought that temperament was determined by the humors, or fluids, of the body.

A more modern version of temperament has been advanced by McDougall. He believes that there are three modes of action that are determined by the chemical condition of the body: namely, fatigability, alertness, and expressiveness. Some people are easily fatigued; others seem never to tire. Since these characteristics are related to the secretions of the adrenal and thyroid glands, they are regarded as a matter of temperament. Some people are alert and energetic; others are sluggish and indifferent.[31] By expressiveness is meant the ability to reveal one's inner life in social situations. Men who can express themselves in beautiful poetry are often unable to do so in social situations. Those who make apparent their emotional states in social situations are called *extroverts;* those who do not are called *introverts.* That expressiveness is partly due to the chemistry of our bodies is shown, according to McDougall, by the influence of alcohol upon it. Introverted people become extroverted under the influence of alcohol, and it takes more alcohol to intoxicate an introverted person. That this trait depends on the chemistry of the body is also suggested by the fact that individuals so extremely introverted as to require hospital care tend to be tall and thin, while those who are equally extroverted tend to be short and stout.[32] And physique, we know, is greatly influenced

by the glands of internal secretion, especially by the pituitary gland.[33]

All extremes of temperament are undesirable. It is a bad symptom to be always energetically active or always resting. To be always eager is no more desirable than to be always indifferent. It is unfortunate to be extremely introverted or extremely extroverted. One may, as indicated in the foregoing paragraph, become so extremely introverted or extroverted as to be unable to take care of himself. Extremely introverted persons become indifferent to all that goes on about them — even to what is done to them. Self-sufficiency runs riot. No matter what the objective conditions may be, the individual apparently continues to enjoy his dreams of a world of splendor, made according to his desires. Individuals who are extremely extroverted are so engrossed in external things that they merely mirror passing events; or they become so anxious to give outward expression to their inner life that every idea leads to action. The pathological extreme of extroversion is manic excitement.[34]

Fortunately most people maintain a balance between these two extremes, sliding up and down the scale slightly as conditions change. Moreover, within limits, it is possible to change one's temperament. This is especially true during childhood, and one of the most important tasks of parents and teachers is to arrange conditions so that development of the child will not tend toward either extreme. As a term to designate the temperament of the great mass of people, the word *ambivert* has been advanced by Conklin, who gives as illustrations of this type the philosopher-farmer, and the university professor who maintains an active interest in sports.[35]

MOOD

By *mood* is meant a temporary emotional set. We speak, for instance, of a peevish mood, a confident mood, a despondent mood, a remorseful mood, and a lustful mood. Moods may be the result of recent experiences or of organic states. A confident mood may result from a series of successes; a lustful mood is more closely related to organic changes. Moods may also be produced by drugs. For example, doses of adrenalin cause some people to feel on edge; others, to feel as if they were afraid; others, as if they were awaiting a great joy; others, as if they

were about to weep. It is probable that certain organic conditions incline us to remorse, and others to confidence; for anxiety and remorse frequently accompany vague digestive disorders. Both mood and temperament are closely related to organic conditions; mood is related to temporary conditions; temperament, to relatively permanent ones.

Hersey, by keeping under close observation a number of subjects, found that moods are cyclic. Each person seems to have a fairly regular interval between the mood of confidence and the mood of despondency. The cycle shows individual differences, but no one should expect to be always in a confident, happy mood.[36] If the oscillation from one mood to another is rapid and the contrast of moods very great, a person should seek help from a physician or psychologist trained in the principles of mental health. Otherwise the changes should be accepted in a matter-of-fact manner as probably due to some obscure rhythmic physiological process. There are good reasons to remind active Americans of the present day of the wisdom of avoiding undue exaltation or depression. Our lives are geared to a speed beyond that of a fantastic dream of a hundred years ago — and yet we have the same old kind of nervous system. Our pace is fast, our environment stimulating, and prevalence of nervous diseases is consequently increasing rapidly. We ask a great deal of ourselves and are in danger of asking too much. At least we can all learn not to worry about our worries, or to be anxious over our anxieties. They are natural enough these days, and one should learn early to treat himself carefully.

The influence of moods on behavior is obvious. If a person is in a depressed mood, he works less efficiently than when in a confident one. When a person is in a peevish mood, anything is likely to precipitate an outburst of anger. If a person is in a confident mood, if he feels well satisfied with his power and position, he ignores many things that would cause violent reaction were he less confident. And so with all the other moods. They are states that make the individual extremely sensitive to stimuli of certain sorts.

While moods influence the behavior of every one, they disrupt the behavior of the well-organized less than they do that of the poorly organized. The individual who is highly integrated regulates his behavior by his habits and ideals of conduct. He is,

therefore, not greatly swayed in his overt activity by his moods. But the poorly organized personality is further disorganized by his moods, so that he swings from bombastic and self-assertive behavior to states of extreme dejection. He allows his conduct to be determined by his mood rather than by an adequate appreciation of his own nature and of the external situation. If we behave as we are expected to behave, with little regard to our feelings of misery, we are taking an effective way to rid ourselves of burdensome moods. It should be remembered that abnormal moods belong to the same class of behavior as many types of illness; they are attempts to save our face or to distract our own attention from faults or weaknesses we are reluctant to admit to ourselves. To conceal our faults by becoming moody is, in almost every instance, a futile course of action.

ATTITUDES

The influence which attitudes have upon behavior is attested in both scriptural and classical literature. "As he thinketh in his heart, so is he." And we find modern counterparts in current popular writings. An *attitude* is an emotionally-toned idea or group of ideas, and attitudes usually have a direct bearing on behavior. For example, we do not, as a rule, find in gaming houses those who have an unfavorable attitude toward gambling; and people with a favorable attitude toward the church are apt to spend time or money (or both) in supporting it. Much of our behavior can be best understood in the light of our attitudes toward the many institutions and practices which make up society.

Various methods for measuring attitudes have recently been developed. Noteworthy are attitude scales of the type developed by Thurstone [37] and Remmers.[38] In one investigation reported by Remmers, the attitude of a certain group of employees toward their company was measured and found to be much more unfavorable than the attitudes of similar employees in adjacent industries. Shortly after the measurements were completed, there was a strike in the plant in question. Apparently the attitude of the employees was an important factor in bringing on the strike. In another experiment, conducted in a rural community, the attitudes of parents and their children toward moving pic-

tures were measured. The children showed a much more favorable attitude than their parents, and this difference in attitude was clearly reflected in "movie" attendance.

The American Institute of Public Opinion, a national organization headed by Dr. G. W. Gallup, measures the attitudes of carefully chosen samples of people toward government policies, candidates for public office, and like matters. In a democracy, the importance of popular attitudes is very great, and the measurement of them is correspondingly valuable. By accurately predicting the outcome of a number of national and state elections, Dr. Gallup has achieved nation-wide prominence. His attitude measurements are based on interviews of the type illustrated in Figure 12. A careful examination of the pictures will show the wide variety of persons whose attitudes are recorded. Although their thought processes are probably quite different, both the housewife and the college president possess attitudes that are the result of a complex range of experience, domestic and social, past and present. Their experiences are likely to be fairly representative of those of a great number of other people. Through such types Dr. Gallup has skillfully tapped the reservoirs of national feeling.

Attitudes, of course, are affected by environmental influences. It has been shown that men's attitudes toward such matters as capital punishment, labor unions, and government control of farming can be greatly modified by education or propaganda. The effect of education upon attitudes is seen in a study of 144 freshmen students at the University of Louisville. These students were given interest and belief tests before and after they had taken a social science survey course. The results showed that the students became more liberal in their attitudes toward war, Negroes, and democracy.[39] That attitude changes so induced are as permanent as the retention of material learned in a course in geometry or history is indicated in a study by Bugelski and Lester. Attitudes of university students which had changed in the direction of greater liberality between their freshman and senior years showed no indication to shift away from the position held in the senior year even two and three years after graduation.[40]

Differences in attitudes are not only important as they determine social behavior but also as they affect individual emotional adjustment. The person who always thinks he is getting a "raw

COLLEGE PRESIDENT

FARMER

HOUSEWIFE

FIG. 12. MEASUREMENT OF ATTITUDES BY CONTROLLED INTERVIEWS

The method used by Dr. G. W. Gallup of the American Institute of Public Opinion in the successful prediction of many public elections. (Photos: *Life* Magazine.)

deal" is usually being treated like every one else. It is his attitude which creates the "raw deals." Our attitudes thus color our world in ways that profoundly affect our general outlook and happiness.

SUMMARY

All personality traits vary greatly from one person to another. Some of the more important factors which cause differences in behavior or personality are: (1) age, (2) physiological condition, (3) physique, (4) sex, (5) intelligence, (6) interests and values, (7) disposition, (8) sentiments, (9) degree of organization, (10) temperament, (11) mood, and (12) attitudes.

QUESTIONS ON THE CHAPTER

1. What parts of the body mature most rapidly after birth?
2. What is meant by maturation?
3. How can certain aspects of adolescent behavior be accounted for by maturation?
4. How does learning ability vary with age?
5. What personality differences may be caused by glandular secretions?
6. What light does the experiment on motivation in rats shed on possible differences in human motivation?
7. What evidence have we that strong motivation may overcome a marked physiological disadvantage?
8. Is temperament fixed and unchangeable or may it be modified?

QUESTIONS FOR DISCUSSION

1. How does the behavior of some adults seem to indicate that they have never "grown up"? Under what circumstances is an adult likely to revert to childhood behavior?
2. Can you think of illustrations among persons you have known of behavior or personality deviations which might be due to a physiological condition?
3. Give some illustrations from your own experience of a strong motive causing you to accomplish a very difficult task.
4. In which of the values shown in Figure 10 should you consider yourself very much interested? In which, less interested?
5. How might a parent modify the temperament of a child? Illustrate.

SUGGESTED READINGS

Arthur T. Jersild, *Child Psychology* (Prentice-Hall, 1940), Chapter II. An excellent discussion of maturation and learning in child development.

Anne Anastasi, *Differential Psychology* (The Macmillan Company, 1937). An extensive discussion of the chief findings on measured differences in psychological traits.

MORE ADVANCED READINGS

W. V. Bingham, *Aptitudes and Aptitude Testing* (Harper and Brothers, 1937), Part I. The importance of individual differences in determining capacity to do different kinds of work.

L. L. Thurstone and E. J. Chave, *The Measurement of Attitude* (University of Chicago Press, 1929). A description of the theory of tests designed to measure attitude, and an account of the application of this theory to the development of a scale for measuring attitude toward the church.

CHAPTER THREE

Differences in Environment: How They Affect Our Behavior

IN THE preceding chapter were described some of the ways in which people differ as well as ways in which their differences affect their behavior. We suggested from time to time the importance of environmental conditions, especially those that influence physiological development, and of the many attitudes, sentiments, and complexes which blend into a personality. In the present chapter we shall consider in greater detail the effect of our surroundings. The environment not only influences the way in which we act at particular times; it also plays an important part in determining our mental and physical development as a whole. A personality is an assimilative system, and both the quality and quantity of our mental development depend upon the environmental situation in which we live and mature. Recent experiments have shown that even intelligence — formerly believed to be the one personality trait relatively fixed and unchangeable — is influenced by environment.[1] If, for eight months, two groups of children, equal in scores on intelligence tests, are exposed to different conditions, one attending a skillfully conducted pre-school and the other indulging in the random life of the neighborhood, the two groups, when they are tested at the end of the period, are not equal. The first group will have gained in intelligence (as measured by the tests), and the differential pre-school experience will have shown itself mainly responsible for this new superiority. Differences in external conditions matter vitally. Environment makes a real difference. You *can* change human nature.

Environment influences behavior both directly and indirectly. A person does not act in the same way at a dance as he acts at his office or store; his behavior in a strange place where he suspects danger is not the same as in the security of his home; his conduct when he is with his boon companions differs from that when he is with his father or his employer. In all these instances the immediate environment acts for a short while directly on behavior. But by influencing the general development of the individual, the environment can also influence his behavior indirectly. The pressure of environment on development is slow. We experience our environment minute by minute, day by day. And these experiences pile up through the years. Although it is easy to believe that such slight experiences cannot matter very much, they do matter a great deal. In fact, a forceful conviction that *everything matters* is one of the most valuable lessons a student can learn from a first course in psychology. A person who, time after time, encounters difficulties too great for him to master, becomes discouraged and loses confidence in himself; while a person who habitually solves difficult problems gets, in this way, a taste of the joy that success can give, and he develops confidence and assurance. The former is inclined to withdraw further and further from difficulties; the latter, to meet them without hesitation. Similarly with a person who has defective eyes. He tends to read a little less than others, since the physical process is a little harder for him. Minute by minute this does not matter very much, but over a few years, especially over the college years, it may well produce enough difference to be of prime importance in his life. A person who looks, responds, lives in a world he cannot quite see has quite a different environment from what he would have if he wore proper glasses. Environments differ, but whatever the environment is, it has a great influence on behavior. Its influence is not least when it is acting in almost imperceptibly small ways.

In the last chapter we indicated the effect of various *traits of personality* on behavior. In this chapter we shall discuss the effect of *environment*. For one thing, we shall notice that it is a very important source of those traits which we have already considered. We do not wish at this time to raise the question of heredity. For the present we shall take it for granted that heredity is one important determinant of the various traits of a personality, and we

shall focus our attention upon the importance of another, the environmental conditions.

GENERAL PRINCIPLES OF ENVIRONMENTAL INFLUENCES

It is our hope that in the future we shall be able to build better environments for ourselves. Before we discuss, however, the influences that may bring this about, we shall mention several general principles which the young psychologist should make the warp and woof of his thinking.

(1) In the first place, except in unusual circumstances man is not completely at the mercy of his environment. Continually to attribute one's failures to external influences, implying that one is not the captain of his fate, suggests that there is probably a predominance of inner weakness over external handicaps. Of course, the early death of a man caught in a flood can be blamed entirely upon environment. But even the victims of severe economic depression or of protracted illnesses are by no means in a comparable position. What of Lincoln's poor schooling and his amazing power over the English language? It is possible to lead a kindly, wise, and cultured life even on a frontier, and many do so. The difficulty of thinking, in the mad rush of college classes and extra-curricular activities, is undeniable; still one can forge ahead many steps in his intellectual development during a year of college. If you do not, remember that others will. Environment matters, but it is not a sole determinant.

(2) In the second place, almost any environment is made up of so many facts that the same factors do not influence every one equally. We cannot passively absorb all external influences. We respond actively to some elements and apparently not at all to others. Thus to a common element of environment — say, a forceful lecture on marriage — one person will listen eagerly and believe, another will listen eagerly and disbelieve, a third will daydream, and a fourth go off to sleep. Environment, as a general concept, affecting man, as a generality, is interesting to speculate upon. But it is wiser to recall the idea of the psychological whole and to think specifically about the question: What elements in this particular man's surroundings are affecting him, and in what specific ways? Environment may be all-powerful in its effect on a *passive* organism, but an *active person* allows part of his environ-

ment to influence him and other parts he neglects. Thus we select from a complicated situation what we *want*, and are not molded by it willy-nilly.

(3) In the third place, it takes much inquiry to determine the factors of an environment that count for a given person. It is not only amazing but important to see how an apparently identical environment is functionally different even to closely related individuals. For example, take the significance of a mirror hanging above a dining-room buffet. To the family around the table it is, to a certain extent, a *common* environmental element. To the person with his back to it, however, it may be of next to no significance. The person facing it, on the other hand, may be so continually observing himself, that eating a meal is, minute by minute, also an experience in mirror-gazing. A chicken to be carved and eaten at dinner seems, at first sight, to be an element of environment common to all the diners. But to Father it presents a struggle between being generous and saving his favorite piece for himself; to Mother it is a product of her cooking; to the guests it raises the interesting question of who will be selected for the first serving; to the older children it is merely food; to the youngest child, if he is served last, it is a reminder of his position in the family. How many adults still carry tensions due to the fact that they usually got the neck of the chicken at Sunday dinner? Sometimes apparently trivial things are the most important elements of one's surroundings. In the psychological whole of an individual the environment contains many subtle, hardly recognized elements which are influential. It is exceedingly difficult to appraise the good, bad, or indifferent factors in any man's environment.

(4) Finally, since environment matters so much, it is wise to do everything possible to attain and retain a satisfactory one for ourselves and to provide the best we can for those for whom we are responsible. Most of us know what to do if we sit on a chair with a thumb-tack on it. We should respond to such an element of environment by getting up, by removing the tack, or by obtaining another chair. Few of us would sit and suffer. In everyday life, aggressive adjustment to tack-like elements in the environment is good management. When the problems of unsatisfactory environment are at all complicated, however, we are apt to postpone action if the situation as it is is at all tolerable. But it would often

be wiser to take some bold action than to submit oneself thus to environmental influences which go against the grain, debilitate a little, humiliate a little, exhaust a little — minute by minute, day by day. It is easy to get accustomed to what we really do not want, if we can stand it from one day to the next. Human beings are very prone to laziness. There should, however, be but scant sympathy for the young man who does not take advantage of his chances, but stays forever in an inferior position because things are not quite bad enough to make him jump off his chair. As the reader learns more about life, he will see with increasing clarity that many men make their own environment.

INFLUENCE OF THE HOME

Of all the environmental conditions that influence the development of an individual, the home is the most potent. The illustrations of Figure 13 show the interior of two homes at opposite extremes of the socio-economic scale. The effect of surroundings in each of these instances will be doubted by no one. From the disorder and untidiness of the slum we may assume a general indifference in the old woman toward the problems of her life. The difficulties of daily life with which she is faced would certainly discourage the best intentions. To a child's proper development they might be fatal. On the other hand, the presence of the cat and of inanimate objects to which she is in some way attached may well provide for the old woman a humanizing influence that is lacking in the proper and ordered elegance in the room of the well-to-do couple. But of whatever kind it may be, the influence of the surroundings is felt by the personality. Let us consider some of the factors which enable the home to exercise its profound influence.

(1) *Prestige of parents.* The young child obviously has little knowledge of, or opinion on, the world or his place in it. At first, behavior patterns or ideals of conduct presented to him do not have to pass the criticism of ideals and beliefs already accepted, as they must a few years later. Hence the child, lacking a basis of criticism, readily accepts the ideals and conduct of his parents. His tendency to do this is strengthened by his own helplessness and by the prestige of his parents, who seem to have unlimited power to punish and to reward. Furthermore, the tendency of

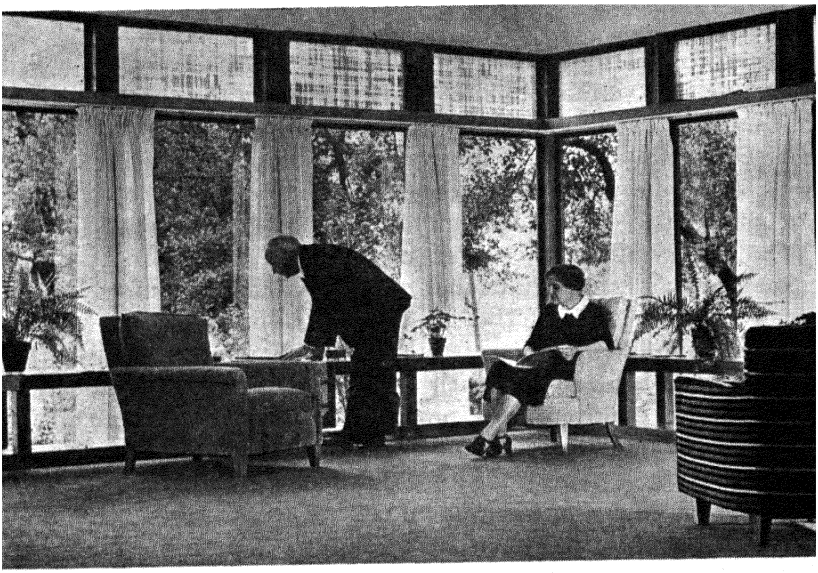


FIG. 13. HOME CONDITIONS HAVE GREAT PSYCHOLOGICAL IMPORTANCE

The home above and the one below are *real* — not movie — homes. (Photos: *Life* Magazine.)

children to identify themselves with their parents also strengthens the tendency to imitate them. The home is, for the child, a closely knit unit. It is *our* home; the things connected with it are *ours* — *our* car, *our* way of doing things, *our* position. These considerations, apart from any question of hereditary behavior patterns, are sufficient to explain why children act as their parents do.

One can readily understand, in the light of the foregoing discussion, why it is important that nothing should happen to impair the prestige of parents in the eyes of their children. Since children identify themselves with their parents, a blow to their regard for their parents is a blow to their own self-respect and confidence. Furthermore, children need some one to imitate and some one to discipline them. If the prestige of the parent suffers, he can no longer provide a pattern for his children to imitate, and the difficulty of imposing wise discipline increases. In a culture changing as rapidly as ours, many parents lose much of their prestige when their children reach adolescence, sometimes with disastrous consequences. The loss is most frequent and most serious in families where parents are foreign-born. The children in such families, on accepting American ideals and standards, begin to look down upon their old-fashioned parents. Needless to say, both parents and children suffer.

(2) *Economic status.* The economic level of the home influences even the prenatal development of the child. During pregnancy a well-to-do mother has medical care. Her diet is carefully regulated for the good of the child as well as for her own good. This care is important; for, though nature has done much to insure the fetus against changes in the mother's health, it has not succeeded in giving complete protection. This is shown by the effect of lead poisoning, which produces abortions, deaf-mutism, imbecility, and macrocephaly (a condition characterized by an excessively large head and caused by too much fluid). It is claimed that the fetus is injured 92 times out of 100 when the mother suffers lead poisoning.[2] What is true of lead poisoning is probably true, though to a less noticeable degree, of malaria, toxins in the body, and alcoholism. At the time of the child's birth, the well-to-do mother and the child are given the best care that medical science offers, whereas the infants of the poor are frequently not even fed in accordance with the best practice. If the child of well-to-do parents is thought to need sea breezes or

mountain air, he is taken to the sea or the mountains. He is at all times provided with the medical care and supervision necessary to insure his best development. The importance of these things was indicated when we discussed the influence of physiological conditions on behavior. It should be added, however, that the special importance of proper diet for normal development is becoming more and more evident. The omission of a certain vitamin is a cause of defective eyes; the omission of another, of defective bones; of another, of emotional instability. Deficiency of secretion of one endocrine gland may cause idiocy; the excess of another, prolonged childhood. Fortunately, these conditions can be detected by experts and, in many instances, corrected. Obviously it is difficult for families of insufficient means to give these advantages to their children.

The economic conditions of the home may influence the personality of children in more direct ways. The fear of hunger and the denial of many legitimate wants deeply influence the outlook of those who are unable to have necessary food, clothing, and shelter. Children who have experienced hunger and who have been compelled to spend much of the day in bed to keep warm dream of warm shelter and plenty of food, while more fortunate children dream of a life of leadership and social recognition.[3] Children of the poor look forward to a life of toil and seem to expect nothing more than the necessities of living; while those of the well-to-do anticipate college, travel, and adventure. The former are expected to curtail their desires, the latter to pursue a vigorous program of self-realization.

We should not wonder that the attitudes of children are influenced by the economic status of their parents. Children whose early life is spent in want feel that they are insecure and that they are a burden to their parents, especially if they hear their parents discuss financial difficulties. Children whose early life is a "bed of roses" are spared these fears and negative self-feelings. To belong to a wealthy home practically insures the child a satisfactory standing in society; to belong to a poor one means a decidedly lower social standing. The fortunate child is surrounded with beautiful things and is spared an early introduction to disease and filth, or an intimate acquaintance with birth and death. Children of the poor frequently acquire an early familiarity with these sobering conditions and events.

The consequences of poverty and extreme wealth are intensified in a democratic society where all children go to the same schools. Two boys may go through high school side by side; one goes out to security, social position, and luxury, and is given every opportunity to develop all that is in him; the other goes out to get a job with no assurance that he will find one, or that the job offered him will be suitable. It is not surprising that such underprivileged boys often become resentful and embittered, or that many of them follow a life of crime or become parasites on society.

The influence of poverty on respect for property rights has been clearly shown by a study of the effect of the depression on moral ideas. In 1924 and again in 1933, after three years of depression, Schatz asked a large number of high-school boys and girls the question, "Is it ever right to steal?" The high-school boys and girls of 1924, with few exceptions, answered, "No." More than half of the high-school group of 1933 answered, "Yes." Many justified their answers by saying, "Every one is doing it — the rich on a large scale; why should the poor not steal as far as they are able?" [4] This study corroborates the conclusion reached by Hartshorne and May, who found that children from homes economically and culturally superior are more honest than children from homes that are inferior in these respects.[5]

That adverse economic conditions affect adversely the development of character is indicated also by a study of Glueck and Glueck. Of 734 delinquent children, they found that 62 per cent lived in distinctly poor homes, 23 per cent in homes of fair condition, and only 13 per cent in homes that were sanitary, well equipped, and reasonably prosperous.[6]

Though it is clear that superior economic status provides a favorable background for the development of desirable personality traits, yet such status by no means insures the development of a fine character or personality. If wealthy parents lack wisdom, their children are apt to become arrogant, extravagant, dissipated, insensitive to social obligations, and contemptuous of the opinions and rights of others. On the other hand, an economically underprivileged home does not always crush the spirit or make a child resentful. Instead, it may inspire a boy with a spirit of courage and thrift and with the determination to work hard in order not to remain poor; it may teach him to be cheerful in the face of want, and to appreciate possessions which do not depend on

money; it may instruct him in the value of mutual love, helpfulness, and respect for others. Economic status is only one condition, though an important one, that molds character.

A problem investigated by Baker and Traphagen is interesting in this connection.[7] Since this study involves the concept of correlation, with which every student of psychology should be acquainted, we shall describe it in some detail.

Baker and Traphagen rated, on a scale of five points, the economic status of the homes of 189 problem children and 181 non-problem children. The highest rating was 5. This rating was given families who owned the houses they lived in and were in fair circumstances. The rating 4 was given to homes where wealth had been acquired suddenly, and where false standards had resulted. Families that were paying for an average house or renting a good one but that were practicing strict economy were rated 3. Those who were renting fair quarters and had an irregular income were rated 2. Chronic charity cases where quarters were very poor, and families that assumed no responsibility were rated 1. The average rating of the economic status of the non-problem children was 3.63, that of the problem children, 2.86.

The children were also rated on 65 other items, such as their general behavior, attitude toward school, discipline at home, scholarship, attitude toward home, etc., and the total score was computed. The median, or score of the middle child, of the non-problem group was 285; that of the problem group, 220. Only two children of the non-problem group fell below the median of the problem children. The total score measures what Baker and Traphagen call excellence of "behavior motivation." [8]

The most significant results regarding the importance of economic status were obtained when the relation was determined between the economic-status score and the total score. The question to be answered was: Does a high score on economic conditions indicate a high score on behavior excellence? Mathematicians have worked out convenient formulae for answering the questions that emerge from the kind of data available in this case. By such formulae one can express mathematically the degree of relation between two sets of variables. The mathematical expression is called the *coefficient of correlation.* The reader should realize that the following non-mathematical description of the coefficient of correlation does not include sufficient explanation

for a complete understanding of its value or its use. The discussion will have served its purpose if the reader retains the knowledge that relationships are best measured in *quantitative* terms, not by vague adjectives, such as *close* or *very little.*

If one set of variables varies perfectly with another, the correlation is perfect and is represented by + 1.00. If two sets vary exactly together, though in opposite directions, the correlation is said to be a perfect negative correlation and is represented by the number − 1.00. If there is no relationship between the variables, the correlation is zero.

The significance of the concept of correlation will be made clear by an illustration. Suppose we rate the economic status of the homes of a group of children, and also the seriousness of the behavior problems (if any) of each child. Now suppose that the child coming from the best home (from an economic standpoint) is found to present the fewest problems in his behavior; the child from the second best home is the second least troublesome; from the third home, third in freedom from behavior problems; and so on until, upon reaching the child from the poorest home, we find him presenting the most serious case of problem behavior. Suppose, further, that we find this situation to be true not of any specially selected group but of hundreds or even thousands of children. We should say in such a case that the correlation between economic status of the home and freedom from behavior problems is + 1.00. If the data had been just reversed — the most troublesome child coming from the best home and the least troublesome from the poorest home — we should express the relationship by a correlation of − 1.00. If *no* relation existed between home and behavior, that is, if knowing what type of home a child came from were of no value at all in deducing whether or not he would present behavior problems, the correlation would be half-way between + 1.00 and − 1.00, or zero.

The actual arithmetic of computing a correlation from a set of data may be found in any standard textbook of statistics.[9] In actual practice we seldom, if ever, find perfect correlations, either positive or negative, but we frequently find correlations that indicate some relationship between the variables in question.

When Baker and Traphagen applied this technique to determine the relation between the economic status of homes and the quality of behavior motivation as revealed by the total scores on

their ratings, they found a correlation of + .53 for the group of problem children, + .22 for the non-problem children, and + .49 when both groups were combined.[10] While these correlations leave no doubt regarding the importance of economic status as a factor influencing behavior, they are still far below + 1.00. They indicate, therefore, two facts: first, that economic status does matter; and second, that other factors are also of importance.

(3) *Attitudes of parents.* All of us have had the experience of going into a home that depressed us. The parents may have been filled with fears. They may have felt that their investments were insecure, that a dependent old age stared them in the face; or they may have been unduly anxious concerning political developments; or they may have felt that God was about to inflict some dire calamity on society. Whatever topic we mentioned was sure to bring forth an expression of fear and anxiety. Even adults, after a visit in such a home, feel that their cares have been increased. How much more depressed must a child become who for years is subjected to its atmosphere!

Wickes has reported how such home conditions led to the actual nervous breakdown of a girl of nine.[11] This little girl, through identifying herself with her father, who was finding it difficult to pull himself together and assume his duties, bore a burden too heavy for her. When the father finally met his problem, the nervous disorder of the child disappeared. In this case, the father was able to change his attitude. Unfortunately, the anxieties of many parents are so deep-seated that they are unable to change them. In such cases, the damage to sensitive children is apt to be more permanent.

Excessive anxiety over the children themselves is usually a focus for anxiety in general. Who has not observed a home in which the parents' eyes, thoughts, and interests are unduly concentrated on the children? A spirit of tension, almost an expectation of impending catastrophe, pervades the home life. Common experience tells us (and child-guidance clinics confirm it) that many children suffer from "too much parents." Dunbar goes so far as to suggest that exposure of children to intense adult emotions is traumatic to their personality development.[12] The situation is easier to detect in the homes of others than in our own. In contrast with the gloomy home, an environment of cheer and good feeling is more healthful. Homes take on a general atmos-

phere. Minute by minute, day by day the general emotional tone of the home is an environmental factor which has a deep as well as a superficial effect on members of the family.

Specific attitudes and values of parents are also reflected in their children. If the parents are rabid pleasure-seekers, the adolescent youth will be influenced — either to follow their example or to avoid what seems to him an empty life. If the parents look upon work as drudgery and are quickly fatigued by it, the child will in all probability develop the same attitude. If the parents are snobs, the child will in all likelihood become one. If the parents are critical of the school and of teachers, the child will become so. If the parents usually escape the disagreeable by becoming ill, the child is likely to develop the same neurotic trait.

(4) *Friction between parents.* Constant nagging, bickering, and criticism between parents leave a mark, and a bad mark, upon the children. Careful studies of problem children show that the parents, not the child, are often the real problem. Adults know how they feel when two persons they esteem highly are constantly quarreling. Sympathizing with both, they are pulled in opposite directions by their loyalties. For children this state is probably intensified by the feeling that their security depends upon the love between parents. Regarding this Brown writes:

> If the parents are at enmity with one another, however hard they may try to conceal it, the fact becomes apparent and exerts a baneful influence upon the child. The child sympathizes with both parents, and so internalizes in itself the outer conflict — the conflict becomes implanted in the child's mind, and is a source of weakness later on.[13]

The same thought has been vividly expressed by another writer: "The house divided against itself often becomes the battle ground on which a child's future is sacrificed." [14] This is illustrated by the case of a little girl of nine who "ran" a temperature for three months and was unable to attend school. She had no other physical symptoms of trouble except loss of appetite and languor. The physician could find no cause for the condition. Both parents felt that they had the child's confidence, and that she was not unhappy or worried about anything. Finally, the mother admitted that she was not happily married, and that she wished a divorce but could not make up her mind to accept the changes

that would be involved. Though the matter of a divorce was an open question with the parents, she felt sure that the child knew nothing of this. The mother was finally made to see that she was not helping her daughter by allowing the present state to continue, and it was made clear to her that she and her husband should either adjust their difficulties or decide to separate. Though the mother felt sure that a separation would be a hardship for the child, they decided to try it. They therefore explained the situation to the child and separated. The child immediately began to improve. Her relief at being no longer the victim of her vague fears was so great that she soon returned to normal health and to a real enjoyment of her school and play.[15]

Friction between parents may lead also to the undoing of discipline and to the division of the family into two hostile camps. The following case will serve as an illustration. The parents of two boys were at odds with each other. One of the brothers sided with the father, the other with the mother. Since the father was away most of the day, one of the boys was without a defender. As a result, he was constantly treated unjustly by the other, who always had the support of the mother. This, as might be expected, caused him to feel bitter, and from time to time he gave violent expression to his anger. Under such conditions the other boy became extremely arrogant and domineering. Both boys were thus injured by the favoritism and injustice of the mother, which was caused ultimately by the friction between her and her husband.

In yet another way friction between parents has an injurious effect on the child. Children need to have some one to admire and to love. Parents usually meet this need; but if there is jealousy and friction between them, they are apt in many ways, sometimes consciously but more frequently unconsciously, to undermine each other's influence and prestige. When this happens, the child not only is deprived of a valuable example, but often develops feelings of insecurity which result in actual suffering. A boy who identifies himself with his father under such circumstances may develop an unhealthy attitude toward members of the opposite sex and toward marriage, and in this way are planted the seeds of another unhappy married life. Girls may, of course, be similarly injured.

Strained relations between parents may also injure the child

by making him a substitute object of affection for the husband or wife. There is general agreement that lavishing on a child love that should be directed toward an adult is undesirable, and yet this substitution is by no means infrequent. When parents are unable to find in marital relations the love and sympathy they crave, or when they feel that their partner is unworthy of their love, they are likely to seek an outlet by showering affection upon their child. Under these conditions, discipline is apt to be undermined, and emotional bonds developed between parent and child that are hard for the latter to break even when he becomes an adult. A child so treated is apt to go through life unable to assume adult responsibilities or to take an adult attitude toward life; he remains emotionally undeveloped.[16]

In this connection it is interesting to note that the death of one parent, separation of parents, divorce, or commitment of one parent to an institution brings about a condition — broken home — which looms large as a factor in juvenile delinquency. Healy and Bronner found that defective family relationships were involved in a little over 50 per cent of their 4000 cases of delinquency.[17] Other investigators have found similar high relationships between home conditions and the children's behavior. In a recent study by Torrance, boarding students in a military school who came from broken homes were found to have more behavior, emotional, social, and health problems than the boys of a control group with whom they were paired. All of the dismissals from the school because of serious behavior problems were of boys from the broken-homes group.[18]

(5) *Lack of real interest in the child.* It is not difficult to find among clinical cases histories of children who have been injured by a real, though often unrecognized, lack of interest in their welfare. Children need more than good food, warm clothes, toys, and sunshine. They need to know that they are wanted, that they are loved, that they "belong." Some parents seem to think that any display of love would be a weakness. Hence they assume a cold attitude, and, as a result, their children are, at least in one important respect, emotionally starved. Some parents actually do not love their children. They feel that their children stand in the way of attaining their ambitions. Children sometimes sense the situation and, in their efforts to hold their parents, regress to an infantile attitude. The following case illustrates this.

A little girl who had a strong love for her parents was regarded by them as a handicap in attaining their social and professional ambitions. The child had been sent to a summer camp at six; and when she was nine, her parents prepared to send her to a boarding school. At this point she suddenly began to be willful and to make all sorts of arbitrary demands for attention. Then certain regressions to infantile behavior, such as sucking her thumb, made their appearance. Commenting on the case, Wickes writes:

> No one with any psychological insight could talk long to the mother without seeing the personal ambition peering from behind her ardour for a "larger life" and for being of use to her husband. It was this unadmitted and unrecognized personal ambition that was the corroding influence in the relationship, and that had destroyed the child's feeling of security in love. Therefore, she tried in these pathetic little power ways to gain control of her parents.[19]

(6) *Discipline.* However heatedly psychologists may argue among themselves about the truth of the old maxim, "Spare the rod and spoil the child," they are well agreed that the wisest use of discipline is a moderate use. Too harsh and too rigid rules make it difficult for the child to learn the reason for the rules. Parents who make the life of a child little more than following a set of commands usually succeed in teaching only that "rules are made to be broken," or in making the child believe that complete subservience and repression of initiative are the correct guides to social adjustment in later life.

Other parents seem to feel that in order not to crush the initiative of the child they should respect his every whim and fancy, regardless of the rights of others. Such training makes it hard for the child to make any social adjustments except by dominating his companions. Some parents encourage their children to be aggressive and to act without consideration for others, apparently believing that will-power and determination are thus developed. In this they are poorly advised, since respect for, not disregard of, the rights and opinions of others is the best ally of persistent and determined conduct.

People sometimes allow their emotional states rather than the needs of the child to determine their disciplinary measures. Such a procedure, by its lack of consistency and rationality, not

only fails to help the child develop self-control, initiative, perseverance, and consideration for others, but actually creates chaos in the child's whole conception of morality and social obligation. The importance of wise discipline is indicated by the fact that the control exercised over the non-problem children studied by Baker and Traphagen was rated 1.9 times as high as that exercised over the problem children.[20]

Frequently parents injure their children by being unwilling to accept them as they are. They wish to make them over in the light of their own desires, and to choose vocations for them. To such parents the advice of Angelo Patri is commended: "If you prayed for a fig and the Fates decreed you a thistle, reflect upon the truth that a thistle fullgrown and blossoming is a heartsome sight, but a thistle upon which a misguided soul has tried to graft a fig is a sorry, not to say a ridiculous sight." [21]

Many parents make their children feel that if they do not achieve a certain goal, the family will be disgraced. The parents may do this because of pride, or in an effort to bolster up their feelings of personal worth. They may even do it out of sincere love for their children. Unfortunately, the sincerity of the love does not prevent the consequences from being disastrous, especially if the child returns that love and fears above all things that he may disappoint his parents. Under such circumstances, the child may drive himself so hard that his health, both mental and physical, is adversely affected.

Some parents make the opposite mistake of not expecting enough of their children. They ought to gauge the child's capacity carefully, and require him to live up to his capacity. Instead of doing this they make excuses for their children and treat them as babies. Such parents might study with profit *The Home Life of a Golden Eagle* by MacPherson.[22] When the golden eaglet is young and helpless, the parents care for it with utmost devotion, but they do not neglect the important task of teaching it how to care for itself; when finally the eaglet has reached the point where he can take care of himself, the old eagles, who were formerly so devoted, forcibly drive him away.[23] Human parents must be willing to face separation from their children. More than this, they must realize that it is one of the highest duties of parents to help their children become adults in every sense of the word.

Many parents, by suggesting undesirable patterns of conduct,

make it hard for their children to develop normally. If a child has been noisy and has caused some confusion and disorder, they call him "a little devil" or "a bad boy," instead of reflecting that they would not really desire their child to sit quietly throughout the day and show no interest in investigating and manipulating things. Perhaps, in his presence and before others, they say that they "cannot do anything with him"; and the child, thus given the center of the stage, finds his vanity and love of attention satisfied. As a consequence of both of these kinds of treatment the child attempts to live up to the type set for him.

Children are frequently made bashful, shy, and cowardly in a similar manner. If, for example, a child is a bit shy, thoughtless parents, friends, and teachers speak of it before him. In this way they direct the attention of the child to himself instead of to what he is doing, and they heighten his self-consciousness and make it harder for him to overcome his weakness. Furthermore, since the child is extremely suggestible to begin with, these remarks serve to remind him of his undesirable reaction pattern and so to aggravate it.

Parents at times ridicule their children. By so doing they erect an impassable barrier between the children and themselves. They laugh at the children's fears, make light of their dreams, and show no interest in the products of their imagination. Yet later, they wonder why their children do not come to them with their problems. The child, as a matter of course, opens the door to his inner life. If those who are invited to enter are callous or ruthless, they should not be surprised or grieved when he bars the door and becomes indifferent to their desire to gain his confidence.

(7) *Size of family.* It has been discovered that the size of the family and the order of birth of the children are related to certain aspects of character and personality. According to Crane, men who are only children (who had no brothers or sisters) show 5.72 times the average in the number of their divorces, whereas men who are in the middle in order of birth show only .58 of the average number. The corresponding figures for women are 4.18 and .65.[24]

Data published by Lentz show that the average intelligence of persons from large families is lower than that of persons from small families.[25] There are two possible explanations: either

persons of low intelligence tend to raise larger families than do persons of higher intelligence (the action of heredity), or children in large families do not receive as much attention and hence are not stimulated in their intellectual growth as much as are children in smaller families (the action of environment). Judging from several recent investigations of the relative strength of heredity and environment (see page 210), we may safely say that these causes are jointly responsible for the facts.

The effect of the home upon every one in it is usually *good* or *bad*, seldom indifferent. The home should not, on the one hand, be a chilly detention ward or a place where one eats and sleeps and which one leaves as soon as possible. But it should not, on the other hand, be a daydream of unreality, in which one's slightest fancy is met, where duties in return for privileges are postponed until next year, where every hurt is an emergency, resulting in oversolicitation. The good home must be worked for, must be achieved by the effort of every one in it. Some of the common elements of a good home (allowing for many differences) are: genuineness, as opposed to insincerity; steadiness, as opposed to vacillation; few "musts," but those strong ones; mutual respect; and the practice of the best knowledge available in matters of health, diet, recreation, and rest. The relation between father and mother far outdistances in importance any other factor. The father will do his best service by being mostly husband, not mostly father. The mother will do her best service by being mostly wife, not mostly mother. In general, sick children come from sick homes, well children from well homes. Emotional maturity, genuine manliness and genuine womanliness in the parents are the open sesame to children's future happiness.

THE SCHOOL

The school should be, and often is, the child's other home. It should be like the home. Too many schools remind one, not only by their smell but by their general atmosphere, of a railroad station, where strangers are forever coming and going in complete disregard of one another. Too many are reminiscent of an orphanage or a detention home. The indifference of American parents to what is really going on in school and to who the teachers, as total personalities, really are is one of our greatest

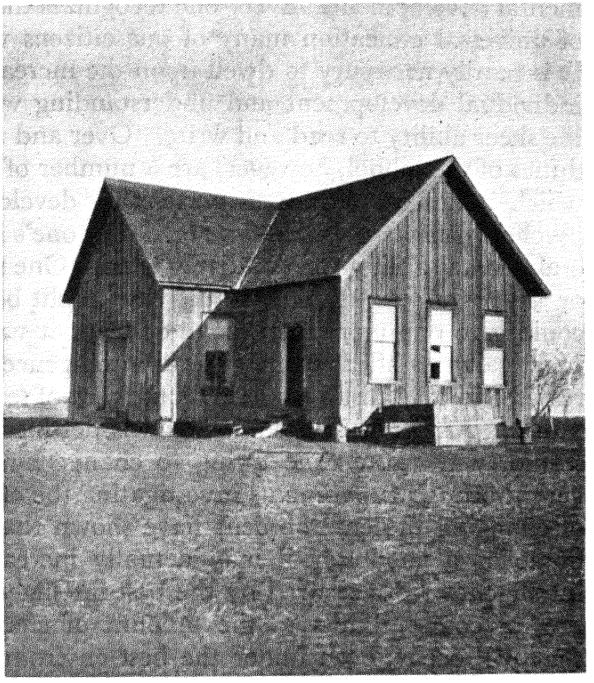


FIG. 14. POOR SCHOOLS SUCH AS THIS HANDICAP LEARNING

Lincoln's success cannot be imitated by those with less genius for overcoming difficulties. (Courtesy of U. S. Office of Education.)

dangers. A father will sometimes move a hundred miles for a better job but not even across a town for a better school. No doubt he loves his children but he is remiss in an important way in showing it. Differences in schools are as great as differences in homes. Do not be misled by the fact that a few great men have been educated in backwoods country schools. Perhaps the genius of a Lincoln would emerge in spite of a school such as the one shown in Figure 14, but persons of mediocre ability require far better opportunities than such a shack could possibly afford. From whatever kind of home a pupil may come, such a school cannot have a cheering effect. The discomfort of cold, the general depression of the place must fail to create the receptive frame of mind so necessary for effective learning. There is every chance that they will actually create in the pupils a permanent antagonism to the school, to the subjects that are presented there, and to education in general.

(1) *Educational and mental development.* The most obvious purpose of the school is, of course, the stimulation of educational and

mental development. Every one recognizes that without a system of universal education many of our citizens would be illiterate. It is hardly necessary to dwell upon the increased possibilities for individual development and understanding which arise through the sheer ability to read and write. Over and above these routine duties of the school, however, are a number of more subtle effects which it can exercise upon personality development. Formerly psychologists were generally agreed that one's intelligence or general mental ability was relatively fixed. One was either "smart" or "average" or "stupid," as the case might be; while education could give one more knowledge or facts, it was thought to have practically no effect upon general intelligence. This philosophy resulted in a fatalistic attitude on the part of teachers toward their pupils. After all, if a stupid child is destined always to remain stupid, why waste time trying to change him? Recently some very thorough experiments investigating the effect on intelligence of changing the environment have shown that a shift to a good home or a good school may actually increase some children's intelligence (as measured by the best intelligence tests).[26] There are, of course, limits to the amount of change in intelligence that will occur, even under the best environmental stimulation; but the fact that *some* change may reasonably be expected greatly increases the importance of schools.

(2) *Socializing influence.* An important effect of the schools, particularly upon children between five and ten years old, is the socializing influence which results from bringing a large number of children together under the control of trained teachers. Schools make for social adaptability; they give the child an opportunity to play under supervision; they teach ideals; they stimulate the child's aesthetic interest and broaden his horizon; they equip him with the tools necessary for entering into and enjoying the accumulated insight and knowledge of his group. Not to have attended school is to suffer social disinheritance. Unfortunately, however, the school does not succeed in socializing all of its pupils. Frequently it fails to inspire its brightest pupils to do their best, while many of the duller ones are injured by being required to study subjects beyond their capacity or foreign to their interests. Happily, we are awakening to the fact that compulsory attendance imposes upon school authorities the duty of making the school such that every child who goes to it shall be helped.

To make the school a help to every pupil, more attention must be paid to differences in ability to learn. If the same amount of work is required of a very dull boy that is required of a very bright one, the latter will find nothing in the requirements to test his powers, while the former will find that no matter how hard he works, he is unable to perform the required tasks. The bright one, therefore, assuming an attitude of superiority, develops habits of laziness and of working at low efficiency; the dull one becomes discouraged, and may attempt to save his self-respect by being disorderly or completely indifferent. He finally leaves school, beaten before he ever begins the life of an adult.

(3) *Emotional development.* Schools should also pay more attention to the emotional differences of children. If a child is a leader and good "mixer," the school becomes an arena for the development of his capacities. He is called on to recite in public, to take a leading part in school plays, and to be a leader in many other activities. But what of the shy, timid, reflective child, who is a poor mixer? Though he is the one who particularly needs to take part in social activities, he is frequently neglected, or placed in a situation in which he is forced to compare his performance with that of those who are not similarly handicapped. Perhaps on the playground he is made sport of by the more aggressive children, with the result that he is driven more and more to live the life of an introvert. A little help on the part of the school authorities might be sufficient to check his tendency toward this extreme maladjustment. Children of this type usually do well under teachers who are sympathetic and who help them to make proper adjustments, but they do poorly if their teachers are insensitive to their inner conflicts. For the school to fulfill its obligations to the children who are compelled by law to attend, the instruction must be adapted to the needs of the child; the school must cease trying to compel every child to conform to a rigid program designed to meet the needs of the majority.[27]

(4) *Attitudes.* Attitudes, also, are much affected by the school. Boedt and Stroud report that the liberalism of college students on matters pertaining to economics and sociology is directly related to the number of years spent in college (sophomores being more liberal than freshmen, etc.). It is also related to the number of social science courses taken.[28] A number of other studies support this conclusion (see page 62).

Schools could also do more to help boys and girls develop desirable social attitudes, not only by discouraging race prejudice and dislike of low-income groups, but also by making a serious effort to place every boy and girl with congenial companions. Moreno found that of 153 boys in a certain secondary school, 32 did not have even a chum or close associate, and that there were seven pairs of chums, one group of three close friends, and two groups of four. The rest belonged to larger groups.[29] Obviously, the social development of the 32 boys who had no chum and belonged to no group must have been adversely affected. Undoubtedly many of them could, with a little help from the principal, have fitted into some group, with real advantage to the group as well as to themselves.

Progressive schools are fortunately beginning to give more attention to the need of boys and girls for companionship. Educational psychology and its branches are fields of advanced study which many college students explore after their introduction to general psychology. But every one should recognize that the school is an environmental factor of prime importance, and that there are great differences between good and poor schools. The school in a thousand ways *makes* the man. Few get over the effects of a poor school or lose the benefits of a good one.

MOTION PICTURES

Of the many features of twentieth-century environment, perhaps few are as important in their effect upon us as the motion picture. A series of studies recently published has shown experimentally that the motion pictures teach facts, influence attitudes, stimulate emotions, affect sleep, and influence conduct. The information taught by them is, at least in some cases, more permanent than material learned in other ways. "At all ages, including the adults, the slow drop of the curve of forgetting is striking. . . . 'The curves of forgetting are considerably higher than those obtained by previous investigators'" (using other materials).[30]

Attitudes as well as information are related to motion-picture attendance. Children who attend motion pictures to excess have "lower deportment records and do poorer work in school subjects." That desirable attitudes may also result, however, is shown by the fact that a single showing of a picture favorable to the Chinese

resulted in a definitely more favorable attitude toward this race among the children who saw it. After pupils had seen *Journey's End* or *All Quiet on the Western Front*, their attitudes toward war were much less favorable than before. Further studies in this direction have revealed that the attitude shifts or changes brought about by pictures of this type have "substantial permanence."

Experiments upon the emotions of children show that "scenes of danger, conflict, or tragedy produce the greatest effect . . . upon children . . . from six to twelve years old." They also show that love scenes and romantic scenes generally have very little effect upon this group but a marked effect on persons from twelve to eighteen years of age. More important than these general trends are the striking individual differences discovered to exist between one child and another. Apparently, the same advice concerning motion-picture attendance should not be given to all children. One must first know the child before he can tell what or how many pictures will be genuinely stimulating experiences and not an "overdose" of emotion.

Another part of the study of the effects of motion pictures dealt with sleep. How is a child's sleep affected by motion-picture attendance? An ingenious technique was devised for measuring the restlessness of a child while asleep or while trying to sleep. The experiments showed, among other things, that a picture "is about as disturbing to sleep patterns as sitting up till midnight, [and] that the influence of some pictures . . . is as great on some children as drinking two cups of coffee in the evening."

The effect of motion pictures on the behavior of children was also clearly shown by these studies. Charters concludes that motion pictures "stir powerful ambitions, good and bad; develop permanent ideals, high and low; and crystallize the framework of life careers."

These investigations prove quite clearly that the "movies" are an important factor in our emotional and intellectual development. Of course, young psychologists ought to go to motion pictures often in order to study the influences playing upon people in general. Tendencies, however, to become a "movie fan" should ordinarily be yielded to only when it is clearly understood what the effect may be. Motion-picture attendance could be considered undesirable to the extent that it intereferes with the attainment of more important goals.

THE RADIO

"From my own experience in writing and speaking on politics, I know that 99 per cent more persons will react to your speaking than to your writing." [31] Thus writes H. V. Kaltenborn, radio news analyst. Though the speech and voice of Mr. Kaltenborn are perhaps more effective than that of many radio commentators, no one will deny that the radio has become one of the most significant and powerful influences of modern society. Nor is it alone an instrument of entertainment. The possibilities of the radio for education and propaganda are realized by every one in public affairs. The diversity of the audience which a radio speaker may reach is almost beyond comprehension. The different postures and expressions shown in Figure 15 give some indication of this variety of human material. But listening at the same moment to exactly the same words, these individuals are being subjected to a powerful force skillfully designed to mold their various opinions into one and to erase the effect of distances such as that from Waterloo, Nebraska, to Lexington, Massachusetts. After extensive study, Cantril and Allport write: "One hundred thousand persons are now employed in the radio industry; . . . 78,000,000 of our citizens are more or less habitual listeners; . . . 20,000,000 of them often listen simultaneously to a single broadcast; and . . . 21,455,799 homes are equipped with receiving sets." [32]

We do not need to guess at the tremendous influence which radio has upon our lives. Many excellent studies have been made which prove this influence. An investigation by Eisenberg dealt with the effects of radio upon the mental life and behavior of children. Among the favorable influences reported were greater interest in the home, greater respect for family relations, the development of new interests and skills, and increased vocabulary. Some unfavorable effects noted were the frequency of nightmares involving plots of stories that had been heard over the air and the possible displacement by the radio of other developmental influences, such as reading.[33] Attitudes may be influenced by radio speeches or programs, as illustrated by an experiment reported by Lumley, in which a single radio speech about the city of Denver to students in Ohio made the "pupils' attitudes toward Denver . . . more favorable." [34] When one considers that the average

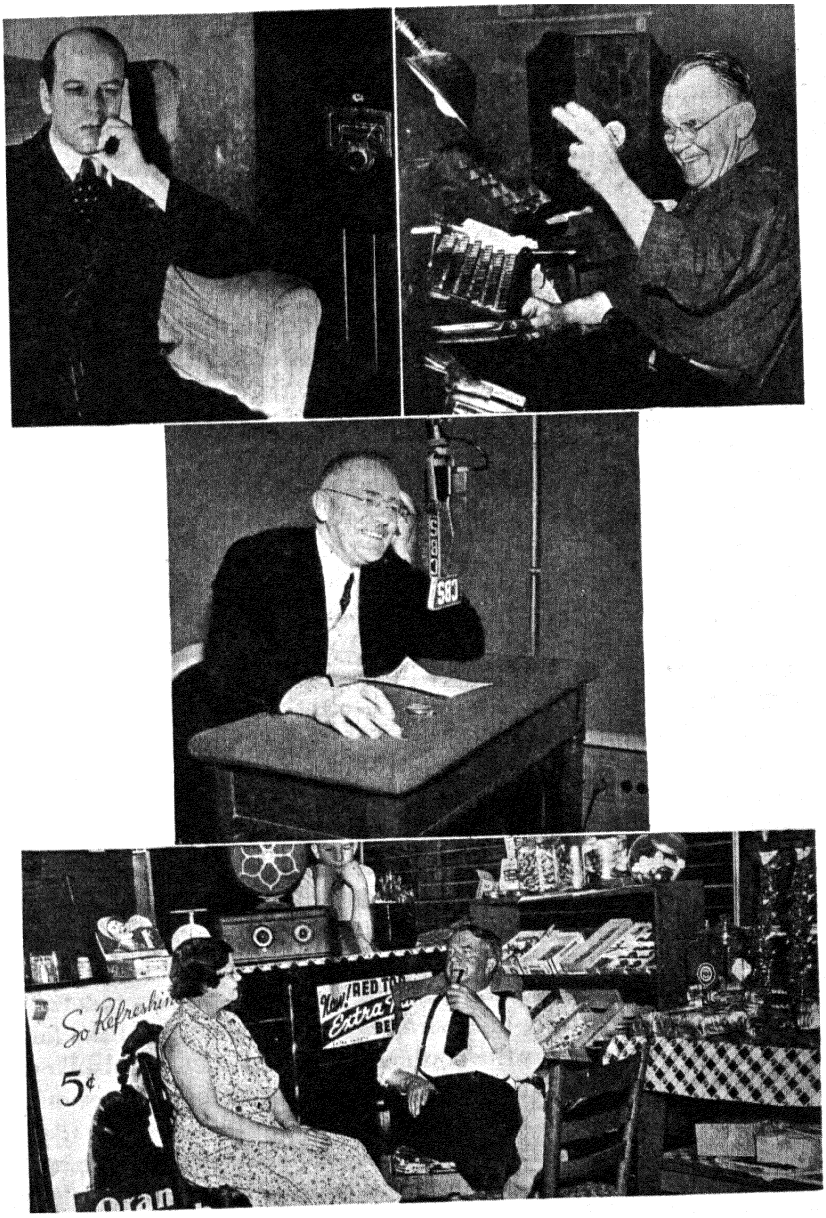


FIG. 15. MENTAL ATTITUDES ARE STRONGLY INFLUENCED BY THE RADIO: BROADCAST BY H. V. KALTENBORN

Location of listeners: Lexington, Mass., Waterloo, Neb., Atlanta, Ga. (Photos: *Life* Magazine and H. V. Kaltenborn.)

child between ten and thirteen years of age spends somewhat more than six hours before the loudspeaker each week, and that adults listen somewhat over four hours a week, the possible effects of what they hear, the instruction or the propaganda, as the case may be, can well be realized.[35]

COMMUNITY LIFE

The community in which we live influences us. The interests, problems, and required activities of an urban community are different from those of a rural one. Even greater are the differences between the attitudes generated in a pioneer community and those of an old, established one. There is a story of a newcomer in a mining community, who, for privacy, hung his shirt before the door. It was not long before he was surprised by a man walking in unannounced. He asked the intruder what he wanted, and the latter replied, "I just wanted to see what was going on in here that requires so d—— much privacy." In many respects the manners and attitudes of those living in an established community appear finicky to people from a pioneer community; on the other hand, outsiders consider the manners of a pioneer community crude and lacking in the niceties of cultured society.

An interesting study of the relation of values and interests to the environment has been made by Davis. He gave a list of forty-five occupations to American and Russian boys and girls with the request that they rate the occupations in order of preference. The Americans rated banker first (this study was conducted before the depression); then came, in order, college professor, doctor, and clergyman; ditch-digger was given the lowest rating. The Russians gave high ratings to the following: peasant, aviator, government official, physician, and party worker. They placed the following occupations near the bottom: clergyman (lowest), banker, prosperous business man, manager of a small factory, owner of a store, and small storekeeper.[36]

Communities also differ in their dominant values, and boys and girls absorb as a matter of course the dominant interests and values of the group in which they are reared. If the advancement of science is an important interest of a city, the youth of that community will share that interest. If the predominant interest of a community is political power, or industrial development, or evan-

gelizing the world, or living a life of sensuous ease, the youth will be influenced accordingly. To understand the personality and behavior of another we should keep in mind the influence of the group in which he was reared. Though one may in some respects outgrow his early environment, the traces of it can never be wholly eradicated from his personality.

Perhaps the clearest evidence of the effect of the community on personality and behavior has been unearthed in the study of crime. A study of 911 delinquents showed that 86 per cent came from neighborhoods which were (1) business districts; (2) manufacturing districts; and (3) districts in which the population was changing, that is, in which the racial or national homogeneity of the community was being disturbed by the moving in of people of a different race or nationality. Commenting on such neighborhoods, Cole writes:

> Perhaps the outstanding characteristics of all these "bad" districts is that they offer no social cohesion, little protection, and only warped outlets for childish activities. The "good" district presents the opposite picture. It is one in which there are social traditions, excellent protection (in the form of observant adults), and adequate outlets for the restlessness and emotional drives of childhood and adolescence. In all investigations "bad" neighborhoods or "bad" companions are found to be important elements contributing to delinquency in the great majority of cases.[37]

This study and the one by Wellman cited on page 215, as well as a number of others, prove the importance of the environment in affecting, if not determining, one's development. Even genius, born in communities which for one cause or another desire little beyond the satisfaction of physical wants and appetites, is often crushed under a load of indifference. A talented boy will find it difficult to rise above the intellectual level of such a community. He will be forced to spend a considerable portion of his time seeking or trying to create conditions which are intellectually stimulating. He will reach his highest level of accomplishment in such circumstances only at the cost of much suffering, caused by a lack of appreciation of his objectives and of encouragement to do his best. Every one needs companionship, and appreciation of his cherished values and efforts. When these are denied, scars are left that time and success cannot wholly eradicate.

PRESENCE OF OTHERS

One is influenced in his behavior by the mere presence of others. The psychological situation is not exactly the same when some one is watching as it is when we are alone. To typewrite, for example, with some one looking over your shoulder requires more effort and consumes more energy than it would otherwise do. This is doubly true if you are composing as you write. Curious people sometimes do not understand the unwillingness of workers to be watched. The onlooker cannot understand that a worker must expend more energy when he is watched.[38]

The effect upon output of working in groups is indicated by numerous studies. Allport investigated this by means of a *free association* test. Testing his subjects both in groups and alone, he had them write as rapidly as possible the words which came to mind after a stimulus word was given. The results are shown in Table I. In every case, the majority of persons wrote more words when working in a group than when working alone. Similar experiments with various other types of behavior have shown that working with a group tends to increase speed. At the same time, group activity frequently results in poorer quality.[39]

To be observed may also cause us to exercise a little more restraint, or to make a little more display than we otherwise should. If, for example, in driving a nail you should hit your finger, you would probably express yourself more freely if you were alone than if another was present. The expression of fear is similarly affected. If others are present, we are more apt to try to inhibit its expression. In public disputes we are apt to be more polite than we are in domestic ones. The way in which the presence of others makes for display is frequently seen in the play of children. If alone, they may play contentedly, but if some one else is present, they are apt to begin "playing to the gallery." Adults also play to the gallery, but in ways which they themselves are often the last to recognize.

Allport summarizes a number of researches on the effect of the group as follows:

> The social stimulations present in the co-acting group bring about an increase in the speed and quantity of work produced by individuals. This increase is more pronounced in work involving overt, physical

TABLE I

INFLUENCE OF THE CO-WORKING GROUP UPON SPEED OF ASSOCIATION [40]

Experiment number	*Number of subjects*	*Number of tests*		*Method*	*Number of subjects writing more words alone*	*Number of subjects writing more words together*	*Number of subjects writing an equal number of words alone and together*
		A	*T*				
1	3	9	12	Every word written	1	2	0
2	15	11	13	Every word written	1	14	0
3	14	5	6	Every fourth word written	4	8	2
4	8	8	11	Every third word written	2	6	0

(By permission, from F. H. Allport, *Social Psychology*, Houghton Mifflin.)

movements than in purely intellectual tasks. In adults the group produces no improvement in the constancy of attention or the quality of work performed. Some individuals, in fact, do inferior work in the presence of co-workers. There is a lowering of the logical value of reasoning carried out in the group, but an increase in the number of words by which such reasoning is expressed.[41]

The energy marshalled by the individual in group activity is to some extent wasted because working under the pressure of a group sometimes causes distraction.

OTHER ENVIRONMENTAL INFLUENCES

The numerous social institutions and practices which comprise our modern society obviously have an important and continuous effect upon us. Studies have been made of the effects of the

church, of the Boy Scouts, of clubs, gangs, and summer camps. From the psychological viewpoint, such organizations may be thought of as agencies of education or development. What they will teach, how they will teach it, what effects upon personality they will have, and how permanent these effects will be — these things differ from one situation to another. But that social institutions are important factors is proved by studies such as the one by Dimock and Hendry, which showed how a summer camp increases self-reliance and courtesy,[42] and the one by Glueck and Glueck, which showed that delinquents come from families having few religious contacts much more frequently than from families associated with a church.[43] Certainly, in attempting to understand any one's behavior, we must consider the cultural and social agencies that have been part of his environment.

THE MULTIPLICITY OF INFLUENCES

Since so many things influence the development and behavior of an individual, it is difficult to say what factor is chiefly responsible for a given personality trait or for a given act. For example, is the bad temper of a particular man due to his having been too much humored as a child, or to a feeling of insecurity and of "not-belonging," or to frequent disappointments in the past, or to jealousy? Is the overaggressiveness of another due to an inferiority complex against which he is fighting, or to self-assertion overstimulated by constant success? Is another's lack of ambition due to an organic disorder, or to the community life of his boyhood, or to conditions within his family? Is the antisocial attitude of another a protest against the injustices he has suffered? Or does it come from a lack of ability to comprehend social obligations, or from faulty discipline within the home?

The attempt to select a single factor as the cause of an act or personality trait is always inadvisable. Behavior is an outgrowth of the whole situation in which it occurs. To understand any one's behavior or personality we must have before us a complete case history of the person. This should include, on the one hand, an account of his intelligence, complexes, mood, temperament, and organic condition; and on the other, an account of his home and school life, the community in which he was reared, the gangs to which he belonged, his religious instruction, and all other situa-

tions or events that may have influenced his life. When this knowledge has been obtained, the act under consideration will become intelligible, because it will then be seen that it was the most "natural," that is, the easiest, thing for him to do under the circumstances.

Understanding a personality is like judging a picture. Both picture and personality must be seen as a whole, and each part must be seen in the light of the whole. The more complete our knowledge of an individual, the more intelligible each of his acts and personality traits becomes. It should be added, however, that even complete knowledge does not insure perfect accuracy of judgment. Our judgments are the judgments of fallible beings. Though we may make them more accurate by broadening our fund of experience and by increasing our understanding of the principles of personality, we should not hope to become infallible in our interpretation of another's behavior, no matter how carefully we study it.

SUMMARY

Environment influences behavior both directly and indirectly — directly, by determining how one acts at a given time, and indirectly, by its effect upon development. One of the most important environmental conditions is the home. Elements of the home that are of most significance are: its economic level; the prestige, attitudes, and intelligence of the parents; the amount of friction between the parents; the degree of real interest in the child; discipline; and the size of the family. Next in importance is the school, which not only determines educational and mental development, but also has its effect upon intelligence, attitudes, and social behavior. In addition, schools can do a great deal toward solving problems of emotional adjustment. Motion pictures are a third effective agency of education and of general influence upon our attitudes and emotional life. The radio also is becoming increasingly important in shaping our behavior and development. Other environmental factors of consequence are: the community in which we live, the people with whom we work and associate, our church, and the other organizations with which we have some contact. In no case can a single factor — either within the individual or in his environment — be singled out as the sole cause operating in a personality's development. We must always look

at the whole environment and the whole individual in our attempt to understand and explain behavior.

QUESTIONS ON THE CHAPTER

1. What is meant by the direct and indirect influence of environment?
2. What are some of the main personality traits that are markedly affected by environment?
3. In what ways will the economic level of a home exercise an effect upon the personalities of those living in it?
4. How do the dreams of children reflect the economic status of the home?
5. What is meant by a coefficient of correlation?
6. What is the status of home discipline among problem children?
7. What effect does the size of the family in which children are reared have upon later personality and behavior?
8. In what ways does the school supplement the home as an environmental influence?
9. According to the experimental results, what effects do motion pictures have upon children?
10. According to the experimental results, what effects does the radio have upon children?
11. What is the effect of a group of co-workers upon speed and accuracy of the work of the individual?
12. What are some of the other important environmental influences?

QUESTIONS FOR DISCUSSION

1. Give some examples of direct influences of environment on behavior. Of indirect influences.
2. What is your reaction to the statement: One's morals must be evaluated in the light of one's home conditions?
3. Mention and discuss some problems which might be studied by means of correlation.
4. Discuss the possible ways for society to capitalize in the future upon the motion picture as an environmental influence on children and adults.
5. Do the same for the radio.

SUGGESTED READINGS

H. Cantril and G. W. Allport, *The Psychology of Radio* (Harper and Brothers, 1935). A scientific and scholarly (and very readable) account of the psychological problems of modern radio broadcasting.

W. W. Charters, *Motion Pictures and Youth* (The Macmillan Company, 1933). A brief, accurate, and interesting summary of a number of scientific studies of the effect of motion pictures upon people, particularly children and adolescents.

L. Gilfillan, *I Went to Pit College* (Viking Press, 1934). An interesting description of the effect of poverty on personality.

MORE ADVANCED READINGS

H. Hartshorne, M. A. May, and others, *Studies in the Nature of Character* (The Macmillan Company, 1928–1930). A series of careful investigations of character and honesty, their measurement and the factors that determine them.

Motion Pictures and Youth: The Payne Fund Studies (The Macmillan Company, 1933–1934). A series of twelve studies of the effects of motion pictures upon children and youth. Conducted by a group of trained psychologists and several universities, this series is an excellent indication of how modern psychology may be applied to a problem of vital importance.

CHAPTER FOUR

Personality and Adjustment

NOTHING is so close, so interesting, and so important to us as our own personalities and behavior. Yet it is one of the paradoxes of nature that most people do not understand their own personalities, they do not know themselves, nearly as well as they know (or think they know) other people. Perhaps we are so close to ourselves that we cannot see the forest for the trees; perhaps we are so important to ourselves that we cannot view our own personalities impartially and objectively. Most of us criticize others, find fault with our friends (usually when they are not present), are quite sure that some one "should have done something," that some one was a little stupid or jealous or shortsighted. But do we willingly admit having these traits ourselves? It is obviously common sense and good business to be one's own best friend, but how frequently one turns out to be his own worst enemy!

In studying psychology we shall try to understand others and shall also go a few steps toward understanding ourselves. We shall learn that every trait or fault or imperfection that we notice in others is also present in some measure (and perhaps in large measure) in ourselves. We shall learn *why* these traits are present, what they do *for* us and *to* us. In short, we shall learn what our personalities are and what our behavior means.

Personality is the sum total of everything that constitutes a person's mental, emotional, and temperamental make-up. As it is usually conceived, personality comprises only the mental make-up, not the physical aspects of a person. But in considering personality we often have to take account of physical characteristics. We find that mental traits are strongly influenced by

physique and physical equipment. The inferiority complex, for example, which has had a great vogue in popular thought and has been so grossly misunderstood, is regarded by Adler as being frequently a reaction to some kind of organ inferiority.[1] Kretschmer has reported that certain personality types tend to be found in association with definite body types. A heavy, overfat person is likely to be happy, good-natured, and carefree, while a light, thin person is more likely to be retiring, morose, and anxious.[2] Other studies dealing with personality traits more easily measured, with intelligence, for example, have revealed other relationships between physical and mental characteristics. As early as 1903 Bolton reported that superior physical ability, as revealed in tests of rapidity, steadiness, and precision of action, is accompanied by superior achievement in school.[3] The most recent investigations in this field show the relation between physique and intellect to be slight, but they do reveal some tendency for desirable physical and intellectual traits to be found together. This contradicts the implied generalization of the phrase *beautiful but "dumb,"* if that phrase is intended to mean that beauty is usually accompanied by stupidity. On the other hand, the tendency for desirable physical and intellectual traits to go together is, in fact, so slight that it cannot safely be assumed in any individual case.

In popular language, personality usually refers to the immediate impression that an individual makes upon others. This limited use of the term, however, is avoided by the psychologist. There is much about the inner mental life, important for an understanding of a person, that is not immediately apparent to others, at least not apparent in the creation of an immediate social effect. A man's personality is the product of all his past experience acted upon by his particular constitution. Hence it includes a really vast number of elements which are of vital importance to understanding his behavior. Your personality and your seat-mate's are no surface phenomena to be seen at a glance. While a psychologist can see a good deal in a short time, he would be the last one to make a hasty appraisal of personality.

Personality should be clearly distinguished from character, which is even more difficult to define. Character inquires whether one's behavior follows certain norms or standards which are known as "right." As standards of right and wrong necessarily

change from time to time (witness slavery and prohibition), a man's character may be good today and bad tomorrow, or *vice versa, even though he does not change his behavior at all.* Washburne, recognizing this and other difficulties in defining character, concluded that there is neither a generally accepted definition of character nor even tacit agreement on the criteria by which character, or any character trait, may be judged.[4] Fortunately, this is not a serious handicap in our study, because our primary interest is in understanding behavior — both "good" and "bad" — not in classifying or condemning it. We should not neglect to give serious thought to what are popularly believed to be urgent problems of character merely because exact definition cannot be agreed upon. But psychology is a very new science and naturally enough has dealt first with easier problems (often problems of little social significance). It has no final word to say about character and character education at the present time. Perhaps, however, the guesses of psychologists are better than the oversure writings on character education by those whose training has been other than psychological. The immense importance of character and the pressing need of effective methods of teaching desirable character traits are clear to every one.

SOME CHARACTERISTICS OF A PERSONALITY

(1) *A personality is conscious.* A trait common to all personalities and, at the same time, one of the most important concepts in the whole field of psychology, is consciousness — that singular capacity we have of being *aware* of what goes on. Consciousness is no concern of the physicist, the chemist, or any student of inorganic or nonliving matter. But the biologist and psychologist, in observing behavior, note at once that living organisms are aware of what is going on and that their behavior is influenced by this awareness.

The relation of consciousness, or awareness, to physical things has not been explained by any scientist. When we see a red rose, the light waves may be measured, but the color *red* — the consciousness of color — is something new which cannot be explained or even described in physical terms. Imagine yourself trying to describe this color to a person who had been blind from birth. You could not say, "Red is the color of a ripe apple,"

because to one who had not seen a ripe apple such a comparison would be meaningless. Nor would it be more helpful to describe the rays of light which result in our seeing red. Even a person with normal vision cannot deduce the color from his knowledge that light waves 760 millionths of a millimeter in length are somehow involved. Consciousness — in even so simple a form as awareness of color — is something *new*, something *unique*, something which cannot be explained in physical terms. Yet consciousness is one of the most important kinds of activity of which we are capable, because upon it depend a great number of other reactions. The movements of inorganic objects are caused by external forces, but much of our behavior would be quite different if we were unconscious and subject only to forces outside us. Common observation as well as experiment proves this to be true. The person who walks in his sleep is in danger, because he is not conscious and does not make the observations necessary for safety. The person who talks in his sleep, or when coming from under the influence of an anaesthetic, is not responsible for his words, because he is not conscious of what he is saying. Some fraction of his total self is talking, but it is not the self that is ordinarily conscious. (Why the "irresponsible" person says what he does say instead of something else is, of course, important and the importance is emphasized by the psychoanalytic school.) As long as a person is sound asleep or completely under the influence of an anaesthetic, he is helpless to make any adjustments except those of a physiological character. While he is in such a condition, the house could burn around him without his knowing it until escape was impossible. On the other hand, when we are fully conscious, we know what is going on about us, we are aware of some, if not all, of the possibilities ahead, and can direct our behavior accordingly.

Consciousness is in some way related to nearly every kind of behavior of which we are capable. Even reflex actions are somehow affected by, or at least related to, consciousness. A *reflex action*, or *reflex*, is a constant response to a given stimulus and is caused by an innate connection in the nervous system between the organ which receives the stimulus and the muscles or glands which make the response. The knee jerk, or patellar-tendon reflex, is a typical example of this kind of response. If the leg is suspended loosely over a support (as when the legs are crossed

while sitting) and a sharp tap is given just below the kneecap, the leg will be extended. This response occurs automatically without effort on the part of the subject. But Fisher has shown that a subject under hypnosis who does not have a fairly clear conscious awareness of the stimulus does not show this reflex action.[5] Hypnosis — a condition of restricted attention, which will be discussed in some detail in Chapter XI — seems to eliminate the reflex merely by eliminating, or reducing, consciousness of the stimulus.

Few topics have perplexed the psychologist more than the topic of consciousness. We all experience it. We know we wake up from unconsciousness and pick up a conscious stream of thought, but what consciousness really is is a mystery — at least to the present writers. We know that thoughts bob in and out of our minds in orderly fashion when we are at work and attentive, in a random manner when we are relaxed and allowing the stream of consciousness to take its own course. We all experience our search for an idea, word, or name which will not quite appear. We see, for instance, a fellow's face, know his address, his general reputation, remember a picnic at his summer home at which there was much conversation about the ultimate nature of consciousness, and remember a ride across a lake. But what was his pesky name? Not Smith — not —. Then it comes — Will French of Columbia. We are conscious of, or have in our consciousness, the name, *French*, which a moment ago was missing. His name will be out of consciousness again in a few moments when we go on to write about another aspect of personality.

We should not feel that consciousness is always either wholly present or wholly absent. In reality, there are degrees of consciousness. During the moments just preceding sound slumber, our consciousness gradually fades — we become less and less aware of our environment. Likewise, during times of fatigue or exhaustion, we may be less conscious, less aware of environment than when fully awake and alert. (More will be said about these degrees of consciousness when we discuss attention in Chapter IX.)

(2) *A personality continually adjusts to its environment.* All activity is an adjustment, or a reaction, to one's environment and one's own inner life. The gambler, cutthroat, thief, outlaw, gangster — the statesman, priest, preacher, doctor, lawyer — the actions of

each are a series of adjustments to his own particular personality, background, and environment. Anderson brings this out clearly when he says that every one's behavior is logical to himself.[6] Our behavior is that which seems to us to be most likely to bring us to those goals which we have set up (or which have been set up for us) as the desirable ends of human life. Sometimes our goals change their importance, as at the time of marriage; and when this occurs new adjustments in behavior must be made. The behavior of an unmarried person, making his or her own living, is relatively unaffected by the needs of others. He forms a pattern of behavior directed toward individualistic goals. His behavior is an adjustment to a life lived alone. At marriage this pattern will almost certainly conflict with the needs of the partnership, and for a successful marriage a new adjustment will be necessary. Such previously unimportant or nonexistent questions as when, where, and how meals are to be served and eaten; which moving pictures to attend (if any); whether to spend a vacation on a fishing trip, or at a resort, or at home in order to save up for the expenses which attend a normal, happy, and healthy expansion of married life — adjustments to such problems as these become vital. The mechanism of adjustment is provided to release us from strain and tension. Our actions when we are perfectly adjusted are smooth, easy, satisfying, and successful. The moment this perfect balance is upset, we begin our striving to bring it back. With intelligence and awareness helping us to interpret the success or failure of our attempts, and with a knowledge that there is a tomorrow, we organize our efforts and try to anticipate what will satisfy us. These anticipations of what we want we call our *goals*, and to these goals our whole activity of adjustment is closely tied.

(3) *A personality strives for specific goals.* The existence of goals in human life is the third great characteristic of personality. When we work hard to master a lesson, when we save our money for a week-end outing, or when we try to win an election in order to humble a rival, we are striving for a goal. Human behavior is clarified by an understanding of these purposes, or goals, by which we direct our action. The most significant explanation of your being a student is the end you have in view. If you hope to become an engineer, you take courses at a college or university because this is the kind of behavior that leads to that end. When-

ever events reveal a series of means and ends, this idea of a goal helps very much to secure a correct interpretation.

Some of man's goals are intimately bound up with his physiological constitution and needs; we can see that there is a goal in his desire for food and shelter, for protection against cold and heat, for rest, exercise, sleep, and sexual activity. Other goals are not bound up with physiological states. Man shows, for example, a tendency to protect his offspring and the helpless in general; a desire to understand; a love of truth; and a desire to achieve fame, to do his duty, and to create and possess beautiful things.

The strivings of man are rooted in his inherited nature. They spring from inherited drives which are called *instincts* or *propensities*. Human behavior is so modified, however, by acquired standards of conduct and by experience that it does not afford as clear manifestations of innate drives as does the behavior of some of the lower forms of animal life. For example, the propensity of all living things to reproduce their kind is, in man, overlaid with acquired characteristics, such as romantic love, idealization of parenthood (especially of motherhood), and considerations of social advantage. Human behavior is so affected in this fashion by society, so "institutionalized," that it cannot be understood apart from human institutions, with reference merely to fundamental propensities. In sharp contrast to this is the behavior of animals. In the male seal, for example, the sex drive functions to the exclusion of all other drives. Several weeks before the mating season, a male seal will swim ashore and establish his right of possession over a narrow water front. To keep other male seals from sharing his frontage, he will fight to the death; nor will he leave his place, even for food. When the females arrive, the males battle for their possession. This continues for approximately three months. During this period the males neither eat nor drink. When they return to the water after three or four months of fighting over the females and of abstinence from food and water, they "return as so many bony shadows of what they were only a few months anteriorly; covered with wounds, abject and spiritless, they laboriously crawl back to the sea." [7] The behavior of the male seal is so completely dominated by the sex propensity that hunger, thirst, and safety are ignored.

Because a great deal, if not all, of human behavior is directed, consciously or unconsciously, toward attaining definite goals that

are desirable to men, we may say that man's behavior is influenced by *motives*, or tendencies to seek goals. The word *motive*, having the same root as *motor*, is likely to be interpreted as meaning some special source of driving power that turns the wheels of the rest of the personality. Actually, however, a motive is only a way of acting, a way that has developed from hereditary inclination or from experience or from both. When we say that a man is motivated by the desire for praise, we mean that he has developed modes of behavior which bring him praise and that he utilizes these modes of behavior whenever possible. The statement that he is motivated by the desire for praise raises, of course, further questions, which are answered only when we know *why* this person seems to need more than an average amount of praise. It may be that he has a feeling of uncertainty about his behavior or work and that praise is needed to convince him that it is worth while.

Many classifications have been made of motives, or ways of acting. When the discussion centers around behavior that is inherited and common to all, or nearly all, members of a species, the behavior is commonly called instinctive. *Instinct* is merely a word for behavior that is universal and that does not need to be learned. It is a useful descriptive term, but it is not one that explains anything. To say that behavior is instinctive is no more than to say that it is not learned. Observation and experiment show that any organism will fight for its life, but it contributes nothing to this observation to add that the *instinct* of self-preservation causes the organism to fight.

Obviously, the modes of behavior of man vary greatly, both from generation to generation, and in different localities. Perrin regards the various forms of man's striving for superiority, recognition, and power as the socialized aspects of the biological struggle.[8] With changes in the form of society and social organization, there are corresponding changes in the action or behavior which obtains favorable recognition.

A number of experimental studies in motivation have been made. These studies show that if we manipulate the conditions that bear upon a person's general outlook or upon his energy, we are able to change the speed with which he progresses toward his goal. We can effect an improvement in outlook or an increase in energy, which in turn will stimulate accomplishment. Typical

of such studies is one by Sims which shows that an individual reward or bonus is usually more effective than a group reward.[9]

In attempting to understand the motives of any person or to gain real insight into why he thinks and acts as he does, the following four principles should be kept constantly in mind:

(a) Man is always wanting something and doing something about his wants. His wants are his goals. The chief trait of a human being is *wanting*, and he exercises his amazing energy chiefly in the service of his wants.

(b) Man's wants are curiously disguised by social influences, but at bottom they are familiar, age-old drives. Intellectual curiosity is but one, and seldom the strongest.

(c) Man's goals are simple, clear, and orderly only in books; in life they are confused and in conflict. When men are inconsistent in their behavior, it is because they are aiming at irreconcilable goals.

(d) Man is often quite unaware of what his wants or goals really are. What am I really trying to do? is a question too searching for many even to ask, much less to answer honestly. But *all* behavior is an attempt to reach some goal; every gesture or lapse of attention means *something*. To understand a man, keep always in the forefront of your mind: What are the real goals of this man? How aware of his goals is he himself?

(4) *A personality functions as a whole.* Even simple forms of activity are affected by the whole organism; the parts of an organism never act in isolation. This has been shown by Haldane in his account of breathing.[10] The rate of breathing is governed by numerous conditions — not only by the external conditions of atmospheric pressure and the amount of carbon dioxide in the atmosphere and in the air sacs of the lungs, but also by internal conditions: the alkalinity of the blood as affected by the exertion of the organism, the activity of a small area in the lower part of the brain, and the activity of the kidneys and liver. We say inaccurately that when the organism needs more oxygen, the rate of breathing increases because of the activity taking place in these various parts. But the really significant thing is that the increased rate of breathing and the complete cycle of activities that directly produce it *all* take place because of the needs of the organism as a whole. We can understand all that takes place by the need of the organism for oxygen, and we cannot really understand the

activity of any single part except in this connection. The parts of an organism are in the employ of the whole organism.

In its mental activity the unity of a personality is even more complex. Babies and children give themselves up to impulse and to the mood of the moment. They are frequently ready to follow the suggestions of others. As they develop, however, impulse and fancy are restrained and behavior becomes integrated into a unified personality. This unity is more characteristic of some than of others, and even persons who have achieved a high degree of unity may, under long and severe strain and disappointment, suffer a breakdown. The breakdown of a personality is indicated by such symptoms as loss of memory, impulsive ideas, exaggerated fears and anxieties, and delusions of grandeur. At times even the consciousness or awareness of the environment may also be lost. Such conditions, however, are abnormal. They are found only in the mentally sick — those who have suffered a disintegration of the several aspects of their personalities. The normal action of the person as a whole gives strong evidence that everything matters, that everything has some importance. Careful study of an author's experiences and history would probably reveal why he used the name *Nancy Jones* rather than *Dolores Wingate* for one of his characters, though he himself might be quite unaware of the factors influencing his decision. To the reading of the present page you bring not only your eyes and that part of your nervous system directly involved, but also your supper of an hour ago or (if you had no supper) an empty stomach. A telephone ringing or not ringing, the pressure of a shoe that is too tight — such things as these have their effect on what you are at the present moment and on what you are doing. For the moment you may be chiefly a psychologist, but nevertheless, a psychologist acting as a whole person. Tomorrow as you enter your class, you will bring not only your written home work and memory traces of this page, but you will also bring your shoulder muscles, your intestines, and the effects of too many or too few spankings in earlier years. No one can hope to understand the behavior of another (or himself) without a far more detailed knowledge of the individual's developmental history than it is usually possible to obtain without painstaking and careful reconstruction of his past.

These four characteristics of a personality — consciousness, adjustment, goal-seeking, and functioning as a whole — will be

found helpful at nearly every turn in our efforts to understand human behavior. It should be recognized, however, that neither these nor any other characteristics of a personality can contribute very much to our understanding of human behavior unless we study them, first, as they are exemplified in our own behavior, and second, as they are manifested in the behavior of our associates. In fact, without making them your own by deliberate and continued study, your chances of gaining insight into human behavior (beyond a confused, skin-deep, common-sense acquaintance) will be few indeed. Such a study should be profitable not only from the standpoint of understanding human behavior, but also from the standpoint of a personal interest in psychology.

BEHAVIOR AN ADJUSTMENT

The importance of adjustment as a characteristic of personality has already been mentioned. The adjustments which we make vary from relatively simple physiological responses to extremely complex activities embracing a large and complicated psychological whole. To remain alive we must draw from our environment sufficient food, water, and oxygen, and maintain a reasonably constant temperature. Deprived of any of these things, we die. The efforts of man to insure for himself a plentiful supply of food and water, and of clothing and shelter as means of keeping a constant body temperature have given rise to complicated economic systems.

Air is so abundant that it has no economic value, and yet the physiological adjustments a person makes to meet the need for oxygen are worthy of notice. Under ordinary circumstances, our breathing is regular and easy. But in a room where the amount of carbon dioxide is great, we unconsciously breathe more rapidly because more air must be taken in for the same amount of oxygen. The same is true when the air is rarefied, as on a high mountain. The rate of breathing is, then, a variable of the amount of available oxygen in a given volume of air. We also breathe faster when we are strenuously exerting ourselves. Exertion requires more energy; and conversion of latent energy into available forms is a process of oxidation, for which we require an adequate supply of oxygen. When oxygen itself is scarce, therefore, or when the organism needs extra oxygen for a

special purpose, breathing is faster. In other words, the organism, by breathing more rapidly, adjusts itself to the changed circumstances.

Physiological adjustments of this kind are of interest to us because they show that even such simple behavior of an organism as rapid breathing is an outgrowth of the whole situation in which the behavior occurs. Given organic needs on the one hand and an ever-changing environment on the other, we see the organism always struggling to adjust its needs to the fluctuations outside itself. Thus the muscles will shiver to keep up body temperature. But there is another kind of adjustment besides the physiological. A person will quite unconsciously become involved in psychological shivering to keep up social temperature, even to the point of buying what he does not need and can ill afford. For the human being is an organism that adjusts to a threat of losing face about as surely as to a threat of losing body heat. Some adjustments are good — they *pay* as long-term "habit investments"; some are bad — they do not pay; many are between these two extremes. An adjustment good at one age or in one psychological whole is not good at another age or in another psychological whole. It is well to be able to report: "When I was a child, I spake as a child. . . . When I became a man, I put away childish things."

An individual does not wait, however, until he is of age to begin making adjustments. The infant that is hungry cries. Food is brought; he eats, and shortly afterwards falls asleep. He has made an adjustment. The infant cries when he is frightened. His mother picks him up, and in her arms he is reassured and soon falls asleep again. Another adjustment has been made. The happy ending of a struggle to adjust is the relief in the organism of stresses and strains — the bringing, as it were, of the organism into peace with itself and its environment.

As a person matures, he becomes less dependent on others in making adjustments. The lonely child craves companions and would be delighted to have playmates. But if these are denied, he creates for himself imaginary companions and plays contentedly with them. A boy may wish to have a bicycle, which his parents do not have the money to buy, and he adjusts the conflict by earning and saving money until he is able to buy one himself. If a man's wife complains that he is so absorbed in his

work that he does not give enough time and attention to his home, he agrees to rearrange his habits.

The adjustments of politicians, though more complex, are of the same order. Different constituents make different demands. The interest of one section of the country conflicts with the interest of another. To plot a course that does justice to the conflicting demands and the conflicting interests is an adjustment of an extremely high order. It is complicated by the private need of doing also those things which will lead to reëlection, since personal defeat is a maladjustment few human beings are tough enough to contemplate. Much of the confused and exhausting action of public officers is due to the fact that they have to adjust to too many opposing factors. A politician must keep his ear to the ground and his feet on the ground at the same time. Try the adjustment and see what it looks like.

Frequently problems are not met wisely, and the individual fails to make a satisfactory adjustment. For example, a schoolboy may find himself unable to do the work required of him. Having failed, he may seek an outlet for the resulting tension by becoming a bully on the playground and by causing disturbance in the schoolroom; or, after long-continued failure, he may become permanently indifferent and apathetic. These are unsatisfactory adjustments. Adjustments range all the way from entirely satisfactory to entirely unsatisfactory. A common adjustment that is half-way between is the effort many people make to hide from themselves some defect, real or fancied, by swinging to the opposite extreme. This type of behavior is called *compensation.* One woman who had been very selfish, on realizing the meanness of her behavior, turned to the extreme of giving up almost everything for the pleasure of others. Many a person who believes he is too easily influenced by others fights against his weakness by developing a generally antagonistic attitude. A man in fear of his inclination to cowardice may become rash; or to fight his fear of inferiority, he may assume an air of overconfidence. These are all instances of compensation.

Such responses are in some respects desirable. If a person is weak, the question is What shall he do about it? Should an individual who is cowardly merely say, "I know I am a coward," and let it go at that; or should he put up a fight against his cowardice? Should a man of strong sensuous nature give himself

up to his appetites, or should he seek to control them? Long ago Aristotle advised those inclined to be rash to err on the side of prudence, and those inclined to be cowardly to aim to be rash. What Aristotle advised we all do automatically when the fight against weaknesses leads us to overcompensation. On the other hand, it is better to acknowledge our weaknesses and to fight them openly than to try to blind ourselves to them. The former course, producing no internal strain and creating no false attitudes, makes for poise and simplicity of character; the latter, involving self-deception and internal tension, consumes, in merely hiding a disagreeable fact, energy that might be used to accomplish something in the external world.

MALADJUSTMENTS

As long as a process runs smoothly we pay very little attention; but when something happens to upset it, we are compelled to observe more carefully, and, as a result, we are likely to learn more about it. This is strikingly true of our adjustments. When they are made smoothly, their mechanism is not revealed; but when we fail in various ways to attain our goals, our behavior lends itself more easily to analysis. Partly for this reason we shall describe a number of maladjustments, and our account should have some guidance value since it deals with some of the more common pitfalls into which we may stumble.

For an adjustment to be intelligent and satisfactory, it must relieve the organism of tension without involving it in another maladjustment of equal or greater severity. Note that here there are two requirements: first, it must remove immediate tension, and second, it must not make more difficult the future attainment of fundamental needs and purposes. That some sense of satisfaction, relief, or attainment must accompany adjustment is implied by the very meaning of the word. If adjustment, which is a goal-seeking activity, takes place, pleasure accompanies our success in attaining our goal. If we remain dissatisfied, no adjustment has been made. Pleasure alone, however, does not insure a *satisfactory* adjustment. If pleasure were the only criterion, drunkards and mental patients with grandiose delusions would be regarded as making satisfactory adjustments. For an adjustment to be satisfactory, it must not make more difficult the attain-

ing of fundamental human ends, such as development, race preservation, and social approval. *Adjustments must be evaluated in view of one's whole life as well as in view of momentary release from tension.* The crucial question to ask of an adjustment is: Does it pay, all things considered, as a permanent long-term habit investment?

Conversely, when a person acts in a way that makes more difficult the attaining of his fundamental ends, he makes a maladjustment. Maladjustments may accordingly be divided roughly into two classes, those that fail to provide satisfaction, and those that provide satisfaction at the cost of future good. The first class we shall call *futile adjustments.* The phrase *blind alley* aptly describes them. The second class are "spendthrift" adjustments, too costly to be satisfactory. Since they generally stunt or thwart development, we may call them *thwarting adjustments.*

In futile adjustments, the individual seeks to resolve a state of tension and disequilibrium, but instead of doing so he performs useless acts, which perhaps get him into more trouble. Like a person in quicksands, he sinks deeper with each effort to extricate himself. Thwarting adjustments, on the other hand, may resolve the original tension; instead, however, of making for the full realization of one's potentialities by providing this relief, they only make such development more difficult. They afford a certain satisfaction, but the satisfaction is gained at the cost of social usefulness and of the great objectives that give worth and significance to life.

SOME FUTILE ADJUSTMENTS

(1) *Bragging.* Bragging is an effort to gain the favorable regard of one's fellows — perhaps by hiding some defect or by bidding for leadership. The psychologist understands the forces that produce the braggart, but the chances are excellent that the poor fellow himself understands neither his compulsion to brag nor the relative futility of such action. Instead of attaining its objective, bragging is more likely to be taken as a defect in the personality of the braggart, who not only fails to win admiration, but is probably humiliated and ridiculed into the bargain. Even if he should succeed in gaining favorable notice, the ultimate effect would be bad; for, instead of being incited to real accomplishment, he would be encouraged to substitute

permanently appearances for accomplishment and thus to deceive not only others but himself as well.

Fortunately, as people mature, the tendency to brag is curbed by expansion of interests and by social pressure. The mature person identifies himself with various groups; and because of his interest and pride in the success of any group, he finds satisfaction similar to that of individual accomplishment. Group pressure tends to bring about the same result. The group does not countenance bragging about oneself, but it delights in the person who brags of the group. Bragging is further checked by a man's positive accomplishments, for the person who has proved his worth to himself and to others is not impelled to conspicuous boasting.

(2) *Teasing and cruelty.* Teasing is frequently an effort to gain attention. Nothing is so unendurable as being ignored. The child who cannot get attention otherwise is sure of it if he mistreats or teases another. The child whose feelings of worth are lowered by failure or lack of appreciation in the classroom may, on the playground, seek to regain his feeling of worth by bullying. Similarly, the child neglected in the nursery may seek to gain his mother's attention by hurting his younger brother or sister. In such cases, the kind of attention received in return is not the kind sought, but at least the satisfaction is gained of being an object of some kind of attention and of showing power by arousing others to action.

The desire for mastery and power is one of our most powerful interests, and the possession of it is valuable to the adult. We should, therefore, not be too severe in our censure of teasing. It is better for a child to attempt in this way to keep up his spirit and confidence than to accept defeat and cease to struggle. Since, however, we are compelled to stand up for the child that is being mistreated, the aggressor frequently feels that his victim and the adult are in league against him. This tends to produce resentment and new acts of cruelty or teasing. Thus the child continues to cut himself off from the favorable notice and the companionship he craves. In such cases the child should be helped to find constructive ways of gaining attention. When this is done, the motive back of the teasing and cruelty finds an outlet in acts that gain not merely attention, but favorable attention. Teasing and bullying in their many forms are, to the

psychologist, symptoms of deeper trouble, as sore throats and ear aches are symptoms to the physician.

(3) *Timidity and bashfulness.* Sometimes the desire for favorable attention produces behavior the opposite of that we have described. Just as fear may either incite to energetic action or paralyze action completely, so the desire for attention may cause a person to become unduly aggressive or unduly retiring. The excessively bashful person is apt to be egocentric (that is, concerned chiefly with self) and to have a great desire for favorable attention. Less concern over the opinion of others and more genuine interest in what he is doing would cause him to lose some of his self-consciousness and help him to act without the tormenting anxiety that others may not admire what he is doing. Excessive desire to win approval diminishes efficiency in much the same way that fear of falling makes it difficult to walk a plank fifty feet in the air which we could easily walk on the ground.

Bashfulness, perhaps more than any of the maladjustments we have so far considered, indicates a serious personality defect. The person suffering from it needs outside help. He needs to take part in social situations that merge the individual with the group. Games, which mix people rapidly, costume parties, which create a festive and carefree atmosphere, special training in graceful movement, and public appearances in which action rather than speech predominates are all helpful. Adults can help bashful children by paying less attention to them and by treating their actions and work in an objective manner. The bashful child does not need to be the center of attention. He must rather be helped to cease regarding himself as the center of things.

(4) *Pouting and temper tantrums.* Children and the emotionally immature frequently pout or fly into a rage when denied what they desire. Both methods are poor adjustments. Pouting is completely ineffective; tension cannot be resolved by withdrawing from the field of action, by thinking harshly of others, or by dreaming of revenge. Such behavior is bad enough in a child; it is inexcusable in adults. It should, therefore, be nipped in the bud. Temper tantrums are habits that thrive on the success they achieve. If the child gains nothing — not even attention — by a tantrum, he will soon learn to contain himself. On the first display of rage the parent should pay no attention at all to the child. If guests happen to be present, this is difficult, but it is

by far the best means of meeting the situation. If attention is *lost*, rather than gained, by a tantrum, the child will quickly eliminate this response from his repertoire of adjustments. Adults who have tantrums (and unfortunately there are still too many of them) are simply persons whose parents did not recognize this simple principle. In most of us there is still potent a large fraction of our childhood. In a sense, our maturity has not taken the place of our childhood but has been placed on top of it, and childish anger will break through the upper crust under sufficient provocation in the absence of restraining factors.

(5) *Jealousy.* All people desire companionship, love, and favorable attention. Many, however, become jealous when they see others receiving attention which they think they should have themselves. Jealousy should be fought as a dreaded disease is fought. Like some other diseases (dis-eases) it is often completely hidden, and it lurks behind behavior which is apparently innocent. Man is often astonishingly cunning in concealing jealousy.

We may mention three major criticisms of jealousy as an adjustment. In the first place, jealousy lowers one's self-esteem. A person may brag of his anger, he may laugh at his fears, but jealousy affects too disastrously his self-esteem for him to brag or laugh over it.

In the second place, jealousy makes one unacceptable socially. A jealous person is apt to be disliked. Deprived of normal social contacts he develops the conviction that he is persecuted. When that happens, he tends to become still more antisocial and to seek to injure those whom he considers his enemies. Hiding his jealousy as best he can, he is usually so irrational that he finally explodes and injures some innocent person. All the time he becomes more and more pugnacious and self-centered, more and more unlikable.

Finally, jealousy makes impossible the enjoyment of companionship between those who should be closest to one another. We are not jealous of strangers; we are jealous only of intimates and people we know well. Perhaps we have here the explanation of the saying: "A prophet is not without honor save in his own country." Jealousy arises between members of the same family or between citizens of the same community. Jealousy within a family may wreck the lives, not only of the jealous ones, but of those who come within the orbit of their influence. (Such a

situation is vividly described by Sarah Warder MacConnell in *Rivalry.*[11]) In spite of its injurious effects, some parents seem to take delight in provoking a child to jealousy by lavishing attention on another child or on each other in the child's presence. These are emotionally immature adults who, like children, want to be a cause of something, if only of maiming a child's disposition or of inflicting needless pain. It is within the family that jealousy can do its worst work.

(6) *Lying.* An individual may lie in order to gain the regard of others. He may misstate what he has done, or make promises that he cannot fulfill, or give false reports of others.

Delinquents avoid punishment by lying about what they have or have not done. Unfortunately, when the lie is not discovered, a satisfactory adjustment is the temporary result. But just to the extent that lying is *not* discovered, and hence becomes a fixed pattern of adjustment, the future is being built on a precarious basis. Any adjustment is poor which, to be successful, must be kept unknown to others; sooner or later the liar will be found out and the whole structure of his adjustments will be undermined. Whatever one's moral views are, there is much truth in the saying that "Honesty is the best policy." But furthermore, lying, involving as it does the violation of one's moral ideals, results in a feeling of lowered worth, no matter how successful it may be in gaining the immediate object.

The young psychologist must free himself from the childhood notion that lying is solely a matter of *saying* something that is not so. Lying uses many other instruments besides words. Lying is a special form of the more general device of deception. In the affairs of life many forms of deception are in good standing. The basis of much excellent football offense is good honest deception. For a doctor to tell the truth is under some circumstances to inflict needless pain. And not every guest need tell the truth to his week-end host. But lying and other forms of deception for most of us are usually sure signs of weakness. The world clearly tells us that if we lie, we must also take the risk of punishment. Forgery of checks is only one form of lying; many other forms can turn a free citizen into a hunted man.

(7) *Stealing.* Stealing may be employed as a method of gaining the esteem of one's fellows. For example, a certain schoolboy who craved more popularity stole five dollars from his mother's purse

in order to treat his playmates. The theft was detected, and the boy, instead of gaining the esteem and friendship he hoped for, was looked down on as a thief. If the theft had not been detected, he would have held his new high pitch of popularity only while his money lasted. He would probably have felt it necessary to steal again. Thus, he would have again purchased satisfaction at the cost of feeling disloyal to his mother and of violating his moral sense, and thereby he would have generated a feeling of lowered self-esteem.

SOME ADJUSTMENTS WHICH THWART DEVELOPMENT

Because the maladjustments so far considered do not relieve tensions or result in satisfactory adjustments on a long-time basis, we have called them futile adjustments. The maladjustments we are about to consider may succeed in relieving the particular tension, but they do so at the cost of development and future satisfaction. We have, therefore, called them *thwarting adjustments*. They are evidence of weakness or even stupidity.

(1) *Capitalizing a defect.* Some people use their defects to gain sympathy and to escape the ordinary responsibilities of life. A person may avoid many disagreeable tasks and establish himself as a tyrant in a household by persistently pleading a headache. A crippled boy may cherish his weakness as a means of escaping competition with other boys in rough sports. In contrast to such weaklings are individuals who, in spite of handicaps, succeed by hard work in making themselves valuable and respected members of society. Demosthenes is said to have struggled for years to overcome a speech defect. Helen Keller, though deaf and blind, has enriched her mind far beyond the average person who suffers no handicap. In spite of blindness men have become members of the United States Senate. Crippled boys have been known to take an active part in athletics; men without arms have become good marksmen or have learned to write with their feet or mouths.

Why some people use their handicaps to escape an active life (some even create imaginary difficulties for the same purpose) while others rise above them must be explained in terms of the psychological whole. Perhaps heredity endows some with greater self-reliance than others. Of undoubted importance is environ-

ment. If a handicapped child is permitted to gain satisfaction by using his handicap as an excuse, we need not be surprised that he develops the art. On the other hand, if the child is stimulated to live up to the full measure of his capacity, he experiences the satisfaction of positive achievement and learns to overcome obstacles. The experience of success is especially important for handicapped children, for out of such experience confidence and the will to succeed are born and nourished. Since handicaps are not always insuperable, confidence and determination may win the day. Demosthenes, a stutterer, became a famous orator. Glen Cunningham, whose legs were so badly burned when he was a child that it was thought he would be a cripple for life, became the master miler of his day. After all, one *can* compensate for handicaps; and on the other hand, too great dependence on his strength often actually creates weak spots for a man. Life is a fight to be met with courage; and if he is not abnormally stupid or cowardly, no one who reads this book need be very sorry for himself in the competition in which he continually has to engage with his fellows.

(2) *Rationalization, or excuse-making.* When a person makes a mistake or acts in a manner of which he is ashamed, he may look facts in the face, try to understand his failure, and resolve to do better in the future. On the other hand, an individual who has made a mistake, instead of looking at his conduct squarely in order to improve it, may attempt to convince himself that he acted rightly. He searches for reasons to justify his conduct. Since he is at once the lawyer, judge, and jury and is exceedingly anxious to save his pride, he readily succeeds in his search. Having justified himself for acting as he did, he is, of course, encouraged to make similar mistakes in the future. Deception is always bad; self-deception stunts one's growth and development.

It has become common to accuse others of rationalizing, or "finding reasons," when they do not agree with us. No doubt much that formerly passed for logical thinking or reasoning is rationalizing. Yet we should hesitate a long while before accusing an antagonist of rationalization, for so to accuse him puts an insurmountable obstacle in the path of social thinking. For example, if two men discuss our economic order and one says, "You feel as you do because you are wealthy," and the other retorts, "You condemn this order because you are poor," all

possibility of critically examining the merits of the case is at once destroyed. A series of personal remarks shedding no light on the economic situation and of doubtful value as psychological analyses would be the only result. Every one's thought is much affected by rationalization but no one enjoys having this fact pointed out. In fact, it is difficult even for one determined to be honest with himself to decide just how much his wishes and blind spots affect his reasoning. It is far easier to detect rationalization in another's words than in one's own thinking. After listening to your roommate explain the long and involved reasons why he "ought" to carry out his plan, it is easy enough to say, "Now that I have listened politely to your rationalization, tell me the *real* reasons." It is more difficult and more important to insist upon knowing the *real* reasons for one's own decisions and actions.

In abnormal psychology there is frequent use for the concept of rationalization, but even there it is profitless to accuse a person of rationalizing. Although a psychiatrist may be sure that everything his patient says is rationalization, yet, instead of attending to the arguments as such, he more wisely examines them as symptoms, to gain understanding of the patient's underlying disorder. When that is discovered, he is in a position to help the patient make a more satisfactory adjustment. For example, if he finds a man in the depths of despair, accusing himself of many sins and expressing fear of eternal damnation, and upon investigation discovers that the sufferer has been a good citizen and father, he knows that the patient is merely trying to find reasons for his state of depression. The psychiatrist needs to learn the real cause of the depression if he is to help the patient take a brighter attitude. It would be futile to show the sufferer that his statements are wrong. That would only cause him to make other statements equally wrong. The depression must be attacked at its roots. If it can be uprooted, the rationalizing will take care of itself.[12]

(3) *Apathy and self-absorption.* When a person has suffered defeat after defeat, he may cease trying and lose interest in his undertakings. This happens to the schoolboy who is unable to master his subjects. If a person's failures are spread in many fields, or if he feels that they are, he may develop a permanent attitude of indifference. In the end, failure in his work or profession, failure to make friends, failure in love, failure to attain physical vigor will lose their power to disturb, because he has

become indifferent to everything. Such states of apathy are frequently accompanied by persistent daydreaming. In his dreams a man gains satisfaction otherwise denied. This method of relieving tension reaches a pathological extreme in schizophrenia, one of the most common of mental disorders. Overdosing oneself with daydreams, as a substitute for satisfaction and zest in real life, leads to a personality debility which renders one progressively unable to extract from the world enough interest to make the game worth the candle. Daydreams may be used sparingly when the edges of reality are too sharp; but, at best, they should be analagous to the frosting on a cake after a well-balanced meal of the roast beef, potatoes, and vegetables. It is better to play ball on the sand lot than to dream away the afternoon fancying oneself a hero of the World Series. It is better actually to own and run a "collegiate flivver" than to dream of foreign travel in a Rolls Royce with chauffeur and footman.

So acceptable are daydreams as a psychological aspirin that they have been highly commercialized. Many moving pictures, magazines, and novels are but daydreams offered for those who are too lazy to create their own flights of fancy. It is easy to identify oneself with either the hero or the heroine and, for a time, literally lose oneself in fantasy.

Teachers and future teachers of literature may use the foregoing paragraph as a caution, lest their teaching actually harm students who are too quiet and submissive. The student who is earning a high grade by reading one "good novel" after another may be learning to feed on fantasy under the plausible rationalization that he is learning to love good literature.

(4) *Expressionism.* Children are by nature creatures of impulse. Experience, insight, and discipline are needed to convert a life of impulse into one of rational control. In few of us, perhaps, is this conversion so complete that we do not at times feel urged to throw off all restraint and to live again the life of impulse. Regression to childhood has its uses, but here again moderation is recommended. Civilization itself is still in its infancy; all of us have so much of our babyhood and childhood still in us that life is full of tension. To unbend the bow on occasion is good management. In a perfect world, perfectly mature people might require no vacations from adult duties; but at present, for most of us, vacations are psychologically wise. The old job looks

good to us upon our return. Fourth of July celebrations and Christmas festivities with the children are probably even better for the parents than the children. The enormous crowds at football games show that child's play gives adults something that they need. Undue interest, however, in athletics on the part of adults, or undue absorption in young people's affairs may be symptoms of lack of development.

The fundamental defect of expressionism as an adjustment lies in the very nature of personality. Whether we will or not, the gratification of one impulse affects the gratification of others. Choices must be made. The artistry of a writer does not consist in describing everything within range. What should we think of an author who attempted to describe everything in view at a crowded beach? A person wins distinction as a descriptive writer by his choices, as well as by the handling of the selected material. Similarly in living, a person's success depends upon his choices, as well as upon his subsequent method of handling himself in the situations which he chooses for himself.

(5) *Flight into reality.* When life becomes too difficult, some people, instead of withdrawing into the world of fantasy, pursue the opposite course of losing themselves in a round of activity. Those who do this find moments of reflection unbearable. They cannot endure an hour of thinking things over or an afternoon of being alone. They must be constantly "on the go." Pleasure seekers are typically of this sort. The pathological extreme of this is manic excitement, the antithesis of the self-absorption of schizophrenia, which we mentioned above. The normal person is one whose mind is occupied with the external world, but who, at the same time, is not averse to thinking matters through in the hope of deepening his understanding of himself and of the world in general. To deviate far from the normal in either direction is unhealthy. The behavior of those who complain that their engagements at clubs, dances, and committee meetings never allow them to have a quiet evening at home often shouts to an understanding psychologist that they are really running away from something or other.

We have in the foregoing sections described briefly a number of maladjustments. Others will be mentioned from time to time in the description of various mental processes. Meanwhile, the reader will do well to add as many maladjustments to the

list as he is able, and attempt to classify them as thwarting or futile adjustments. He will find it profitable to note how frequently, in his own life, he acts in a way that either fails to resolve the tension or does so at the price of future development. Among adjustments which usually do not pay are: gossip, some forms of nervous breakdown, "sour-graping," attempting to keep up with the Joneses (which we may call the "Jones complex"), hating, seeking revenge, and bearing grudges. These warrant the careful study of the serious student of psychology. Do not expect to understand human nature unless you understand how people make adjustments to internal tension and external difficulty.

THE NERVOUS SYSTEM AND ADJUSTMENT

All our activities depend in an especially intimate manner upon the nervous system. This statement is based on the following facts:

(1) *Without sensory organs, such as eyes and ears and their nerve connections, we should have no sensations.* Many experiences in everyday life demonstrate this. We close our eyes to keep from seeing something disagreeable or to facilitate a bit of dreaming which is more satisfying at the moment than observing the outside world. To keep from smelling a disagreeable odor, we hold our nose. A dentist prepares a patient before extracting a tooth by injecting a drug which blocks the nerve, that is, deadens the neurones (nerves) which lead from the vicinity of the tooth to the higher brain centers. By thus preventing nervous impulses from going from the tooth to the brain, he deadens the pain. We have all had a hand or foot "go to sleep" and become, for a time, relatively insensitive to touch. This phenomenon is due to the pressure which temporarily blocks the nerves connecting the part of the body affected with the rest of the nervous system. If an individual were deprived of all sensation, little, if any, mental life in touch with the outside world would remain.

(2) *Drugs and illnesses which disturb the nervous system affect mental life.* The alcoholic who deadens his nervous system alters in important ways his mental processes and states of consciousness. Bizarre mental states may arise in this way. The same general effect of delirium may also be brought about by a very high fever.

(3) *Diseases, such as paresis, which involve degeneration of the nervous system bring about a general deterioration of mental life.* An individual

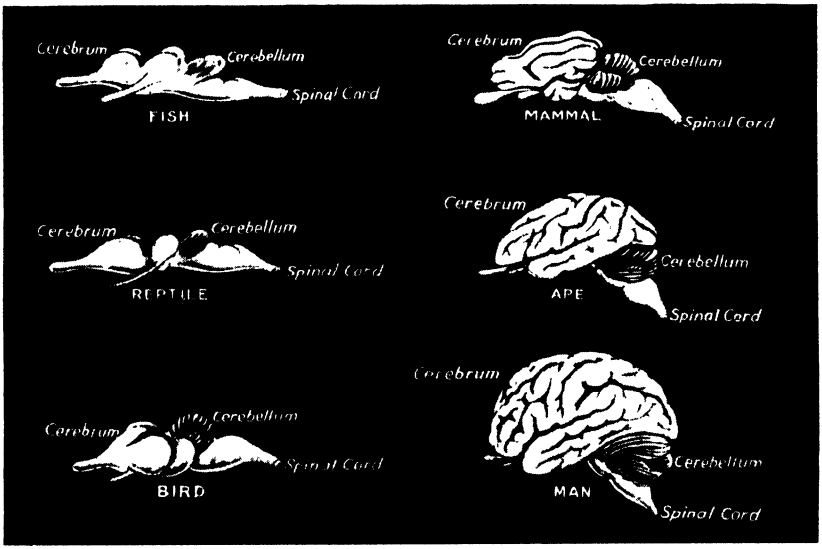


FIG. 16. RELATIVE COMPLEXITY OF BRAINS OF DIFFERENT FORMS OF LIFE

In general, the more complex the brain and nervous system, the more complex the behavior. The brain of man is far more complex than that of any other organism. (From J. A. Thomson, *Outline of Science*, Putnam's, 1922, I, 73.)

so afflicted loses the ability to make correct judgments and to manage his affairs. He may also develop false beliefs or delusions regarding his social importance, wealth, or inventive genius.

(4) *The complexity of behavior increases with that of the nervous system.* A fish has a relatively simple nervous system and its behavior is therefore relatively simple. Mammals have a much more elaborate and organized system of nerves and nervous centers, and their behavior is therefore more complicated — that is, it shows a much wider variety of responses and possibilities of adjustment to changes in its environment. Of all mammals, man has by far the most complicated nervous system and hence his behavior presents more variety of adjustment and response than that of any other form of life. The differing complexity of the brains of different forms of life indicates the variety that exists in nervous organization. Figure 16 shows such differing brain complexity.

(5) *Under normal conditions a muscle will not contract unless stimulated by a nervous impulse.* The partial paralysis experienced when a hand or foot goes to sleep indicates the importance of an open passage for the motor nervous impulse. More serious paralysis occurs when the nerves are injured or diseased, or when disease attacks the area in the brain where the nerve impulses originate for a particular part of the body. In such circumstances, there may be complete loss of the use of the corresponding part of the body.

The nervous system has four great divisions: first, the great mass of nervous matter in the head, comprised of the cerebrum, the cerebellum, and the thalamus; second, the brain stem and spinal cord; third, the numerous nerves going out from the cerebrospinal system to all parts of the body; and fourth, a great mass of nervous ganglia along the spinal cord. This great system contains billions of structural units, or cells, which are called *neurones;* but among these billions of neurones only three *functional* types exist. There are: (a) sensory neurones, or those that convey nerve impulses toward the brain or central nervous system; (b) motor neurones, or those that convey impulses from the central nervous system to the muscles or glands; and (c) association neurones, or those that connect the sensory and motor neurones.

The nervous system functions like a well-organized corporation; it has a high degree of unity, but each part performs certain specific tasks. One part of the brain takes charge primarily of visual perceptions, another of auditory perceptions, and so on. Each type of perception is carried on chiefly by a certain part of the brain. Other parts of the brain have the leading part to play in motor processes. Certain parts of the brain thus have very definite functions of their own. If, however, a part of the brain ceases to perform its function, other parts have been known to take over its duties.[13]

One part of the nervous system, the mass of nervous ganglia along the spinal cord, enjoys such a high degree of independence in the performance of its duties that it is called the *autonomic nervous system.* This system is divided into three sections (shown schematically in Figure 17): the upper or cranial, the middle or sympathetic, and the lower or sacral. It has charge of the vital processes, such as digestion, circulation, and breathing. The upper part promotes the building up of the body and the storing up

of energy; the lower controls elimination and the sex organs; the middle controls the rapid discharge of energy. The sympathetic division is therefore antagonistic to the other two parts. It is given right of way when there is an emergency, since in an emergency there is no time to store up energy. Instead, all energy must be mobilized to meet the crisis.

The independence of the autonomic system is, however, by no means complete. Like a subordinate official in a corporation, it is unmolested only as long as things run smoothly. When difficulties arise, when, for instance, a person restrains the expression of fear or anger, the organism as a whole gives it new orders.

The pathway from a sensory end organ to the point of discharge of a motor nerve is called a reflex arc. Simple nervous

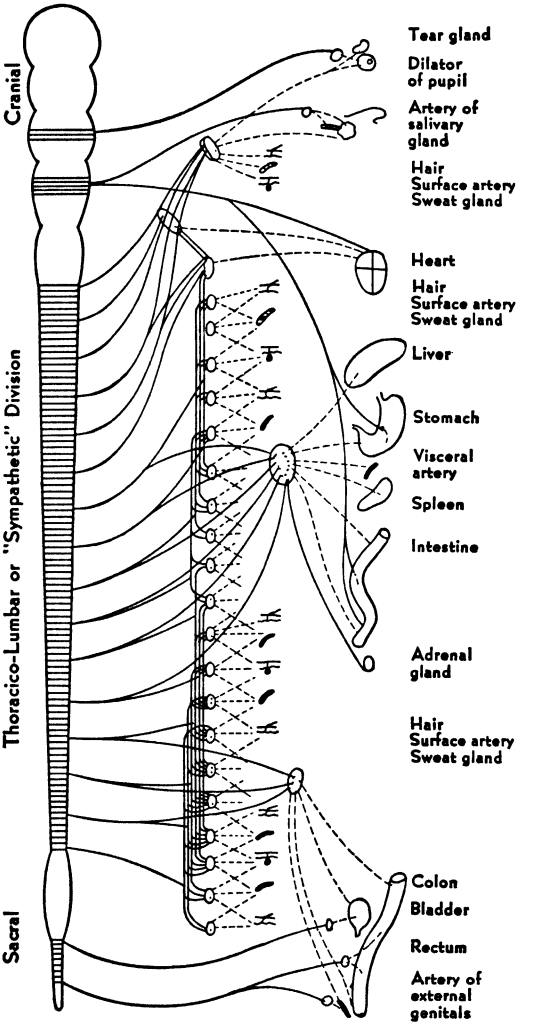


FIG. 17. GENERAL SCHEMATIC DRAWING OF THE AUTONOMIC NERVOUS SYSTEM SHOWING THE "AUTOMATIC" OR "SEMI-AUTOMATIC" BODILY FUNCTIONS WHICH IT SERVES

(From W. B. Cannon, *Bodily Changes in Pain, Hunger, Fear, and Rage*, Appleton-Century, 1929, p. 23.)

arcs, such as the one shown in Figure 18, possess a certain degree of independence.[14] Yet all reflex action, whether under the conscious control of the organism or not, is modified by the general situation. Even such an involuntary reaction as the patellar-tendon reflex,

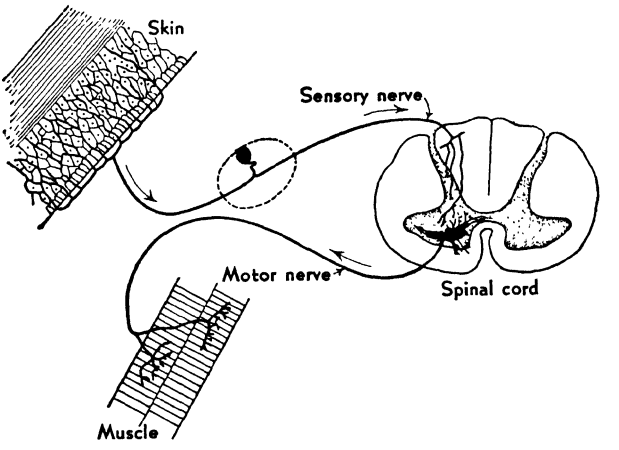


FIG. 18. THE PATHWAY OF A SIMPLE REFLEX ARC

The organ is stimulated at the skin; the impulse travels along the sensory nerve to the spinal cord, is relayed thence to the motor nerve, and travels along the motor nerve to the muscle. This whole process takes place in approximately .019 of a second.[15] (After C. J. Herrick, *Introduction to Neurology*, Saunders, 1921, p. 26; after Van Gehuchten.)

which is caused by striking the leg sharply just below the kneecap when the leg is hanging loosely, is modified by clenching the fists or by a loud noise. This is shown in Figure 19. Over many reflexes we can exercise conscious control. We reflexly withdraw our hands from a painful object, but we do not drop a hot dish; instead we find a suitable place for it. The task of sizing up the situation and directing behavior in accordance with our requirements is performed by means of the higher brain centers. The whole personality or organism through these centers supervises the action of the lower centers; but its control of reflexes is not absolute, as is made evident by such experiences as stage fright.

The rôle of the higher regions of the nervous system in directing behavior is frequently misunderstood. They should not be thought

of as directing and inhibiting the lower centers, as if they were little kings ruling the rest of the organism. We should think of the total individual as exercising control. For example, if a person touches a hot stove, his first impulse is to withdraw his

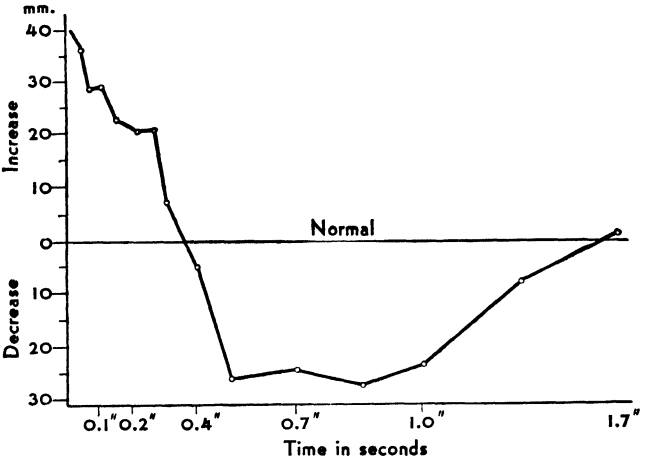


FIG. 19. A REFLEX ACTION (THE KNEE JERK) IS MODIFIED BY ACTIVITY IN ANOTHER PART OF THE BODY (CLENCHING THE FISTS)

As the time between the clenching of the fists and the blow producing the reflex is changed, the amplitude of the knee jerk varies above or below normal. (From H. P. Bowditch and J. W. Warren, "The Knee Jerk and Its Physiological Modifications," *J. Physiol.*, XI, 1890, 25–64.)

hand. He might, however, restrain this impulse if he saw a knife directly above his hand. Without the higher regions of his brain he could not respond to such meanings any more than he could see without eyes, but the behavior cannot be explained by basing it merely on changes in the higher nerve centers. The changes that occur in the brain as well as those that occur in muscles are changes in *ways of acting;* they are not the *cause of the activity.* The cause must be sought in the conditions giving rise to the act, including the objective conditions and the nature and experience of the individual. Thinking is not merely a function of the nervous tissue making up the brain, but of the whole organism.

The rôle of the nervous system is to effect coördination and integration of the activities of the various parts of the body. Man

is equipped with specialized structures. Though the amoeba digests food, it possesses no specialized structure for that activity; though it moves, it has no specific structure for locomotion; though it senses in some way the nature of its environment, it has no specialized sense organs. In man all this is different. We possess specific structures for digesting food, for locomotion, for sensing the various features of our environment, and for many other activities. For such highly specialized structures some means of coördination is necessary. The nervous system supplies this need. By virtue of it we are able to act as organic wholes rather than as assemblages of loosely connected parts. Without it, or some other connecting device, our behavior would be chaotic instead of coördinated and integrated. Without it the individual could neither respond to meanings nor coördinate his movements. In brief, the nervous system is necessary for the integration of behavior and for the higher mental activities.

The nervous system not only provides coördination and unity, but it also is so organized as to permit the individual a considerable degree of conscious control over his behavior. Response to outside stimulation involves four steps: (a) the reception of the impression; (b) the interpretation of the impression; (c) the preparation to deal with the situation; and (d) the execution.[16] That all the steps are in a measure under the control of the person as a whole may be shown by a simple analysis of a voluntary response to external stimulation. For example, a mother may be so absorbed in her work that she does not hear the laughter and chatter of the children in her yard. There is a blocking of the impression at the start. But if a child cries out in anger or pain, she takes notice at once, and no doubt makes preparation, mental and physical, to deal with the situation. The blocking of the impression is broken, the impression is received and interpreted, and plans for meeting the situation are considered. But after making preparation to respond, she may decide that it is better for the child to meet his problem unaided, and accordingly resume her work. In other words, execution of the plan may be checked. We must infer that connection is made with the brain at each of the four steps in responding to external stimulation. Otherwise, stimulation would lead invariably to overt action. As it is, the reception of a sensory stimulus may be blocked, or prevented, by interest in something else. Or if the sensory impression is received,

it may remain uninterpreted or unattended to. Finally, if it is interpreted and a suitable course of action is planned, the organism may decide at the last minute not to act. This degree of control at all stages of response to a stimulus means that there are numerous points in the nervous system where the organism as a whole can assume control.

STIMULI AND ADJUSTMENT

Anything that provokes an organism to act is called a *stimulus.* Stimuli may be conditions either within the body or without. For an explanation of a man's resentment, we should naturally look outside the individual for the conditions provoking his response. If, however, a person should show signs of agony and we could find nothing wrong in his environment, we should expect to find some condition within him, perhaps a toothache, to be the cause of his distress. Our suppositions in these cases would be sound common sense. We have learned by half-conscious experience that a burn or an aching tooth causes pain; a funny story, laughter; separation from loved ones, sorrow. Naturally then, in attempting to understand any act, we look for an appropriate exciting condition, either within or outside the body of the person performing the act.

Some psychologists have made this procedure of common sense the keystone of their view of behavior. To understand an act, they say, we must find the stimulus. The goal of psychology, as they conceive it, is to find the relations that exist between stimuli and responses, so that given a stimulus we can predict the response, and given a response we can say what the stimulus was. Knowing, for example, that a person pricked on the hand with a pin will ordinarily withdraw his hand, we could, if we should see a man's hand being pricked, foresee that he would withdraw it. Conversely, if we should see a man snatch his hand away from an object, we should infer that he was responding to a painful stimulus. This view may be represented by the following diagram:

$$S \rightarrow O \rightarrow R$$

In this diagram S stands for stimulus, O for organism, and R for response.

This formula regards the individual as acting in direct response

to a stimulus. He eats *because food stimulates him;* he becomes angry *because of an insult;* he studies *because the teacher has aroused his interest.* Those who use the formula realize that in this form it is far too simple. A person may fail to eat food that is placed before him, because he is not hungry, or because he is waiting for others to be served, or because he believes the food to be poisonous. He may fail to be made angry by an insulting remark, because of his contempt for the person offering the insult, or because of the restraining presence of others, or because he realizes that the insult is his opponent's technique of combat, calculated merely to arouse his anger and to decrease his judgment. He may fail to study in spite of the best efforts of the teacher, either because he is interested in something else or because of disturbing conditions about him. The formula, therefore, should be made to represent these changing conditions within the individual and the general circumstances of which the selected stimulus is a part. It may consequently be elaborated by the inclusion of as many modifications (M_1, M_2, etc.) of the stimulus and of the organism as are necessary to represent adequately the complexity of the stimuli playing upon the organism and the changing conditions of the organism itself. So modified, the formula may be represented as follows:

$$\begin{aligned} S &\rightarrow O \quad \rightarrow R \\ SM_1 &\rightarrow OM_1 \rightarrow R_1 \\ SM_2 &\rightarrow OM_2 \rightarrow R_2 \end{aligned}$$

THE PSYCHOLOGICAL WHOLE

Whether an activity be a simple reflex or a complicated mental response, it is always a result of both the organism and the environment — the psychological whole.

Not only are emotional states and voluntary decisions outgrowths of the situation in which they occur, but acts of perceiving, such as seeing and hearing, must also be explained in terms of the whole situation in which they occur. Under what conditions does seeing take place? A person asleep does not see at all, and a completely absent-minded one fails to see much that goes on about him. Even an alert person cannot see unless there is something to be seen. The seen object is therefore as essential to seeing as the seeing organism. In short, perceptual acts such as this are outgrowths of the psychological whole. They can occur only

when an organism equipped with the structures necessary for perceiving attends, and when there is something to be perceived.

Similarly, thinking is a product of the psychological whole. It occurs only when a person who is able to think is brought face to face with a problem. It is evident that there would be no thinking without an organism that can think. It is equally true that there would be no thinking without a problem. The general setting determines to a considerable degree the thought processes. The thoughts of a trained public speaker who is *en rapport* with his audience are not merely an outgrowth of his own interests and experience; they are determined in part by the attitudes of the audience. When he is speaking to an interested and sympathetic audience, his thought processes are different from what they are when speaking to an indifferent or a hostile one. Discussion groups also show that thinking is influenced by the whole situation. In such groups thoughts are born from the sharing of common ideals and from the exchange and conflict of ideas. Just as an object reflected in one mirror may appear long and thin, and in another short and round, so the thinking of the group is variously reflected or mirrored in the thoughts of each participant, and the reflections vary with their abilities and interests.

That behavior should be explained in terms of the whole situation giving rise to it is also indicated by the radical change which exceptional circumstances may produce in behavior. A person who has never shown unusual ability or courage may, in an emergency, become a pillar of strength and a gallant leader. More than one man has surprised not only his friends and enemies but also himself by his behavior in new or unusual circumstances. How should such changes be explained? Does the emergency tap reserves of energy within a man or is new energy created by the emergency? From either point of view, the courage and leadership are creations or outgrowths of the situation in which they arise. The importance of environment is so great that a person who becomes a leader under certain circumstances might under others show no tendencies toward leadership. The great Athenian, Themistocles, was once told by a citizen of Seriphus that his greatness was due only to his being a citizen of Athens. Themistocles replied shrewdly that had he been from Seriphus and the citizen of Seriphus from Athens, neither would have been great. It is always difficult to say how far the times create the

man, and how far, on the other hand, the man himself helps to create the times. To what extent were the problems of the day responsible for the emergence of Lincoln as a great man? And if he had not lived would they have produced another heroic character to do his work? To what degree did the ills of post-war Europe create the character of Hitler? Are there other men living who would have played his rôle if he had not? Environment, while an important part, is still only a part of the psychological whole. Although we must take account of all its many elements, both subtle and obvious, in attempting to understand a man, the center of interest is always the man himself, the product of a biological constitution and of the thousands of experiences it has undergone.

All the factors relevant to understanding an act constitute the psychological whole. Strictly speaking, the psychological whole includes *everything;* for to understand anything fully we are logically driven to relate it to everything else. To explain why you are reading a book on psychology, you must take into account your previous training and family ideals. These, in turn, cannot be understood apart from your ancestry and the cultural group to which you belong. These, again, must be related to the nature of man, which itself must be related to the nature of life and the environmental pressures which have made life on our planet what it is. Thus we reach the conception of an all-inclusive functional system. For practical purposes, however, in explaining an act or a mental state, we ignore many things and select for our attention those varying conditions which we believe to be most important in causing the particular act or state that interests us. Shrewd, or even lucky, are we if we actually hit upon the correct conditions. An apparently lazy schoolboy may be idle because his mind is on the quarrels of his parents at home, but his teacher is unusually fortunate if he has this knowledge at hand, to use in interpreting the boy's laziness.

In using the concept of the psychological whole in a practical way, the first problem of the psychologist is to select for consideration those factors which really make a difference. In this the psychologist follows the well-established practice of the older sciences, such as chemistry and physics. Physical phenomena would not be as they are but for the pull of the sun and the earth on each other, but in the study of specific problems, physicists

neglect such constants. So the psychologist need not consider invariable or remote conditions which he has learned are of little importance in dealing with the variations of behavior. Little light is thrown on our emotional states by relating them to the law of gravitation or to the cosmic storms occurring in the remote regions of space. For that matter, they are seldom illuminated by the events occurring in Asia or even in the house next door. Only a small part of the environment is important in throwing light on any act. The color of your hair, your knowledge of chemistry, and your love of family have little to do with your interpretation of the causes of the American Revolution. Your political and social ideals, your understanding of human nature, and your knowledge of history are obviously the important considerations.

The second problem in employing the concept of the psychological whole is to find all the factors which really matter. Crucial factors are often completely hidden from casual observation, hidden even from all but the most patient and skillful search. For instance, King was president of a company in which Smith aspired to be sales manager. King failed to appoint Smith in spite of general anticipation — and in spite of a dinner party given by Smith's wife. King's explanation was obvious nonsense, and in fact he did not know himself the reason for his decision. Smith had not even a clue. One would find it difficult, or actually impossible, to know when he had discovered the really pertinent factors in this situation. Perhaps King's wife had had too many good things to say of young, good-looking Smith. Perhaps the duck at Mrs. Smith's dinner had reminded King of his poor marksmanship.

VARYING COMPLEXITY OF PSYCHOLOGICAL WHOLES

Sometimes the conditions necessary for understanding an act are few and no difficulty is experienced in stating what they are. This is true when there is a close connection between condition and response. But all too often cases thus easily explained do not matter very much anyway. At other times the significant factors are so numerous, or so well hidden, the situation is so complex, that it is difficult to discover which are the most important factors and in what combination they are operating.

In our account of psychological wholes, we shall proceed from simple to complex situations.

(1) *Involuntary reflexes.* The most direct influence of stimulus on response is to be found in involuntary reflexes, definite responses to definite stimuli, made automatically by virtue of the innate organization of the nervous system. Examples are the patellar reflex, or the knee jerk, and the pupillary reflex regulating the amount of light admitted to the eye. The stimulus for the first reaction is a sharp tap just below the kneecap when the leg is hanging loosely; that for the second, a variation in the intensity of the light striking the eye. In both cases, a definite response follows a definite change in environment. Although the general condition of the organism may influence the response, the activity is relatively independent of the remainder of the organism. The psychological situation is, therefore, very simple. Given a nervous arc properly stimulated, the response regularly occurs. In such activities, the stimulus is rightly regarded as initiating the act.

(2) *Partially controlled reflexes.* In reflexes of a simple sort over which the individual as a whole can exercise a degree of conscious control, such as blinking the eyes, removing the hands from a painful object, or sneezing, the complexity of the psychological whole is somewhat greater. To be sure, when our eyes are threatened we nearly always blink them; as a rule, we remove our hands from hot objects; and we sneeze almost automatically under proper stimulation. But on occasion we inhibit these reflexes, as when we hold fast to a hot object in spite of the pain. Something more than pain or a simple reflex determines our response. Hence, the psychological whole in terms of which such acts are to be explained involves more than a stimulus setting off a simple reflex that we cannot control. Account must be taken also of the attitude and desires of the acting individual who inhibited the reflex action.

At times the external situation may dominate behavior of even a relatively complex type. A common example is stage fright. In such cases, the individual does not act in accordance with his desires or purposes, nor in accordance with the requirements of the situation. Instead, his behavior is dominated by certain features of the situation. But the nature of the individual is an important factor in these situations; for some speakers do not experience stage fright in circumstances that would be quite

disastrous to others. To understand the behavior of a person overcome by stage fright we need to consider the speaker. Perhaps he is inexperienced; perhaps he is not prepared; or perhaps he is more interested in the attitude of the audience toward himself than in their reaction to what he is saying.

(3) *Reactions consciously controlled.* The psychological whole is yet more complex when the individual is definitely master of the situation, and decides consciously how he will act. Common examples of this are deciding how we shall spend an evening, what we shall have for dinner, and how we shall "get even" with some one who has injured us. Even in emotional situations a person may remain master of the situation and keep the initiative. For example, a person who has been insulted may choose any of several courses of activity or inactivity. He may fight with his fists or in one of a dozen different ways. He may try to injure his enemy indirectly. He may merely heap coals of fire on the man's head by being unusually polite. He may inhibit overt activity altogether. He may even restrain himself from being angry at all. This last he may do because he has resolved, like the Stoics, not to let other people bother him, or because he is sorry for the offender and thinks that he knew no better. The nature of the response at such times is clearly not determined by the stimulus; the initiative belongs to the person who decides how he will meet the stimulus. Such mastery and self-control involve a complex psychological whole made up of many factors.

(4) *Exceptionally complex reactions.* Attitudes and personality traits such as courage, loyalty, and ambition involve still richer and more complex psychological wholes. To explain, for example, why a person is always on the defensive and ready to fight, may require the reconstruction of his entire past, his early home environment, his companions, his school experiences, and his physiological condition. The more that is learned of the background of a person showing unusual and puzzling behavior, the more intelligible his behavior becomes.

Only one who is lacking in psychological insight expects to understand a person in terms of present conditions. A cross section of the present situation is useful; but only when one has the additional advantage of an accurate longitudinal view, running back to childhood, does his understanding of a person become reliable. A human personality is an exceedingly com-

plicated thing. Many of us go through life with hardly a nodding acquaintance with ourselves — much less with sufficient insight into others. The factors that provide insight are many, and some important ones are so subtle that to date they have utterly eluded precise measurement. Even when you have done your best to use the concept of the psychological whole, you will often be dumbfounded by human behavior.

SUMMARY

By personality is meant the sum total of everything that constitutes a person's mental make-up. Character, a narrower term, refers to the ethical quality of behavior. Character is the steering apparatus; it includes the ideals, dispositions, even prejudices which all together swing the total person one way rather than another. As psychologists, we are interested in understanding both "good" and "bad" behavior — in fact, all behavior — and therefore we are interested in the total personality, not character alone. Personality and physique are related to each other, and any marked physical abnormality is likely to have an effect on personality.

Some of the major characteristics of a personality are: (1) consciousness, or awareness, of what is going on, (2) continual adjustment to the environment, (3) striving toward goals, and (4) functioning as a whole, not as an assemblage of isolated parts. Man's traits are not separate one from the other, like neckties neatly arranged; they are *merged* to form a whole.

Behavior is essentially and always an adjustment, whether it be breathing or rescuing a child from a fire. Adjustments are not textbook trivialities. They are being made ceaselessly in the fundamental wants and needs of *living organisms*. Man is forever wanting, and doing something about his wants. Much of our task in studying psychology will be to learn how adjustments must change from time to time, how best to make these changes, how to avoid maladjustments. Some futile adjustments are: (1) bragging, (2) teasing and cruelty, (3) timidity and bashfulness, (4) pouting and temper tantrums, (5) jealousy, (6) lying, and (7) stealing. Some adjustments which thwart development are: (1) capitalizing a defect, (2) rationalizing, (3) self-absorption and daydreaming, (4) expressionism, and (5) flight into reality.

The importance of the nervous system in behavior is attested by the facts that (1) without sensory organs we should be unaware of our environment; that (2) drugs and illnesses which disturb the nervous system also affect mental life; that (3) diseases which destroy the nervous system cause deterioration of mental life; that (4) those organisms in the biological series which have the most complex nervous systems also have the most complex behavior; and that (5) under normal conditions muscles do not react at all unless stimulated by a nervous impulse. The nervous system is divided into four major parts: (1) nervous matter in the head (cerebrum, cerebellum, and thalamus), (2) brain stem and spinal cord, (3) nerves connecting cerebro-spinal system with other organs, and (4) the autonomic system, which controls vital processes, such as circulation and breathing. Neurones are of three functional types: (1) sensory neurones, (2) motor neurones, and (3) association neurones. The nervous system functions as a whole, though each part under normal conditions controls certain specific functions. The nervous system gives us the means of making adjustments and reaching specific goals. One's behavior can be explained only by relating it to his total personality. It cannot be explained by relating it to the nervous system, except in so far as that, apart from a nervous system, no behavior is possible.

Response to external stimuli involves four steps: (1) reception, (2) interpretation, (3) preparation, and (4) execution. Behavior cannot be regarded as a series of simple, invariable responses resulting from specific stimuli. Behavior can be understood only through a detailed knowledge of the psychological whole. The psychological whole is simplest in involuntary reflexes; it becomes progressively more complex in reflexes over which we can exercise conscious control, in behavior dominated by the external situation, in consciously directed behavior, and finally, in such activities as bravery, courage, etc.

QUESTIONS ON THE CHAPTER

1. What is the difference between personality and character? Which is the broader term?

2. What is meant by the statement: We are continually adjusting to our environment?

3. Why do we need to consider goals to understand behavior but not to understand movements of inanimate things?

4. What is some of the evidence upon which we base the statement: A personality always functions as a whole?

5. What is a successful adjustment?

6. What are the chief kinds of "blind-alley" adjustment?

7. What are the chief kinds of thwarting adjustment?

8. Describe the lines of evidence which prove the importance of the nervous system in behavior.

9. What are the functions of the main parts of the nervous system?

10. What is a reflex action? How does a reflex action differ from other types of behavior?

11. What are the stages between a stimulus and the resulting activity?

12. What is meant by the psychological whole? Why must we consider the psychological whole in understanding behavior, rather than simply the personality of the person involved?

13. What are the important parts of the psychological whole?

QUESTIONS FOR DISCUSSION

1. How can one's physique affect his personality? Give illustrations from persons you have known.

2. Suppose a man from Mars who had never seen the color blue were to drop in on you for a visit. Could you describe the color to him? Under what conditions can any one convey his conscious experiences to another?

3. Is a goal always present in consciousness?

4. Give some illustrations from your own experience of persons who have used each of the following as an adjustment (or maladjustment):

(a) Bragging.
(b) Cruelty.
(c) Timidity.
(d) Temper tantrums.
(e) Jealousy.
(f) Lying.
(g) Stealing.

5. Do the same for the following adjustments:

(a) Capitalizing a defect.
(b) Rationalizing.
(c) Self-absorption.
(d) Expressionism.
(e) Flight into reality.

6. Does rationalizing always thwart adjustment? Explain.

SUGGESTED READINGS

J. J. B. Morgan, *The Psychology of Abnormal People* (2d edition; Longmans, Green and Company, 1936). One of the most interesting and readable books available on the behavior adjustments made by abnormal minds.

D. G. Paterson, *Physique and Intellect* (The Century Company, 1930). A thorough, reliable, up-to-date survey and interpretation of modern research on the relation between physical and mental characteristics.

L. F. Shaffer, *The Psychology of Adjustment* (Houghton Mifflin Company, 1936). A comprehensive treatment of the many types of adjustment and maladjustment, and the effects which they have on the total personality.

MORE ADVANCED READINGS

K. S. Lashley, *Brain Mechanisms and Intelligence* (University of Chicago Press, 1929). A series of brilliant researches on the relation between parts of the brain and intelligent (or adaptive) behavior. Relatively easy to follow.

C. S. Sherrington, *The Integrative Action of the Nervous Systems* (Yale University Press, 1906). A thorough survey of the integrative action of the nervous system from the physiologist's viewpoint. Somewhat technical for the beginning student, but well worth careful study.

CHAPTER FIVE

Personality: How We Judge and Measure It

EXPERIENCED managers, be they plant superintendents, university presidents, superintendents of schools, or army generals, know that the selection and placement of men is the most important function of management. It is easy to build a factory or the physical plant of a university, because science has given us sure control in the mechanical arts. But this is a world of men as well as of machines, and in any human enterprise problems of judging personality are the crucial ones. If an executive is hiring a man for a job, he probably desires some one who has had a certain type of education, who is reasonably intelligent, who is level-headed (that is, not given to emotional outbursts), who has a pleasing personality, who can make friends readily, and who is, above all, trustworthy in a position of responsibility. In short, he wants a man who will work *for himself* by working *for the business.* If there are ten applicants for the job and each has favorable letters of recommendation and makes an excellent impression in an interview, how is the executive to choose one of the ten without resorting to sheer guesswork or trusting to good luck?

If time and money were of no moment, the surest way to pick the right man would be to hire all ten for a trial period and retain at the end of say ten weeks the man who best fitted into the job. But a company is in business to make money, not to run a testing ground for employees. For better or for worse, one of the ten must be selected quickly, to go to work the next morning. Obviously, a really accurate judgment of a person depends largely

upon our knowledge of him. However, many instances of the type cited above arise, where we must make a judgment about a man without knowing any too much about him. In such cases to make a wise decision is often as important as it is difficult. Admiral Byrd has said that the selection of men is the most important preparation for polar exploration, and we can readily understand why this is so.

Because we are compelled to make decisions and judgments about other men and women whom we do not know intimately, many techniques have been developed to increase the accuracy of our judgments. Some of these are mere common-sense methods, and those who use them should make no claim of their having a scientific character. Thus, one employment manager may think that his uncanny skill in selection is due to never hiring a man on Tuesday, while another is sure that his scrupulous avoidance of men who both wear glasses and have a moustache saves grievous errors. One manager may prefer Harvard men, while another prefers any one but a Harvard man. There is a strong tendency to deceive oneself and to believe that methods which have always been "good enough" cannot be improved.

Other methods of judging make fraudulent claims to be scientific. They may be called pseudo-scientific methods. Some attempts to increase the reliability of our judgments of personality, however, are genuinely scientific. We shall examine these different methods.

COMMON-SENSE METHODS OF JUDGING PERSONALITY

(1) *The "hunch," or intuition.* These words refer to judgments based on vague feelings for which no explicit grounds can be given. The following lines offer a good illustration:

> I do not like thee, Doctor Fell,
> The reason why I cannot tell;
> But this alone I know full well,
> I do not like thee, Doctor Fell.

In such judgments it is frankly admitted that definite grounds for the judgment are lacking. If, however, the person making the judgment is pressed, he may say that the man he dislikes "gives him a creepy feeling," that he does not like his expression, that his eyes are shifty, or that he has the bearing and appearance of a

man who cannot be trusted. Sometimes we form aversions toward individuals who have certain mannerisms or toward members of certain races and classes. Occasionally these judgments are based on unpleasant experiences, occasionally upon group suggestion, but the inadequate grounds of such judgments always become apparent when an effort is made to justify them. Obviously, the accuracy of "hunches" cannot be much greater than chance. But if a man's hunches have seemed to serve him well, his faith in his own special ability to judge men is often unshakable. No "scientific heresy" disturbs him. He refuses to ask himself the question: How much better might my judgments have been if I had used other methods?

(2) *Past behavior of a person.* One of the best and most frequent bases of our common-sense judgments of personality is knowledge of the history of the individual. If a man has been a leader, it may be taken for granted that he has the qualities of leadership; if he has met an emergency energetically and bravely, it can be assumed that he is brave and energetic — though we may temper such judgments as the latter by recalling that one swallow does not make a summer. The more frequently a person *acts* bravely and energetically, the more positive we become that he *is* brave and energetic. Yet we should always keep in mind the possibility of overcompensation. In judging a man by his past history, observe the following cautions:

(a) A man with a splendid past may collapse suddenly. Or he may gradually degenerate.

(b) A man may have a record of continued successes because he has never been in a really critical situation. Any half back can gain ground in a practice game.

(c) Continued and repeated failure may only indicate that a man has been playing in too fast a league. Even champion lightweights should avoid heavyweight competition.

(d) A large proportion of a man's success (or failure) may have been determined by unusually favorable (or unfavorable) circumstances or associates. A man's performance in one psychological whole is no guarantee of similar performance in another psychological whole. Thus, a "hot weather" pitcher may have an excellent record in New Orleans and fail in Minneapolis. Likewise, a man in any new position which involves unpredictable personality adjustments or clashes may fail in spite of most careful selection.

(3) *Associates.* "Birds of a feather flock together" is an old saying that has gained general acceptance and that, incidentally, is supported by scientific investigations.[1] In trying to size up an individual we naturally observe his companions. If he "strings along" with the giddy, the irresponsible, and the thin personalities in his group, we conclude that he is of that type also. If he gravitates toward men that matter, we are likely to think that he also is of some account. But in judging one by his associates the sincerity of his choices must be appraised. The faithful are not the only ones who go to church.

(4) *Personal interview.* The personal interview is a method, highly prized by common sense, of sizing up the personality of another. It is used especially in the appraisal of applicants for a position. Obviously, face-to-face talks are of some value. After talking with a person, we know more about him than we did before, and probably we have learned whether or not we shall like him, which may be very important. But how well a person conducting an interview can, in this way, pick the person really best suited to a position the reader may infer from the following account of an investigation made by Hollingworth.

Twelve experienced sales managers were asked by Hollingworth to interview fifty-seven applicants for a job as salesman and to rate them in order of merit. The managers were permitted to ask the applicants any question and to assign them to any task they wished. The only requirement was that they rate the applicants in terms of their probable success as salesmen. The lack of agreement among the managers is enlightening. One applicant was rated one by one judge, fifty-seven by another, two by another, and fifty-three by another; in general, the applicant was given positions all along the scale. His case was by no means exceptional. Only occasionally did the judges agree in their estimates of a man. In some instances there was a decided tendency to rate certain applicants low and others high, but even here there was a wide diversity of ratings.[2]

Two questions of interest are suggested by Hollingworth's study. In the first place, if personal interviews lead to no more reliable results than this investigation indicates, why do employers attach such importance to them? In the second place, what can be done to increase the value of personal interviews?

The answer to the first question is probably found in the fact

that employers have no adequate check on their judgments. Each picks the man that he believes to be best, and if the man selected does fairly well, the employer is satisfied, even though he may have rejected a number of men who were better qualified for the work or who would have been, in other ways, more valuable members of his organization. In the absence of a check, a personnel manager may continue to make mistake after mistake and still maintain confidence in his ability to pick the right man. Employers, furthermore, are interested, to a certain extent, in selecting men who are likable and congenial, and these are qualities that can be determined fairly well by an interview. In the matter of congeniality there are obviously individual preferences. One person likes chocolate cake; another does not. One person likes a certain personality ensemble; another does not. The personal interview serves at least to give the employer a chance of learning whether he is likely to find the applicant congenial.

As to how the personal interview can be made more reliable, Hollingworth makes the following suggestions: (1) Frame questions so as to require a definite reply, and make a random reply impossible. (2) Establish favorable *rapport.* (3) Distinguish between relevant and irrelevant questions and replies. (4) Keep a careful record of facts obtained, in addition to any inferences drawn therefrom. (5) Use a standardized form of report. (6) Carefully weave together all information gained. (7) Make a clear statement of personal reaction.[3]

To the sound advice given by Hollingworth, two considerations must be added. The personal interview is of limited value because first impressions may be deceiving. During an interview a candidate puts his best foot forward, unless he is so embarrassed that his panic makes it impossible. One must recognize that the relation between being a good candidate and a good performer may vary all the way from zero to one hundred per cent correspondence. Furthermore, we should care little, if at all, about "candidacy performance" in a research chemist, whereas we should care a great deal about the first impression made by a prospective salesman.

A second consideration is that the *interviewer* as well as the *one interviewed* is on parade. If the interviewer is without benefit of psychological insight, he may not realize that his judgments are often connected with his own traits as these are contrasted to those

of the candidate. It is well known that interviewers usually find some excuse for turning down men if they find themselves feeling vaguely uncomfortable because they are in the presence of ability superior to their own. The employment manager is working for a living and he might lose his job to some one he employs. The degree to which he is conscious of this ultimate consideration may vary greatly.

(5) *Letters of recommendation.* The reliability of a personal interview may be further increased by pooling the judgments of several persons. Since it is generally not feasible to have an applicant interviewed by several men, letters of recommendation are frequently resorted to.

The reliability of letters of recommendation depends on the judgment of the persons writing the letters and on their willingness to give accurate reports. Investigation has shown that the opinions of friends regarding one another are none too reliable. For example, twenty-five people well acquainted agreed to rate one another and themselves with respect to a number of traits. The person who stood highest in respect to any trait was to be rated one; the person who was second, two; and so on to lowest, who was to be rated twenty-five. In regard to some traits the disagreement was approximately as great as chance would have yielded, and even where there was closest agreement there was considerable variation.[4]

Similar investigations show that there is greater agreement in judging some traits than others. There is greater agreement, for example, in rating efficiency, quickness, and energy than there is in rating cheerfulness and kindliness.[5] The reason for this is that the first traits are more objective and depend much less than the others on the social situation. When, however, the persons who do the rating all stand in the same relation to the person rated, as with students and an instructor, there is closer agreement regarding kindliness and cheerfulness than regarding efficiency and energy.[6] This indicates that one reason a person may impress different people differently is that with different people he acts differently. Though this is true to some extent, real *split personalities* are not found among normal people. A man who is a lamb at home deceives only himself and other stupid people by making believe he is a lion at the office. Still, it is possible to stress one fraction of one's personality at the office, another at home, and

still another at the club; and this brings into clear relief the importance of obtaining letters of recommendation from men who know something about the complexity of human nature and who possess a genuinely judicial temperament. It is given to few men to write letters of recommendation that are worth reading, and many letters of recommendation tell far more about the writer than about the candidate being considered.

Opinions of those who have seen the person to be judged from the same angle can be pooled to secure a counterbalance to personal bias. Pooled ratings attain a high degree of reliability, even though the ratings made by any two individuals may differ greatly. An investigation showing this has been made by McCabe. She selected from the 40 members of a certain sorority the 20 who were best acquainted with the other girls. Each of the 20 rated all the 39 other members of the sorority with respect to 10 traits. The raters were then divided into two groups of 10 each and the average of their judgments compared. The correlations ranged from .80 for crudeness to .96 for beauty. The correlation for intelligence was .92. The average correlation for the 10 traits considered was .88.[7]

Other investigations also have shown the importance of pooling the judgments of a number of acquaintances. The bearing of this on the use of letters of recommendation is obvious. Friends, in spite of intimate association, form different judgments of each other; and a letter of recommendation written with every effort to be honest may reflect a different impression from another letter written by an equally honest and capable person. Hence in using letters of recommendation, an effort should be made to get several and to pool the judgments expressed. Eight or ten are usually sufficient for ordinary purposes.

There are other reasons why a number of letters should be secured. We cannot be certain that all letters of recommendation are written with the sole purpose of conveying correct information. The writer may be biased for or against the person about whom he is writing. An employer may feel that it would be well for the individual in question to move on and make room for some one more promising. Many an undesirable employee has been "sold" in this way by a good letter of recommendation. These additional sources of error should be considered in evaluating testimonials.

In order to increase the value of letters of recommendation, it has been suggested that printed forms, listing numerous personality traits, be used. The advantage claimed for such forms is that by providing a ready-made list of both good and bad qualities for a person to check, they lessen the chance of the writer's neglecting the weaker traits because of his goodwill toward the person under consideration.[8] It should be remembered, however, that no aid, printed or otherwise, will enable a man to write an accurate letter of recommendation if he is careless, ill informed, or seriously biased.

(6) *Letters of application.* Having the applicant write a letter of application is another common-sense method of judging personality that has much to commend it. Apart from any revelation of personality that may be made by the handwriting and neatness of the letter, something regarding the applicant's command of language, his attitudes, and his judgment can frequently be learned in this way. The inability of many college students to write a convincing letter of application is a severe handicap. The letter of application is the first contact with a possible job and, unfortunately, often the last. It is the applicant's full-page advertisement, his crucial sales talk. Good intentions will not produce good letters. Letter writing is a difficult art, which cannot be acquired over night. The reader can probably well afford to take this hint.

PSEUDO-SCIENTIFIC METHODS OF JUDGING PERSONALITY

The foregoing are some of the common-sense methods of judging personality traits. They make no pretense of being scientific, though scientists have been interested in studying their reliability and in devising ways of increasing their value. Many people, not content with these methods, have attempted to discover relations between mental traits and more tangible factors, such as physical characteristics, that will enable them to infer one from the other. An extreme instance of this is the claim of a London barber that he is able to judge a man's personality by examining a cross section of one of his hairs. While every one will scoff at this claim, many people are inclined to accept the equally unproved notion that a high forehead indicates keen intelligence, and that delicate features and long, tapering fingers indicate a refined and aesthetically

developed personality. It will be interesting to consider some pseudo-scientific theories.

(1) *Astrology.* According to the ancient "science of astrology," to be born under a certain star indicates health; under another, cheerfulness; under another, masterfulness; and under another, cowardice. The reading of horoscopes by astrologers has fascinated not only the giddy, but at times the serious-minded. The position of the stars is supposed to indicate both one's personality traits and also one's future. This so-called "science" was based originally on the belief that gods, inhabiting the planets and the stars, exercise an influence upon human affairs. At first, efforts were made to foretell the fate of large groups or of empires. Since the fate of a nation depended then, as it still often does, to a great extent on the personality of its ruler, special efforts were made to tell his character and predict his fortune. Later, perhaps partly as a result of a deep yearning in the masses to know their future, and partly as a result of the desire of astrologers to acquire easy money, fortune telling from the stars became widespread. Today one need not listen long to radio programs to realize that astrology is still an easy method of extracting money from the superstitious. Needless to say, the predictions of astrologers have nothing but a guess and a hope behind them. The best use which we, as psychologists, can make of astrology is to see in it an impressive illustration of the fact that man's wishes may seriously distort his judgment.

(2) *Phrenology.* When the motor and sensory areas of the brain were discovered, it occurred to some that an examination of the shape of the skull would reveal the shape of the brain and, consequently, the character traits of the person. Without pausing to test this hypothesis, they claimed that well-developed bumps above the ears indicated destructiveness, that bumps a little farther back indicated combativeness, and that bumps in various other locations had different meanings. Figure 20 shows the departmentalized head which they conceived. In all, some thirty-five or more "organs of the brain" were thought to have corresponding bumps, and it was believed that the degree of development attained by the bumps indicated the strength of definite character traits. These claims were embodied in the scientific language of the day and were called the "science of phrenology." The *actual* location of functions in the brain is shown in Figure 21. The ar-

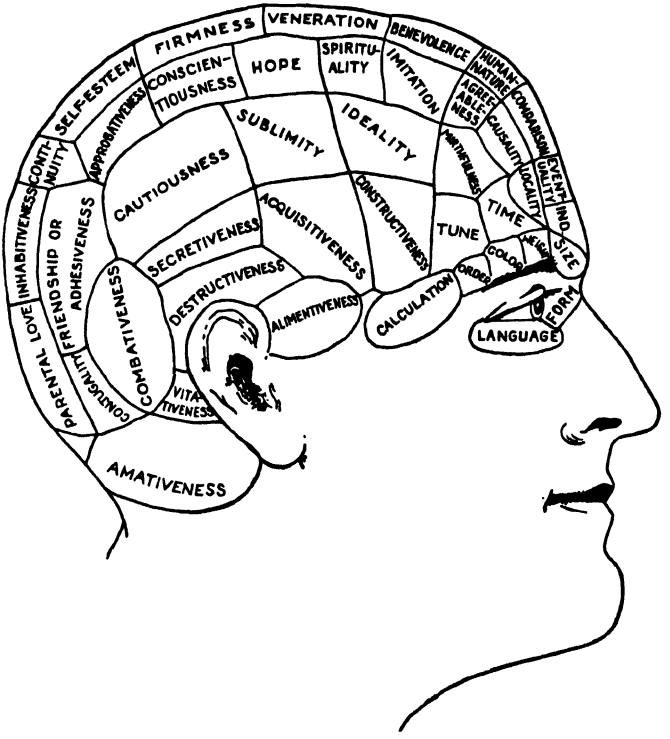


FIG. 20. THE MEASUREMENT OF PERSONALITY ACCORDING TO THE PHRENOLOGIST

The bumps on your head have different meanings for different locations, according to this pseudo-science. Compare Fig. 21, which shows what is really known of localization in the brain. There is no basis for the phrenologist's scheme.

rangement is much less spectacular than the claims of the phrenologist and it is not revealed by bumps on the head.

As frequently happens with those who propose a new theory, phrenologists disregarded negative cases — that is, instances of bumps which, by their system, should have indicated a certain trait, but failed to do so. An examination of the anatomy of the head and brain, which could readily have been made, would have shown that the outer shape of the skull does not correspond to the surface of the brain. Because they failed to get this important

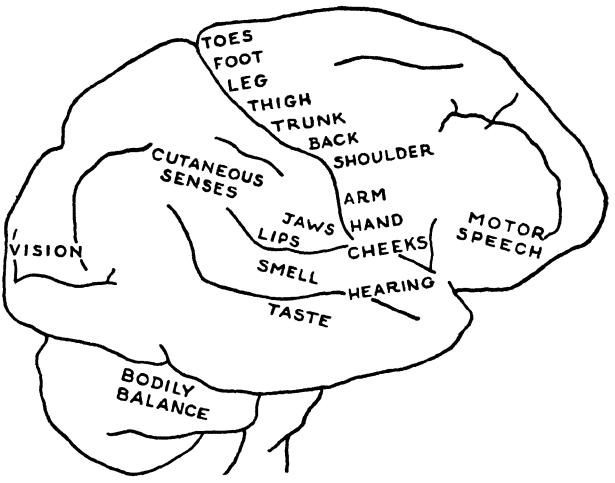


FIG. 21. THE ACTUAL LOCATIONS OF FUNCTIONS IN THE BRAIN

Notice that locations have to do with movement of different parts of the body and with the senses — not with personality traits such as hope or cautiousness.

information and yet, at the same time, sought to support their claims with the prestige of science, they are called *pseudo-scientists.*

Moreover, a serious effort on their part to learn the basis of such personality traits as kindliness, ambition, and jealousy would have shown that these traits depend too much upon training and experience to be determined by some bump on the head which cannot change. Such traits are outgrowths of present and past psychological situations. No single cause can be held responsible for them. Assume some conceivable single cause, such as a physical defect or home training, and you will find so many negative instances that the assumption is rendered untenable. Much less can we relate these traits to such superficial things as bumps on the head. Within the variations in head formations found among normal people there have been no adequate demonstrations of the validity of phrenology. It is not taken seriously by any competent student of human nature. One would be hard pressed to find a better example of a psychological "gold brick" than this pseudo-science.

(3) *Stigmata.* It was widely held in the past that anatomical

deviations or deformities, which are technically known as *stigmata*, indicate degeneracy of the personality. Lombroso, a celebrated Italian criminologist of the latter half of the nineteenth century, went so far as to claim that by their stigmata criminals can be classified as thieves, murderers, forgers, and so on. More careful work has shown that, though criminals and such degenerates as the feeble-minded have on the whole a more than average tendency to bear stigmata, we cannot say that a person with a physical stigma will necessarily have a personality defect. It is no doubt true, however, that those having unusual physical development or deformity, such as harelip, unusual ears, a conspicuous birthmark, a deformed back, a cleft palate, defective speech, hair where others do not have it (as in the case of a bearded woman) or no hair where others have it (as in the case of a bald-headed boy) are subject to unusual psychological stress and strain. Because of this extra load of tensions, worries, and self-consciousness, undesirable personality traits may be developed. Two facts should be remembered, however. First, no one can excuse himself for murdering another because of his harelip, since Lombroso's theories were more wrong than right. Second, those suffering from physical defects can usually be taught to carry this extra load without undue handicap or self-pity, a fact illustrated all through history from Demosthenes down.

(4) *Physiognomy.* The belief that character is revealed in the face is persistent and widespread. The following paragraph from Blackford and Newcomb is an extreme instance:

> The significance of the pure convex type [of face] is energy, both mental and physical. Superabundance of energy makes the extreme convex keen, alert, quick, eager, aggressive, impatient, positive, and penetrating. . . . The tendencies indicated by his convex mouth will cause him to speak frankly and at times even sharply and fiercely without much regard for tact or diplomacy. . . . The pure concave, as might be expected, is the exact opposite, so far as the indications of form are concerned, of the pure convex. The keynote of his character is *mildness*. . . . He is slow of thought, slow of action, patient in disposition, plodding. . . . The convex is also, in the majority of cases, a blonde. The combination of hopeful, optimistic, restless, organizing, creating, domineering characteristics of the blonde with the quick, alert, practical, aggressive qualities of the convex make this type distinctly the type of action. . .

In the paragraph quoted, considerable importance is attached to complexion. In general, blondes are supposed to be more active, energetic, and aggressive than brunettes. When, however, Paterson and Ludgate asked 187 people to rate their brunette and blonde friends on these and many other traits, no significant differences were found.[10] The physiognomist, confronted with such facts, might acknowledge that complexion alone does not enable us to judge personality, but still insist that the character of the face as a whole reveals a great deal. If this were true, judgments of personality based on photographs should have some value. However, when such judgments are compared with the pooled judgments of intimate associates, they are found to correlate very poorly, though exceptions must be made for judgments of beauty, intelligence, and snobbishness.[11] It might be thought that judgments based on inspection of an actual person would be more reliable than judgments based on photographs. However, there is no significant difference. Table II, which sets forth the findings of Cleeton and Knight, indicates that little can be inferred regarding personality merely from an opportunity to see a person, even when the judges, as in this case, are experienced business men, school principals, and employment managers.

TABLE II

CORRELATION EXISTING BETWEEN THE RATINGS OF 20 CLOSE ASSOCIATES AND THE RATINGS OF 70 CASUAL OBSERVERS [12]

Trait	*Correlation*
Judgment	.32
Intelligence	.02
Frankness	.21
Will power	.26
Ability to make friends	.18
Leadership	.31
Originality	.32
Impulsiveness	.20

An "expert physiognomist," confronted with the diversity of individual judgments based on photographs and on actual observation of the person to be judged, would no doubt retort that physiognomy is a science that must be mastered through long study;

that we should not expect untrained persons to make accurate judgments. In that case physiognomists ought to be willing to demonstrate their ability themselves. Yet they do not seem willing to do so. Hull asked a leading physiognomist to judge a group of girls on the basis of their photographs. (The girls had already been judged by their sorority sisters.) Though the physiognomist was assured that if he failed, his name would be kept secret, he refused to coöperate in the experiment. As Hull points out, this is typical of physiognomists in general.[13] They will not venture to test their ability. Under such conditions we must be skeptical of their claims.

This attitude of skepticism is further confirmed by examining the claims of physiognomists regarding the relation between profile and personality traits. In order to test the validity of the claims of Blackford and Newcomb quoted above, Evans, working under Hull, asked twenty-five members of a sorority to rank each other (no one ranked herself) in respect to a number of characteristics. When this had been done, the judgments of thirteen of the judges were compared with those of the remaining twelve. The high correlations between the ratings by the groups show that this method of rating personality traits gives consistent results from one group of raters to another.[14] These correlations are shown in Table III.

TABLE III

CORRELATIONS BETWEEN THE POOLED JUDGMENTS OF THE GROUP OF 12 RATERS AND THE GROUP OF 13 RATERS FOR THE VARIOUS TRAITS [15]

Trait	*Correlation*
Optimism	·75
Activity	·80
Ambition	·90
Will power	·82
Domination	·87
Popularity	·44
Blondeness	·93

They are highest for ambition and domination, and lowest for popularity. This means that a person judged ambitious or

dominating by a few close acquaintances will be judged ambitious or dominating by nearly every one who knows him, but that a person may quite probably be judged popular by some acquaintances and unpopular by others. Ambition and domination are more *consistent* traits than popularity.

Turning now to the relationships between these personality ratings and the degree of convexity of the profile, we find the correlations shown in Table IV. The only correlations that are far enough from zero to indicate any possibility of significant relationship are those, in the fourth row, showing the relation between the chosen traits and the convexity of the part of the face between the chin and eyebrows, not including the nose. Even these correlations are by no means high enough to afford proof of anything.

TABLE IV

SHOWING THE CORRELATION BETWEEN VARIOUS PHYSIOGNOMIC TRAITS AND A NUMBER OF CHARACTER TRAITS [16]

Physiognomic Traits	*Character Traits*						Blondeness
	Optimism	Activity	Ambition	Will power	Domination	Popularity	
Convexity, whole face with nose	+ .10	− .05	− .17	− .13	− .11	− .03	− .20
Convexity, chin to eyebrow, with nose	+ .13	+ .01	− .13	+ .13	− .08	− .11	+ .03
Convexity, whole face without nose	+ .02	− .24	− .17	− .11	− .13	− .27	− .04
Convexity, chin to eyebrow, without nose	+ .37	+ .39	+ .33	+ .34	+ .24	+ .17	+ .03
Convexity of upper face, with nose	− .06	− .08	+ .04	+ .06	+ .08	− .17	− .02
Height of forehead from eyebrow to hairline	− .17	− .29	− .23	− .39	− .22	− .10	− .21
Blondeness	− .26	− .02	+ .05	+ .28	+ .14	+ .03	

Other investigations of physiognomy, several of which were directed and reported by Hull, show in general that, while there may be a small degree of relationship between personality traits and physiognomy, the relationships are slight, often doubtful, and of little practical importance.

(5) *Physique.* Regarding general physique it has been found that there is a small but reliable positive relation between size and intelligence. The large well-developed person is on the average slightly more intelligent than the small one. The physique of a person, however, seems to throw more light on his emotional nature or temperament than on his intelligence. We have already referred briefly to the work of Kretschmer, who found that certain body types are associated with certain personality traits. Kretschmer reports that there are three physical types: the short-round, the thin-long, and an intermediate type. The first he calls the pyknic type; the second, the asthenic; and the third, the athletic. The pyknic individual, he claims, tends to be an extrovert. When a person of the pyknic type becomes mentally ill, he is likely to develop manic-depressive insanity (characterized by alternating periods of intense excitement and depression). The asthenic individual is introverted and differs sharply from the pyknic. He lives within himself and is a poor mixer. Instead of experiencing the emotions of those around him he remains a spectator. If he becomes mentally ill, he often develops schizophrenia (characterized by extreme indifference to all that goes on around him). The athletic type tends toward the personality traits of the asthenic.[17]

Supported as these conclusions are by years of clinical experience, they have attracted much attention and have been the subject of several careful investigations. Most of these studies have dealt with patients in mental hospitals. One study, made by Wertheimer and Hesketh, determined the average morphological index of 11 manic-depressive cases and 23 schizophrenes. (The morphological index is a convenient way of quantifying "body-build." It is the ratio between length of the limbs and volume of the trunk. A tall, thin person would accordingly have a high morphological index and a short, fat one a low index.) Wertheimer found the manic-depressives to have an average morphological index of 233, while the corresponding index for the schizophrenes was 281.[18] These findings tend to support the theory advanced by Kretschmer. Another study has been made by Shaw with similar results. He found that all patients with a morphological index between 250 and 340 were manic-depressives, whereas all having an index above 680 were schizophrenes.[19]

In a recent study, Fay and Middleton had an audience judge

the physical build of nine speakers heard over a public address system according to Kretschmer's three physical types. The judges scored 20 per cent, 22 per cent, and 1 per cent above chance in identifying the men of asthenic, pyknic, and athletic build respectively. There were three men of each type.[20]

A new approach to the study of physique and its relation to human behavior has been made by Sheldon, Stevens, and Tucker. In the first of two volumes these authors present a three-dimensional system for the description of human physique. Three components of bodily constitution are identified as endomorphy, mesomorphy, and ectomorphy. The endomorph shows a predominance of soft roundness throughout the various regions of the body. The mesomorph is heavy, hard, and rectangular, showing a predominance of muscles, bone, and connective tissue. The ectomorph is linear and fragile, having in proportion to body mass the greatest sensory exposure to the outside world. Each of these components is rated on a seven-point scale according to the degree of the component involved, a rating of 1 indicating the lowest degree of the component. Thus a "711" physique shows an extreme amount of endomorphy and a minimum amount of the other two components.[21]

In a second volume Sheldon and Stevens have presented a three-way temperament scale for three temperamental components, viscerotonia, somatotonia, and cerebrotonia, and point out the relation of these components to the three components of physique. Since the three components of temperament are extreme variations from "average," most people combine in their temperaments various mixtures of the three components. The extreme viscerotonic loves comfort, is greatly interested in food, likes social gatherings, and expresses his feelings easily. The extreme somatotonic is an active, energetic person who behaves aggressively. The extreme cerebrotonic shrinks away from sociality, avoids attracting attention, is inhibited and restrained. A scale for temperament composed of 60 traits, 20 for each of these three primary components, is used for assessing the individual's temperament.[22]

Suggestive as are these and similar investigations, we must be careful not to make too sweeping a generalization. We must remember, for one thing, that many of the studies have dealt with patients in mental hospitals — that is, with pathological persons.

It is not reasonable to expect that the personality traits of normal persons can be divided so sharply on a basis of bodily measurements. The great difference between the mentally normal and abnormal is that the former are a more homogeneous group — more like each other — than the abnormal. The mentally abnormal, by definition (*ab* means *from*), are persons whose mental life presents marked and sometimes weird variations from the average. Normal people act and feel in ways that are relevant to the situation; the feelings and actions of the abnormal are determined by some obscure mental or physical condition. Since normal behavior is an outgrowth of many conditions, such as family influences and education, we should expect the influence of any *single* factor, such as physique, to be less marked than in abnormal behavior.

It should also be noted that most people cannot be sharply classified at all into such types as the long-thin and the short-round. Very few people belong to these definite types; the great bulk of people fall in between. It is not surprising, therefore, that studies to determine the relation between the physique and temperament of normal people have not yielded clear-cut, positive results.[23] Even for pathological cases, physique should, according to Farr, be suggestive rather than diagnostic.[24] In this, Paterson, whose survey of the studies in this field is the most recent and thorough, fully agrees.[25]

Marked deviations from the normal in body-build, like the stigmata noted above, exercise a *psychological* effect and are not the *direct* cause of personality deviations. Extreme shortness of stature, operating with other factors in the psychological whole, may make a man become "cocky" by way of compensation and give him a sort of "bantam" personality. This is more than likely to happen if he is continually trying to persuade himself that he is just as good as men of normal size. From the same beginning and with a different combination of factors in the psychological whole, however, the same person might have become retiring or even servile. For instance, the playgrounds of his youth might have taught him that almost any one could whip him, and he might have concluded that the best way to get along in life is to serve rather than to contest. Other factors in the psychological whole might have made him deceitful and sly, trusting to his ingenuity instead of his back muscles. In other

words, the personality of a short man is often very much influenced by his shortness, but this influence cannot be separated from the combined action of the other factors in the psychological whole. Similarly, a man of pronounced physical strength may be genial and easy-going, since, rarely meeting a worthy rival, he can take himself for granted. He is like a Saint Bernard with fox terriers snapping at his heels. But in a different psychological whole — say among people even stronger than himself — the Saint Bernard might have developed into something more like a wolf-hound. In short, pronounced deviations from the normal in body-build often exercise a profound influence upon personality, but never except in conjunction with other factors.

(6) *Acidity of body.* In recent years, hope of judging personality on the basis of chemical analyses has been expressed.[26] It is probably safe to predict, however, that those who entertain this hope will be disappointed. Character and personality are made of, and conditioned by, too many factors for a chemical analysis to indicate more than a tendency in any individual. Already chemical analysis seems to have done this much. Rich has found that in the excited type of insanity the saliva, urine, perspiration, and feces tend to be alkaline, whereas in the confused type of insanity a general acid condition prevails. It has also been found that stammerers of the lethargic type have acid saliva, whereas those of the excitable type have a neutral or alkaline saliva.[27] On the basis of Rich's data, Paterson has found interesting and suggestive correlations between acidity of urine and saliva and such personality traits as good-naturedness, perseverance, leadership, aggressiveness, and excitability.[28] While both Rich and Paterson maintain a cautious attitude, they agree that the less excitable and aggressive person is apt to have acid urine and saliva. These facts, while of interest, are of no particular use in measuring the personalities of normal people. One does not have to make a chemical analysis of his saliva to know whether or not he is excited.

(7) *Shape and size of the hand.* There is a popular impression that a long, narrow hand with tapering fingers is a sign of aristocratic breeding or of an artistic nature, while a big bulky hand indicates a plebeian origin. As a matter of fact, such differences in hands are probably indicative only of the amount of manual work which an individual has done. The attempt to judge

character by the size and shape of the hand is called *chirognomy.* One chirognomist claims to have taught the heads of 275 business concerns in New York, 125 in Boston, and 342 in Chicago how to judge character by examining a person's hands. Chirognomists in general claim that "the longer the first finger is as compared to the second, the more ambitious the person is; that the farther a person can bend his fingers backward, the keener is his mind; that the longer the fingers in proportion to the palm, the stronger is the tendency to impulsiveness, and so on." These claims were investigated by MacLaurin. After obtaining personality ratings of thirty members of a sorority, MacLaurin carefully measured their hands. She found that the correlations were too low to be of significance.[29] Doubtless the same is true of the size and shape of one's feet.

(8) *Graphology.* The claim has been made frequently that handwriting reveals character and personality traits, and there is some evidence that expert graphologists are able to tell something about the personality of a person by studying his writing. For example, Binet gave to several graphologists specimens of the writing of pairs of men, one member of each pair being famous and the other not. The members of each pair were from the same cultural level and had enjoyed the same educational advantages. The graphologists were asked to say which specimens were written by the famous men. This they were able to do in more cases than could be accounted for by chance.[30] Other graphologists have demonstrated their ability to tell with considerable accuracy the sex of a person by his or her handwriting.

Graphologists claim to have a reliable system. However, a careful check of their system by Hull and Montgomery yielded results which were not related to personality ratings.[31] In another study by Super the vocational recommendations of a professional graphologist showed no more than a chance relationship with the personality traits of 24 college students as measured by intelligence, interest, and personality tests. The occupations recommended by the graphologist were quite different from those revealed by an interest inventory.[32] This may mean merely that the graphologists did not describe all the clues which they really use. That they are able to derive from a person's handwriting at least some indication of his neatness and individuality seems, from the experimental evidence, quite possible; and it would not be

necessary that they should also be able to describe how they do it so that a novice could get the same results.[33] The explanation of the popularity and uncritical acceptance of graphology as a system of personality analysis may lie not so much in anything it reveals as in the fact that graphologists usually provide highly flattering analyses. Do not be afraid to submit your handwriting to a graphologist. The chances are that no serious weakness will be exposed and that such a venture will prove an excellent test of your ability to withstand flattery.

PITFALLS IN JUDGING PERSONALITY

The methods of judging personality discussed in the foregoing paragraphs, alluring as they are, possess little if any dependability for the serious student of normal people. But before considering some of the more useful methods of judging personality, we must mention certain pitfalls to be found even here.

(1) *Halo effect.* The first pitfall is the tendency to think that a person is superior, or inferior, in a number of ways because we know (or think) that he is so in some particular way. This transfer of impressions is known as the *halo effect.*[34] To give an example, if we know a person to be kind, we are apt to rate him high in other traits as well, courage and industriousness, perhaps. If a boy is noisy and uninterested in his studies, his teacher will be likely to suspect him of being generally unintelligent and a congenital bully. Such judgments are obviously unwarranted; for though desirable traits do tend to be associated with other desirable ones, and undesirable traits to go together, the correlations are far too low for making specific judgments. A recognition of this fallacy can prevent us from extending a general estimate to particular characteristics, or from turning an accurate estimate of one trait into a false estimate of an unrelated trait. This caution should lead us to seek for definite and positive grounds for any judgment which we may form about an individual.

(2) *Unconscious bias.* Our judgments of a man are often greatly reduced in accuracy because of the influence of our unconscious prejudices and biases. It is very difficult to allow for these factors because they *are* unconscious. Thus, just as one may dislike salmon without knowing why, or similarly prefer Baptists to Methodists, or a man from Harvard to a man from Yale, so

also our casual estimates of people are affected by unrecognized influences and in unknown degrees. The more expert the judge, the more willing he is to admit the possibility of error. Only the quack or the novice is sure.

An example of this source of error is the tendency to apply to an individual the judgments we have previously formed of his group. For example, we have probably formed a type-judgment of communists; and if we should meet a communist, we should consequently expect him to be "true to type" — to have a certain appearance and to act in certain ways. Such type-judgments are called *stereotypes*. A common experience which reveals the influence of stereotypes is the surprise we experience on discovering that a person from another nation is not at all queer but a likable human being. Forewarned is forearmed. Knowledge of the fact that we tend to crowd individuals into the molds of our preconceptions should put us on our guard against doing so and make us fairer in our judgments of those who belong to groups other than our own.

(3) *The acquaintance factor.* Long acquaintance with a person is apt to increase for us the halo effect. Thus, transfer of judgments to unrelated traits increases with the length of time that the judge has known the individual whose personality he is analyzing. If we approve, on the whole, of some one, we tend to forgive his weaknesses more and more the longer we know him. On the other hand, if we have found a man dishonest, we underrate his other traits in spite of ourselves. Judgments based upon long acquaintance are almost certain to suffer from a psychological near- or farsightedness. Friends who have worked together for many years lose the ability to judge each other critically. A person may have known another *too long* to be the best judge of him.

(4) *The error of the pigeonhole.* Another pitfall is our tendency to divide people into two groups. We say that a girl is *blonde* or *brunette*, that she is *tall* or *short*, that she has a *pleasant* or an *unpleasant* personality. We know now from repeated measurements that most people are about average in the various psychological traits — that only the exceptional individual is at one extreme or the other. If a trait is measured in a large number of people and the results are graphed so that the amount of the trait is laid off horizontally and the percentage of persons having each

amount if laid off vertically, we obtain a curve of the general form shown in Figure 22. The curve is highest over the point marked *average*, and lowest over the points representing very great and very small amounts of the trait. From the high point

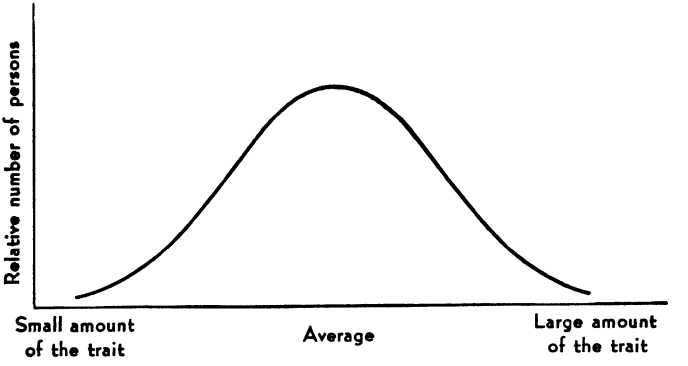


FIG. 22. SHOWING THE DISTRIBUTION OF A PSYCHOLOGICAL TRAIT AMONG A LARGE GROUP OF PEOPLE

Many are mediocre — few very high or very low.

in the center the curve drops, not abruptly, but gradually toward either end. Such distribution of a trait is known as *normal distribution.* Most psychological traits approximate normal distribution. This is illustrated by the distribution of intelligence (see page 201) and the distribution of reading ability (see page 527). When we use simple, unmodified categories, such as *smart* and *stupid* we are assuming that distribution is like that in Figure 23. Such distribution almost never exists.

SCIENTIFIC EFFORTS TO JUDGE PERSONALITY

A human personality is so complicated and behaves so differently as psychological wholes vary that we can construct no personality scale comparable in accuracy to weight scales or temperature scales. Much often depends, however, upon our judgments of others and their judgments of us, and we must judge as accurately as we can. Following are brief discussions of some of the more promising, though far from perfect, methods of judging and measuring personality.

(1) *Rating scales.* Rating scales are devices for making more definite and explicit the personality trait to be rated and for

making the judgment more quantitative in character than it could otherwise be. If you are asked whether a certain person is generous, or honest, or ambitious, you perhaps feel the need of standards of judgment. How generous must a person be before

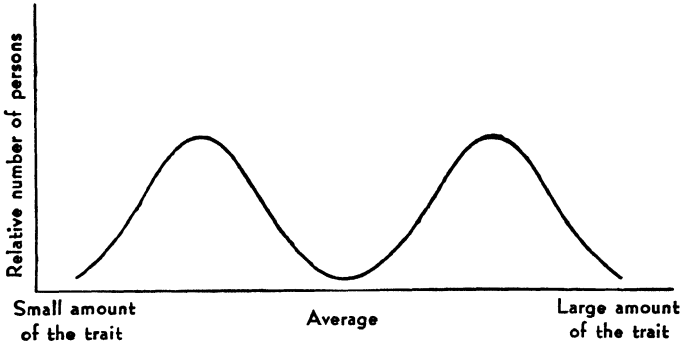


FIG. 23. SHOWING THE DISTRIBUTION WE ASSUME (INCORRECTLY) WHEN WE CLASSIFY PERSONS AS "STUPID" OR "SMART," "BLONDE" OR "BRUNETTE," "GENEROUS" OR "STINGY"

we can call him a generous person? Even with such objective characteristics as height and weight, we feel the same need. How high must a person be before we call him a tall man? How much must he weigh before we say he is a heavy man? Standards are needed in making all such judgments. In some instances, also, we do not have a clear understanding of the traits to be judged. Hence an adequate description of the personality traits in question is also helpful.

Figure 24 shows a rating scale of the type in common use. This particular scale was developed by the American Council on Education. It has the merit of describing in explicit terms the kind of behavior meant when a certain trait is to be rated. It also provides the rater with a convenient way of giving his judgment without the confusion of requiring an excessively large number of small measures.

(2) *Rating by order of merit.* Another method that has certain advantages over a rating chart is the method of rank order. The rater arranges the names (typed on cards) of those to be rated, in order of merit from best to poorest. He may arrange them once for industriousness, again for coöperation, and so on.

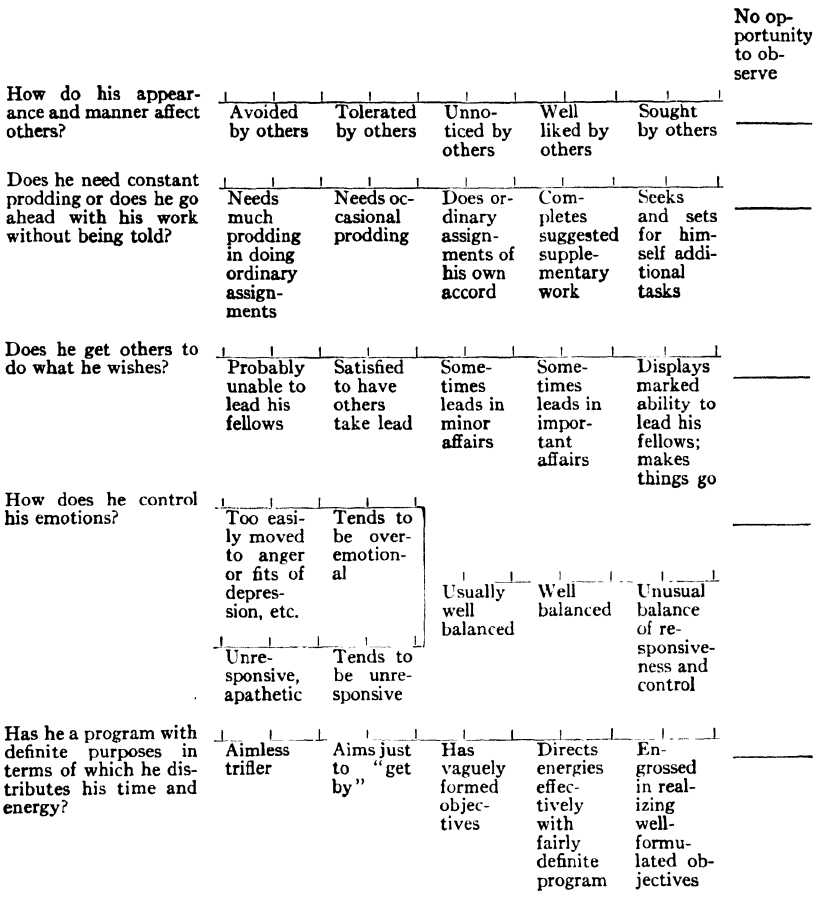


FIG. 24. PART OF "THE PERSONALITY RATING SCALE" OF THE AMERICAN COUNCIL ON EDUCATION

(Reprinted by permission of the Council.)

The main advantage of this method over the rating scale is that the rater is forced to discriminate carefully in every case. For example, if a foreman in an industry is asked to rate his men by means of a rating scale, he may hurriedly check the blanks in such a way that many employees receive the same rating. If he is asked to rank them in order of merit, he must think carefully about every man. The disadvantage of the rank-order method is that often there is no appreciable difference between

certain men, and that when they are forced into rank order, chance alone determines which ones get a preferred position. This factor is largely eliminated, however, when it is possible to have the same persons rated by several judges.

There are several other methods of rating which have been tried from time to time. One of these is the so-called man-to-man scheme, where the persons to be rated are compared with a few previously selected persons known to be high, average, or low in respect to certain traits. Another is the yes-no type, where the rater is asked to check Yes or No for each of a number of statements which might apply to the person rated. The great disadvantage of the man-to-man scheme is that the men chosen as standards may (and probably will) change in their personality traits simply because they have been chosen as standards. If Henry Smith learns that he has been selected as a typically poor worker, he is very likely to cultivate better habits of work. The yes-no scheme is more satisfactory, but usually does not give results enough more reliable than those obtained by the chart or rank-order methods to justify the additional time and labor which it involves.

Of the several kinds of rating scales, those using a chart of the type shown in Figure 24 are satisfactory for most purposes. They are especially useful where a large number of people are to be rated, as in an industrial organization. Charts have been found to yield most reliable results when not more than ten traits are rated, when the degrees indicated for each trait are between three and seven (five are best), and when a person does not attempt to rate a large number of people at one time. Obviously, no rating scale can be of value unless the rater knows very well the persons he is rating. The rank-order method, though it takes more time, should be used when the determination of differences is of great importance and but few people are to be rated.

(3) *Self-rating.* Rating scales are sometimes used to learn what an individual thinks of himself. Estimates a student makes of himself are obviously of value to the educational adviser. Many people have too low an opinion of themselves — that is, they rate themselves lower than others rate them. More people, however, rate themselves higher than others rate them. This is perhaps due to the fact that, when a person rates himself, he does so on the basis of what he "knows" he could do, if he only tried, whereas

others rate him on the basis of what they have seen him do.[35] To a skillful counselor, the fact that one rates himself very differently from the way others rate him is of significance. A man may rate himself low in courage while others rate him high. Such differences have meaning, although their true significance is not always immediately evident. To be overmodest, to be egotistical, or to agree with the ratings of others — all these things are in themselves personality traits and, interpreted in the light of the other factors in the psychological whole, they throw light on personality. The unreliability of self-ratings clusters around two poles: we are quite willing to underrate ourselves on traits which we consider unimportant and, on the other hand, we find it excessively difficult to rate ourselves low on important traits. If you want to know how a person feels about the relative importance of various personality traits, study his self-ratings. A would-be colonel might rate himself low in table manners but never in courage.

Many rating scales sharply contrast desirable and undesirable types of conduct. It is reasonable to believe that this has some value in causing a person who is rating himself to take stock of his good and weak traits and to make efforts at improvement. The following excerpt from a blank prepared by the Boy's Work Division of the International Committee of the Y.M.C.A. illustrates this type of scale.[36]

Thinking it over carefully, would I rate myself as extra good, fair, or poor on the following matters:

(Note: Put a check (√) under Extra Good, Fair, or Poor for each quality on the list.)

	Extra Good	Fair	Poor
Enthusiasm (Full of earnestness or zeal)	....	....	....
Carefulness (Conscientious attention to details)	....	....	....
Punctuality (Being on time)	....	....	....
Honesty (Acting on the square, not somewhat lax)	....	....	....
Energy (Having drive and punch)	....	....	....
Thrift (Saving, not being an easy spender)	....	....	....
Hopefulness (Cheerful rather than gloomy)	....	....	....
Self-confidence (Not over-dependent on others)	....	....	....
Persistency (Stick-to-it-iveness)	....	....	....

(4) *Questionnaires.* Closely related to the method of self-ratings is the questionnaire or inventory method which seeks to measure personality by obtaining the individual's opinion of himself. In its usual form the personality inventory — which is variously referred to as an inventory, a scale, a schedule, or a test — consists of a list of yes–?–no questions in printed form which the subject is instructed to answer by checking the *yes*, the question mark (if he cannot answer the question as yes or no), or the *no*. An example of this type of questionnaire is the inventory devised by Bernreuter which combines in a single test measures of neurotic tendency or emotional stability; of introversion-extroversion; of self-sufficiency (absence of need for companionship, encouragement, and sympathy); of dominance-submission; of confidence in oneself; and of sociability. Since this questionnaire can be answered in twenty to twenty-five minutes, can be administered as a group test, and measures a number of personality traits at once, it saves considerable time in administration. Scoring has been simplified by convenient keys. Below are some sample questions:

1. Does it make you uncomfortable to be "different" or unconventional?
2. Do you daydream frequently?
3. Do you find it difficult to get rid of a salesman?
4. Do you lack self-confidence?
5. Are you willing to take a chance alone in a situation of doubtful outcome?
6. Do you prefer a play to a dance? [37]

An interesting variation of the questionnaire type of inventory is found in the Minnesota Multiphasic Personality Schedule. This test consists of a box of 550 small cards each containing a simply worded statement to be assigned by the subject to one of three sections of the box, "true," "false," or "cannot say." The statements cover a wide variety of subjects, such as general health; sexual, religious, social, and political attitudes; affective states; phobias; and honesty. The inventory yields eleven scores, eight of which represent different phases of personality. The other three scores indicate whether or not the responses of the subject yield a valid set of scores. The eight phases of personality covered by the scale are as follows: hypochondriasis (abnormal concern

about body functions), depression, hysteria, psychopathic personality (absence of deep emotional response), masculinity-femininity, paranoia (characterized by suspiciousness, oversensitivity, and delusions of persecution), psychasthenia (troubled by phobias or compulsive behavior), and schizophrenia. The scores for these characteristics are translated into comparable units and are plotted on a prepared profile chart which reveals the relative strength of the various phases and at the same time provides a personality pattern which is often more important than the score on any one phase. The schedule is designed for individuals over sixteen years of age. Sample items are given below:

1. I find it hard to make talk when I meet new people.
2. I do many things which I regret afterwards (I regret things more or more often than others seem to).
3. I cannot keep my mind on one thing.
4. I have numbness in one or more regions of my skin.
5. I have been told that I walk during sleep.
6. My hardest battles are with myself.
7. I am greatly bothered by forgetting where I put things.[38]

One of the best-known personality questionnaires is the A–S Reaction Study devised by Allport and Allport. This scale, part of which is given in Figure 25, is designed to measure leadership by rating people on a so-called ascendance-submission scale. A high score indicates a dominant and masterful personality, a low score the opposite. Here, as is usual with tests designed to measure personality traits, a number of situations are presented, and the subject is asked to indicate how he feels toward them or how he has reacted or should react toward them. These tests have been widely used, and, on the basis of careful records, norms have been worked out. It has been found that executives and men occupying important positions in the business world make higher than average scores. Persons with high scores should consider such occupations as salesmanship, executive work, factory management, law, and politics. Those with low scores are advised to consider teaching, architecture, art, farming, bookkeeping, banking, dentistry, editing, and writing.

The emotional life of a person may be studied and evaluated by means of questionnaires like the Personality Schedule devised by

Name..... Score.....

Age..... *Form for Men*

A–S REACTION STUDY

DIRECTIONS: Most of these situations will represent to you your own actual experiences. Reply to the questions spontaneously and truthfully by checking the answer which most nearly represents your usual reaction. If a situation has not been experienced, endeavor to feel yourself into it and respond on the basis of what you believe your reaction would be. If the situation seems totally unreal or impossible to respond to, you may omit it.

1. In witnessing a game of football or baseball in a crowd, have you intentionally made remarks (witty, encouraging, disparaging, or otherwise) which were clearly audible to those around you?
   A. frequently .....
   B. occasionally.....
   C. never .....
2. a) At a reception or tea do you seek to meet the important person present?
   A. usually .....
   B. occasionally.....
   C. never .....
   b) Do you feel reluctant to meet him?
   A. yes, usually .....
   B. sometimes .....
   C. no.....
3. At church, a lecture, or an entertainment, if you arrive after the program has commenced and find that there are people standing, but also that there are front seats available which might be secured without "piggishness" or discourtesy, but with considerable conspicuousness, do you take the seats?
   A. habitually .....
   B. occasionally.....
   C. never .....

FIG. 25. PART OF AN ASCENDANCE-SUBMISSION SCALE

(From G. W. Allport and F. H. Allport, *A–S Reaction Study*, Houghton Mifflin, 1928.)

Thurstone and Thurstone. Some typical questions out of a total of 223 on this scale are:

As a child did you like to play alone?
Do you usually control your temper?
Do you get stage fright?
Do you feel that life is a great burden?
Have you ever had the habit of stuttering?
Do you think most people are self-seeking or malicious? [89]

Thurstone reports that there is no relationship between emotional maladjustment, as revealed by this scale, and intelligence. Stu-

dents, however, who are most maladjusted tend ever so slightly to make the highest grades in college.[40] This indicates either that such students work harder as a compensation for their emotional difficulties, or that, lacking a generous amount of self-reliance, they can better tolerate the monotony of college work.

Defining personality as the extent to which an individual has learned to convert his energies into habits and skills which interest and serve other people, Link has devised a Personality Quotient Test consisting of questions regarding habits and activities to be answered by checking two or three alternatives. The test is scored for the following traits or collection of habits: personality (the overall score), social initiative, determination, economic self-determination, and adjustment to the opposite sex. One unique feature of this test is the fact that the overall score is converted into a personality quotient (P.Q.). The mean P.Q. is 100 and the range of P.Q.'s is closely comparable to the range of I.Q. values. The test was standardized upon secondary-school students in a nation-wide study of seventy-four schools.[41]

Freyd has attempted to measure the degree of introversion and of extroversion by presenting a list of symptoms of introversion. The degree of introversion is determined by the number of symptoms a person has. Opposite traits are, of course, those of an extrovert. The following is from Freyd's list of the characteristics of the introvert:

1. Blushes frequently; is self-conscious.
2. Takes up work which requires painstaking and delicate manipulation.
3. Hesitates in making decisions on ordinary questions that arise in the course of the day.
4. Introspects; turns his attention inward.
5. Depreciates his own abilities, but assumes an outward air of conceit.
6. Is critical of others.
7. Is extremely careful about the friends he makes; must know a person pretty thoroughly before he calls him friend.
8. Feelings hurt readily; apparently sensitive about remarks on actions which have reference to himself.
9. Prefers participation in competitive intellectual amusements to athletic games.
10. Daydreams.
11. Expresses himself better in writing than in speech.

12. Is a good rationalizer.
13. Is conscientious.[42]

A personality inventory devised specifically for use in the field of industrial personnel has been developed by Humm and Wadsworth. This scale, known as the Humm-Wadsworth Temperament Scale, is based upon the assumption that an individual's behavior tendencies or temperamental traits tend to occur in groups called components. The 318 items of the scale yield measures of seven components which are listed in Table V together with some associated traits.

TABLE V

THE COMPONENTS OF TEMPERAMENT MEASURED BY THE HUMM-WADSWORTH TEMPERAMENT SCALE

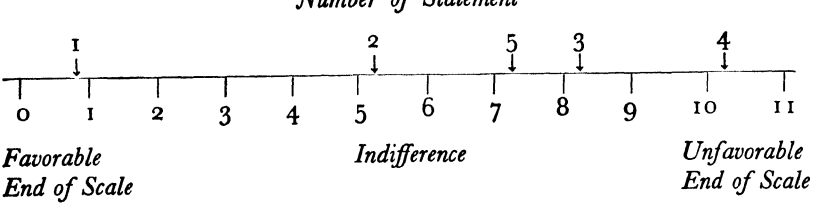
Component	*Symbol*	*Constituted of Traits Associated with*
"Normal"	N	Self-control, self-improvement, inhibition
Hysteroid	H	Self-preservation, selfishness, crime
Manic cycloid	M	Elation, excitement, sociability
Depressive cycloid	D	Sadness, retardation, caution, worry
Autistic schizoid	A	Daydreams, shyness, sensitiveness
Paranoid schizoid	P	Fixed ideas, restiveness, conceit
Epileptoid	E	Ecstasy, meticulousness, inspiration

One interesting feature of the scale is the fact that it does not call for nor expect complete honesty in answering the questions. Methods are provided in scoring for measuring and compensating for over-reporting or under-reporting in answering the questions. For purposes of interpretation the scores for the seven components are plotted on a profile chart. An individual's profile is then compared with typical profiles of individuals of known personality characteristics.[43]

The Guilford-Martin Personnel Inventory is another personality scale designed specifically for use in industry. The traits measured are objectivity, agreeableness, and coöperativeness. A subsequent scale, the Guilford-Martin Inventory of Factors G A M I N, measures five additional traits as follows: G, general pressure for overt activity; A, ascendancy in social situations; M, masculinity of attitudes; I, lack of inferiority; and N, lack of nervous tenseness and irritability.[44]

Questionnaires of the sort listed here yield the kind of knowledge that a trained clinical psychologist could obtain by talking at length with the person to be rated, but they yield this knowledge in far less time and with greater ease than a personal interview could do. They have the additional value of enabling the investigator to determine the significance of the answers by comparing those of one person with those of thousands of others, some of whom are known to have certain personalities, perhaps defective or perhaps especially fitted for certain types of work. In this way it can be learned how a particular person compares with others, which is frequently very important and the very essence of measurement. For example, a person may want to become a salesman, but his answers to a questionnaire may reveal that he lacks the degree of aggressiveness possessed by most of those who have succeeded as salesmen. Obviously, with this knowledge that person could choose his vocation more wisely than he could without it.

(5) *Measurement of values.* Some of the most important characteristics of a person are his dominant interests or values. We have already described Allport and Vernon's method of measuring these (page 50). Other significant aspects of one's personality are his attitudes toward different institutions or social practices. Thurstone has devised an ingenious way of measuring these. The technique consists essentially in learning how friendly or hostile a person is toward any particular institution or practice. This is done by means of an attitude scale, consisting of a number of statements which represent varying degrees of favorableness or unfavorableness toward the institution in question. Part of the scale to measure attitude toward the church is given below:



1. I think the church is a divine institution, and it commands my highest loyalty and respect.

2. I am neither for nor against the church, but I do not believe that church-going will do any one any harm.
3. I feel the good done by the church is not worth the money and energy spent on it.
4. I regard the church as a monument to human ignorance.
5. I believe that the church is losing ground as education advances.[45]

The complete test contains forty-five statements distributed over the whole range between the favorable and the unfavorable ends of the scale. The person whose attitude is being measured is asked to read the items carefully and check each one with which he agrees. Now, it is obvious that a person who checks a number of statements similar to the first one (the scale value of which is .8) is very favorable toward the church. Equally clear is it that if statements like 3 and 4 (scale values of which are 8.1 and 10.2, respectively) are checked, the person is unfavorable. In like manner, a person checking only statements falling in the center of the scale would be neutral in his attitude toward the church. That is, small personal scores indicate favor; large, disfavor; middle, a middle attitude.

Some interesting results have been obtained with this scale. Table VI summarizes some of the findings, as reported by Thur-

TABLE VI

AVERAGE SCALE VALUE OF ATTITUDE TOWARD THE CHURCH OF DIFFERENT GROUPS [46]

(The smaller the value the more favorable the attitude)

Groups		*Scale Value*
Roman Catholics		2.9
Protestants		4.0
Jews		5.4
Men		4.5
Women		4.2
Those who attend church		3.05
Those who do not attend church		5.9
Active members of a church		3.1
Not active members of a church		5.7
University of Chicago students	Freshmen	4.4
	Sophomores	5.0
	Juniors	4.6
	Seniors	4.8

stone and Chave. These data show that there is no appreciable difference in their attitude toward the church of the different college classes, which is contrary to the popular belief that the longer one has been in college the more irreligious he becomes.

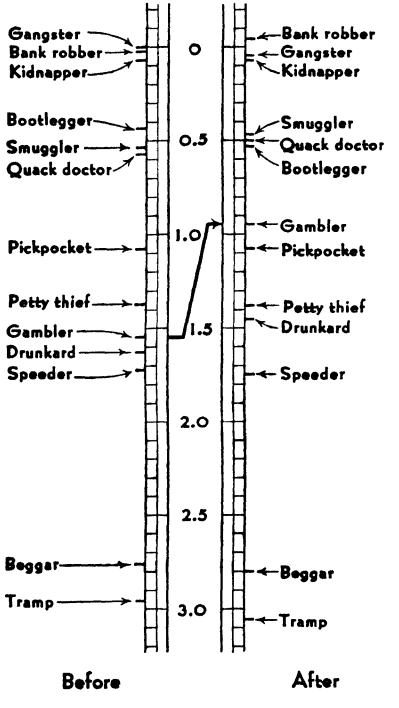


FIG. 26. THE INFLUENCE OF SEEING A MOTION PICTURE (WILLIAM POWELL IN "STREET OF CHANCE") ON THE ATTITUDE OF CHILDREN TOWARD GAMBLING

Notice the shift in the gambler's position. (From L. L. Thurstone, "Influence of Motion Pictures on Children's Attitudes," *J. Soc. Psychol.*, II, 1931, 291–305.)

Attitude scales of this type have been developed and improved by Remmers and have been used to measure attitudes produced or changed by motion pictures, lectures, education, and propaganda.[47]

Closely related to the measurement of attitude is the measurement of our reactions to various situations by the method of paired comparisons. A good illustration of this method is supplied by Thurstone's study of the effect which seeing a certain motion picture about gambling produced on the attitude which students held toward the subject of gambling. Figure 26 shows the positions in which the students placed gambling on a "crime thermometer" before and after seeing the picture. Though the other crimes tend to retain their initial positions, gambling is indicated as a more serious crime after the subject has seen the picture. In locating a crime upon the scale, the subject is asked to choose, of two crimes, the one he regards as the more serious. When his choice has been made, another pair is presented. In this way, every crime is eventually paired with every other. From the

ratings of a group of persons, the seriousness with which various crimes are generally regarded can be determined in a quantitative manner. If a certain crime tends to be judged more serious than all (or nearly all) of the crimes with which it is paired, that crime will stand high on the scale. On the other hand, if a crime is judged less serious than most of the others with which it is paired, that crime will be low on the scale. In this way, the crimes may be scaled in seriousness. Such a scale not only locates the crimes in rank order, but also shows their spacing, or separation distances, along the scale. This method of judging is called the method of *paired comparisons.*

The foregoing paragraphs mention only a few of the available subjective methods of appraising personality or some phase of it. This field of inquiry is one of the most vigorous and promising areas of current psychological research. The student should remember, however, that inherent in any subjective method are certain errors which are very difficult to evaluate. On the whole, psychiatrists tend to discount the value of such methods excessively, while overcredulous magazine readers often accept them as instruments of unerring precision. Between these two extremes lies the proper evaluation.

(6) *Projective techniques.* The term "projective technique" is applied to any one of several methods in which personality is measured or diagnosed by analyzing a person's interpretation of, or his responses to, such materials as cloud pictures, ink blots, finger paintings, puppet shows, drawings, pictures, and music. In telling what a picture means to him or what he sees in an ink blot, or in drawing a picture, or in finger painting, an individual reveals facts regarding his feelings, habits of thinking, moods, concepts, and attitudes. In short, he projects his inner world of meanings and feelings into the materials and situations, and does so without being aware of the fact that he is revealing his personality.

The best known and most widely used of the projective techniques is the Rorschach ink blot test. This test owes its origin to the Swiss psychiatrist Rorschach, who made extensive use of ink blots in an attempt to classify individuals into imagery types and also to define types of insanity.[48] An ink blot (not one of the Rorschach series) typical of those used is shown in Figure 27. The Rorschach test consists of a standard set of ten ink blots, five

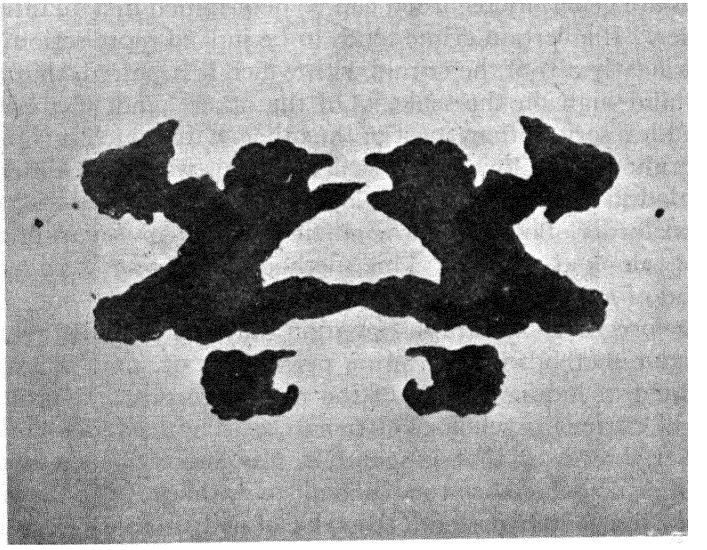


FIG. 27. WHAT DO YOU SEE IN THIS FIGURE?

What one sees in looking at an ink blot tells more about *him* than about the blot.

in various shades of gray and five partly or entirely colored, printed on cards.

The procedure of administration presented by Klopfer and Kelley may be briefly described. The cards are presented to the subject in a specified order, each card in a given position. No time limit is set. Instructions are given at the same time, as follows: "People see all sorts of things in these ink blot pictures; now tell me what you see, what it might be for you, what it makes you think of." The subject is allowed to turn the card as he pleases, but not to look at it from any greater distance than his own arm's length. Any part of the instructions may be repeated. The examiner records everything the subject says in response to each card. In a second phase of the administration each card is presented to the subject a second time. The subject is questioned about where on the card the concept was seen and how it was formed. Any additional spontaneous responses are also recorded.

The scoring is in terms of the location (the area on each card

which forms the basis of the concept), the qualities of the stimulus which determine the characteristics of the subject's concepts, the content of the responses, and the popularity or originality of the responses. A variety of symbols are used for scoring each of these categories. For example, the location symbols include "W" for whole blot area, "D" for large usual detail, "d" for small usual detail, "S" for space, "Dd" for unusual detail, and "dr" for rare detail. The quality symbols include "M" for movement, "F" for form, and "C" for color. The content symbols include "H" for human figures, "A" for animal figures, "Pl" for plant figures, and "At" for figures from anatomy.[49]

The interpretation and even the scoring of a Rorschach record is a highly technical task which presupposes a very considerable amount of specialized training. According to Klopfer, who has described the development of Rorschach training in America, the technique of instruction of fellows of the Rorschach Institute recognizes three skills: administration, which can be acquired easily; structural interpretation, which takes from one to five years to master; and clinical diagnosis, which cannot be taught.[50]

In general, a complete Rorschach record is supposed to reveal the interplay between various intellectual and emotional factors in the subject's personality. These factors include the degree of security or anxiety, and specific imbalances; the degree of personality maturity; creative and imaginative capacities; and a general estimate of intellectual level.[51] Such mental disorders as schizophrenia and epilepsy have been diagnosed from Rorschach records, as have such conditions as feelings of inferiority, negativism, and neuroticism. For example, Miale and Harrower-Erickson compared the Rorschach records of forty-three psychoneurotics with the records of twenty normal individuals of comparable intellectual and age levels. A number of Rorschach "signs," such as the number of "M" responses, the proportion of pure form responses, and the percentage of animal content responses, seemed to differentiate the two groups. The average number of such signs was 6.5 for the psychoneurotic group in contrast to an average of 1.5 for the normal group.[52]

It has been difficult to evaluate the Rorschach technique in terms of the ordinary measures of reliability and validity because the scores of the test do not lend themselves to statistical treatment. In one study Fosberg gave the Rorschach test to the same group

four times with different instructions. The subjects were tested once under standard instructions, once under instructions to make the worst possible impression, once under instructions to make the best possible impression, and once under instructions to look for various things indicated by the examiner. The results seem to indicate that the same fundamental pattern obtained for all four conditions.[53] Validity has been studied principally by the technique of "blind analysis," in which cases are diagnosed from the test records alone and these diagnoses later compared with the diagnoses based upon clinical examinations.

A modification of the Rorschach method for use as a group test has been made by Harrower-Erickson. The ink blots have been mounted on slides, and the test can be administered to a number of individuals at one time. A multiple-choice form of this group Rorschach test is now available.[54]

(7) *Tests.* A seventh method which psychologists have devised to measure personality traits is the provision of test situations. A psychological test is a standardized task given to an individual to measure his performance in comparison with that of others. By far the most successful of psychological tests are those of general intelligence and achievement in school subjects. Indeed, such great progress has been made in the construction and use of intelligence tests that a later chapter will be devoted to this subject. Suffice it to say here that an intelligence test consists of a number of standardized tasks which the person being tested is asked to perform. Some of these tasks involve memory, some discrimination, some the ability to follow directions, some the capacity to solve problems. By comparing the performance of a given person with the performance of others, it can be learned how much and in what direction he deviates from the average. Other well-known tests measure musical talent, artistic judgment, mechanical intelligence, social intelligence, and many other skills and abilities.

Further description of these tests will be given in Chapters VI and VII. Discussion of this material is postponed because, for various reasons, it warrants treatment in detail, not because of the distinction which popular thought makes between intelligence and personality, as when it is said that a person is intelligent but lacks personality. What should be said in such a case is that the person has one desirable personality trait which is offset by

several undesirable ones. Personality is the whole. Intelligence, leadership, coöperativeness, and so on are parts of the whole.

Efforts to measure by test situations such personality traits as aggressiveness, persistence, and honesty have been made. Moore and Gilliland devised an interesting test for the measurement of aggressiveness.[55] These investigators asked the students and faculty of Dartmouth to select the thirteen most aggressive and the thirteen least aggressive men among the students. The men selected were then drilled in adding numbers until they showed no further improvement. They were then given various tests. One was the requirement of performing addition under the distraction of returning the stare of a member of the faculty without looking away; another was that of adding while expecting a painful electric shock. The men who had been picked by their fellow students and by the faculty as aggressive were much less disturbed than the others by these distractions and were better able to control the movements of their eyes.

As another part of the test the subjects were asked to respond to six stimulus words with the first word which came to mind — a *free-association* test. Here again there was a marked difference between the two groups. For example, to the words *enterprise* and *success* the aggressive group responded much more frequently than the other with such words as *initiative*, *push*, *money*, *activity*, *scheme*, *undertake*, *ambition*, *power*, *gain*, *win*, *wealth*, and *advance*. The probability of a definite, forward-looking response to *enterprise* and *success* from an aggressive person was four times as great as from an unaggressive one. The aggressive men were also only one fourth as likely to give a negative response, such as *failure*.

When the scores on the different parts of the test were combined and the two groups compared, it was found that only two men in the least aggressive group made as high scores as the lowest score in the aggressive group. The average score for the most aggressive group was 93, and for the least aggressive, 59. Though this test has not yet been generally used as a measure of aggressiveness, it is a good illustration of the possibilities which this type of instrument offers.

A number of tests of honesty have been devised and used in studying children. Some of them, containing devices to detect dishonesty, give children an opportunity to cheat, lie, and steal

on the playground, in the schoolroom, and at home. The underlying principle of several of these tests of honesty is to find out what children can do on a test without cheating, and then to note whether a particular child greatly exceeds this when given an opportunity to cheat. If, under these conditions, a child greatly exceeds the best regular score, there is a strong probability he has cheated. For example, one test used is a puzzle peg test, consisting of a board with thirty-three holes and a peg in every hole except the center one. The object of the game is to jump every peg until only one is left. This test is of such difficulty that no one of any age has been known to solve it in less than five minutes. If, therefore, a child claims to have solved it in the five minutes allowed, it is almost certain he has cheated.

One of the most striking conclusions reported by Hartshorne and May after extensive investigation is that honesty is not a single personality trait.[56] A person cannot be said to be "honest" or "fairly honest" or "dishonest." He may be scrupulously honest in one situation and quite dishonest in another. He may not pay his monthly bills and at the same time he may be meticulous in paying his gambling debts. An executive may abhor the notion of robbing a bank while he is actually speculating with stockholders' money.

A new kind of personality test has been devised by Cattell. The subject is required to perform certain tasks with a pencil on lines and figures printed on a roll of paper. The paper moves beneath a small opening in the top of a box in such a way that the figures are presented one after another at a certain rate of speed. The test is designed to measure such traits as excitability, quickness of decision, restraint, and resourcefulness. The results so far obtained with this test indicate that the traits measured show low correlations with age and intelligence. The scores of psychotics are markedly different from those of normal subjects.[57]

These tests are samples of the many facets of personality measurement. The above discussion serves only to call attention to a very important area of psychological theory and application which deserves far more consideration than can be allotted to it here. In evaluating results of this type it is important to remember, in the first place, the concept of the psychological whole. Aggressiveness, for example, is not a thing in itself, like white hair or web toes, but is a general name given to a *resultant* of many

factors in the personality working together in certain ways. Thus, two persons who are equally aggressive may be, and often are, aggressive for diametrically opposite reasons. In the field of personality testing, identical scores hardly ever mean identical personalities, just as, in medicine, two severe stomach-aches may mean quite different physiological conditions. A second caution is to guard against easy, unanalyzed judgments, which are little better than sheer name-calling. To label a child dishonest — with all the insinuations of this judgment — because he cheated on an honesty test, and to evaluate another child as honest because he did not cheat on an honesty test would be unwise. It would be equivalent to expecting adult values of a child. It would be a misleading and harmful interpretation of activity that might be quite innocent from the child's point of view. One should remind himself that a person's behavior, whether it be in a test situation or any other situation, must always be interpreted in the light of the question: What was the person really trying to do?

CAN WE CHANGE OUR PERSONALITY?

The answer to the above question is Yes, but it cannot be given without several reservations. The chief reservation is that an individual must be able and willing to understand himself as he really is, and must have sufficient courage to appraise fairly his own undesirable personality traits and their causes. Adequate self-appraisal is excessively difficult. It is a fact that many go through life with hardly a nodding acquaintance with themselves. To be honest with oneself is far more difficult than to be honest with others. A second reservation is that one must recognize what changes in personality he really wants to make. It is easy to slip away from, to distort, or to throw a rosy light upon the facts revealed by self-analysis. Superficial self-diagnosis and a desire for superficial change are worse than none at all. Thus, one might say, "I am going to improve my personality by improving my table manners," when an adequate analysis would suggest that there is even greater need of improvement in self-respect. Fortunately, personality and success are determined by many variables. This makes possible the overcoming of many defects. Weak bodies, in many cases, may be remade, as were those of Theodore and Franklin D. Roosevelt; outstanding success may

be achieved in spite of physical weakness, as in the cases of Descartes and Kant. So with many personality defects. Excessive timidity may be overcome; undue aggressiveness may be curbed; emotional instability may be reduced by careful planning and by "taking stock" of one's emotional habits. But unless one has a reasonably sound body and mind, he obviously cannot attain, in an ordinary lifetime, the most effective and strongest type of personality.

Unless society protects the individual against disease and provides him with a wholesome diet and mental stimulation, he will lack much that is needed for the development of his abilities. This has been stressed in the preceding chapters. It is now time to emphasize another very important point: unless the individual himself takes advantage of the opportunities given him, he cannot and will not attain a very high level of development. The development of an individual personality is not finished when nature lays down its general pattern, nor when parents send the child to school, nor when the school gives its diploma. Personality development is a long process, in which the individual himself plays a part increasing in its importance from the dawn of reflection to maturity. In the school of real life there are no snap courses, no generously graded papers (or papers not graded at all), but there are many unannounced quizzes. In personality development, one must win his own promotions if they are won at all.

VOCATIONAL SUCCESS AND PERSONALITY

It is commonly recognized that personality is an important element in vocational success. The friendly person who inspires confidence obviously has an advantage over one lacking these traits. It is not so generally recognized that, conversely, vocational success has an important bearing on personality. Yet one has only to recall the effect of business failure on men in 1930 to realize that vocational success is one of the most important determinants of personality. To do anything well is a source of confidence and self-respect. Obviously, the more important the thing a person learns to do well, the greater the effect it will have on him and the greater the social recognition it will bring. To learn to play bridge well will give us a measure of confidence and increase the demand for us as partners in bridge games.

But learning to cure the sick, or to organize the productive resources of a community, or to play even a minor rôle in the economic life of a community will do far more to increase self-reliance and to give us a respected place in society. Vocational success will not only enable us to pay our way, but it will be unequalled in the effect it has upon our self-reliance and general feeling of security and satisfaction.

Furthermore, the range of social effectiveness of the person who is vocationally successful extends far beyond his vocation. He earns a reputation for being a sound manager and planner. He is consulted regarding community projects, and his word carries weight. Recognition of worth and a place of influence stimulate further the development of personality traits such as leadership, confidence, and cheerfulness. The person who fails vocationally is denied this stimulation. Perhaps the most important decision which every person must make during his entire life is the choice of his vocation. This decision may be made more wisely in the light of the knowledge of ourselves which psychology helps us acquire.

SUMMARY

Methods of judging personality are of three general types: naïve, or common-sense, methods; popular but unreliable methods; and scientific methods. The common-sense methods make use of: (1) "hunches," (2) past behavior, (3) associations, (4) personal interviews, (5) letters of recommendation, and (6) letters of application. Popular but unreliable methods include: (1) astrology, (2) phrenology, (3) classification by stigmata, (4) physiognomy, (5) theories of physique, (6) study of the acidity of the body, (7) notions about the shape and size of the hand, and (8) graphology.

Four sources of error, or pitfalls, inherent in our judgments of others are: (1) the halo effect, (2) unconscious bias, (3) the acquaintance factor, and (4) the error of the pigeonhole. Scientific methods of judging personality, which attempt to eliminate these sources of error, are: (1) the use of rating scales, (2) rating by order of merit, (3) rating oneself, (4) the use of questionnaires, (5) measurements of values, (6) projective techniques, and (7) the use of tests.

An understanding of any one (including oneself) must be based upon a great deal of information, never on one or two traits or characteristics. We can change our personalities, at least to a limited extent. Several articles and researches have shown what kinds of change will make for greater happiness and sociability. Success in the different vocations depends upon different combinations of personality traits, and one of the values of psychology to us is that it can make us aware of our abilities and disabilities for different lines of work.

QUESTIONS ON THE CHAPTER

1. How does the psychologist explain a "hunch"? Does this explanation give any clue to the average accuracy of "hunches"?
2. What limitations should one place upon the significance of past behavior in judging an individual? Of associations?
3. Give the advantages and disadvantages of the personal interview as a method of judging some one's personality.
4. How can the personal interview be improved?
5. How can letters of recommendation and letters of application be improved?
6. Describe astrology and evaluate it as a method of judging personality.
7. Do the same for phrenology.
8. For stigmata.
9. For physiognomy.
10. For physique.
11. For acidity of body.
12. For shape and size of hand.
13. For graphology.
14. What are the four chief sources of error in our judgments of other people?
15. Describe the purpose and make-up of a rating scale.
16. What are the chief types of questionnaire used in measuring personality?
17. What facts were revealed in the measurement of attitude toward the church? In the measurement of attitude toward the seriousness of different crimes?
18. What facts were revealed in the investigations of honesty?
19. What facts were revealed in the investigations of aggressiveness?
20. How does Cattell's method of measuring personality differ from the questionnaire method?
21. Can we change our personality? Explain.

QUESTIONS FOR DISCUSSION

1. Compare the naïve methods of judging personality with the pseudo-scientific and scientific methods. Are there any general differences?

2. How do we know that judgments based on pseudo-science are of little value?

3. Could any of these judgments conceivably be shifted to the scientific group of methods? Under what circumstances could this be done?

4. Discuss the differences between self-ratings and ratings by others. Explain why these differences should be as they are.

5. Discuss the values and limitations of personality questionnaires. Of attitude scales.

SUGGESTED READINGS

H. L. Hollingworth, *Vocational Psychology and Character Analysis* (D. Appleton Company, 1929). A practical book for the student interested in applying psychology in business or industry.

A. J. Jones, *Principles of Guidance* (McGraw-Hill Book Company, 1934), Chapter X. A very good discussion of rating scales, with numerous examples.

D. G. Paterson, *Physique and Intellect* (The Century Company, 1930), Chapter IV. A death blow to phrenology delivered with an impressive array of experimental studies.

MORE ADVANCED READINGS

Gordon W. Allport, *Personality; A Psychological Interpretation* (Henry Holt, 1937).

Henry A. Murray, *Explorations in Personality; a clinical and experimental study of fifty men of college age, by the workers at the Harvard psychological clinic* (Oxford University Press, 1938).

H. H. Remmers and others, *Studies in Higher Education*, Numbers 26, 31, and 34 (Bulletin of Purdue University, 1934, 1936, and 1938). A series of experimental studies showing how attitudes may be measured and changed by different types of education or propaganda.

CHAPTER SIX

Intelligence: How We Adjust Ourselves to New Situations

LIKE many other concepts in psychology (and some concepts in physics and chemistry), intelligence is more easily measured than defined. Various definitions have been attempted, as: the ability to learn; or the ability to solve problems; or the ability to carry on abstract thinking; or the ability to use one's experience in analyzing and solving problems; or the ability to carry out the tasks of everyday life. Some psychologists, wishing to avoid any possible conflict between what is referred to in a definition and what is measured by intelligence tests, have elected to define intelligence as the ability or abilities measured by intelligence tests.

Regardless of the precise words which we use in defining intelligence or the degree of completeness attained in any definition, we can at least agree that whatever else may be said of intelligence, it has its basis in the behavior of the individual. Intelligence is not a thing, not a substance, not some inherent power that makes us do things. The word refers to that behavior of the organism which is best designated as *intelligent behavior.* This behavior has certain characteristics which can best be observed by comparing an individual who acts very intelligently with one who acts very stupidly. Watch the person who learns easily and quickly and compare him with one who learns with difficulty or not at all. What can you discover that throws light on this difference in ability to profit by experience? Or better yet, make a careful study of the biography of some great artist, physician,

scientist, economist, or inventor.[1] What characteristics distinguish these men from individuals found in an institution for the feeble-minded? Some of these differences will be discussed in the following section.

CHARACTERISTICS OF INTELLIGENT BEHAVIOR

(1) *Alertness.* The highly intelligent person is alert, wide awake, sensitive and attentive to what goes on around him. He is sensitive to stimuli which do not arouse the ordinary person. He goes about any task in a "heads up" fashion. He has normal sensory equipment (ears, eyes, etc.) and this seems to be integrated with his high level of nervous energy and of general bodily activity. The importance of alertness as a characteristic of intelligent behavior is attested by the fact that the early intelligence tests were frequently called "mental alertness" tests. The dependence of alertness upon normal sensory equipment is seen in the fact that children with defective sense organs who appear dull or stupid show marked shifts toward alertness and normal intelligence when their defects are corrected.

(2) *Assimilation and retention.* It is obvious that we cannot profit fully from our impressions, no matter how clear they are, unless they are *assimilated* and *retained.* Some individuals, apparently without effort, retain all of their experiences as memories whether they are important or not. Some are able to repeat eight digits on hearing them once, while others can repeat only five. This matter of retention is such an important factor in intelligence that nearly all intelligence tests include a memory span test. The importance attached to this test has been shown to be well justified by an investigation by Brotemarkle, which indicates that the memory span test is highly diagnostic of general intelligence.[2] A similar conclusion was reached by Louttit, who found that students who made superior grades also excelled in ability to learn and recall experiences.[3] Buckingham also reports a relation between ability to reason and ability to remember.[4]

Differences in ability to retain are undoubtedly due in part to heredity. The importance of physical condition is indicated by the fact that a person half asleep, fatigued, or intoxicated cannot fixate and retain experiences as well as when he is alert and fresh. The importance of age is indicated by the increase of

one's memory span with age. The more truly psychological factors that influence retention are: (a) amount of related knowledge already acquired, (b) methods of study, and (c) interest. These will be discussed in Chapter XI.

(3) *Active manipulation of ideas.* A fertile imagination is an important element of intelligence. Some people do very well as long as things move in the usual way, but are completely at sea when a novel situation arises. They are very likely to plod along day after day doing the same thing in the same old way. It never occurs to them that a short cut might increase their efficiency. In contrast, there are those who imagine a number of ways of meeting new situations. They are able to see the new situation as a combination of familiar elements, and to apply what they have learned to it. When performing a task, they are likely to try various methods; thus they have a good chance of learning to perform the task more efficiently. These are the mentally alert, who, no matter how they are turned, always land with their feet on the ground and their heads up.

(4) *Insight.* The intelligent person does not sit for hours trying to force a square peg into a round hole. He has an amazing ability to see into a situation, to see the solution to a problem with relatively little trying-and-erring. He has a marked ability for keeping many factors in mind in solving a problem, and an equal ability to see in these factors a solution to the problem. He is very unlikely to make blind, stereotyped trials against frustrating conditions.

(5) *Self-criticism.* An intelligent man sees what is required and compares his performance with it. The importance of this comes out clearly when we give an intelligence test to a dull child. An outstanding characteristic of such children is their self-satisfied complacency, no matter how complete may be their failure. If such a child is given the task of making a rectangle out of two triangles, he is apt to put them together so as merely to make a large triangle, and then turn to you for approval. The intelligent child, on the other hand, has a clearer understanding of what is required and is able to judge whether or not he has succeeded.

(6) *Confidence.* The intelligent man has met successfully problem after problem; he has thus developed confidence in his capacity to meet new situations, and this confidence in turn helps

him to continue to do so. "Nothing succeeds like success." On the other hand, lack of confidence gives rise to worry and so to distraction, and it thus makes success more difficult. Furthermore, lack of confidence may result in lack of effort. When this happens, the discouraged individual deprives himself of the means necessary for further growth and development. "Failure breeds failure."

(7) *Strong motivation.* Finally, the intelligent person is interested or strongly motivated. As was stated above, alertness seems to be dependent upon high levels of nervous energy and bodily activity. This is another way of saying that the alert person is highly motivated; for motivation is unquestionably tied up in some way with the general level of bodily energy. It is interesting to note in this connection that Spearman in his two-factor theory of mental abilities regards his universal or common factor "g" (which has frequently been identified as general intelligence) as a measure of a person's "mental energy." [5]

Energy as a characteristic of intelligent behavior is not fully appreciated in most of our thinking. It is a common misconception that an individual who is manifestedly low in ability could rise to a much higher level if his interest could be aroused, if he could be properly motivated. This notion fails to recognize that ability and interest are symptomatic each of the other, that motivation varies with levels of intelligence. One very striking characteristic of gifted children is this very factor of motivation. They seem to have an almost insatiable desire to know things and to do things. And interestingly enough this strong motivation does not come from stimulating conditions in the environment, as is seen in the fact that other children in the same situations seem never to find anything to do and seem never to be aroused by the conditions around them. That the motivation is somehow internal and tied up with bodily energy is well illustrated in the case of Helen Keller. She was able to achieve a life of distinction with a lack of normal sensory equipment which precluded the possibility of being aroused by many outside stimulating conditions.

Our analysis of the factors involved in intelligent behavior is confirmed by an experimental study made by Alpert of the reasons young children fail to solve simple problems. She found one important factor to be self-consciousness, or the inability to lose oneself in the task. She also discovered that other significant

factors were lack of confidence, lack of interest, discouragement, excitability, lack of observation, and emotional immaturity or failure to respond to the situation.[6]

THE MEASUREMENT OF INTELLIGENCE

Only in recent years have qualitative estimates of intelligence been converted into quantitative measurements. This is a great scientific advance, for one of the aims of science is to substitute quantitative judgments for qualitative ones. Instead of saying a man is tall or heavy, it is more definite and therefore more scientific to say that he is six feet tall or that he weighs two hundred pounds. We then have information that enables us to compare accurately the size of the man in question with that of others, provided a large number of other men have been measured in height and weight. Likewise, when we consider intelligence, it is an advance in definite and precise knowledge and statement to say that a given person is as intelligent as the highest 10 per cent of his group rather than merely that he is bright.

(1) *Value of measuring intelligence.* Such quantitative measures of intelligence are important in a number of ways. They enable us to choose a career more wisely; for obviously, we ought not to choose a profession which demands for success a greater degree of intelligence than we possess. Parents should also know the intelligence of their children. Perhaps, if they did, fewer would attempt to make professional men and women out of children who lack the necessary ability. Knowledge of the intelligence of their children would also enable them to tell more reliably whether their children are working to their full capacity. That teachers should know the learning capacity of pupils in their care is obvious. Children frequently show behavior problems in school because they are not given enough work to keep them busy. Other children give up their school work because they cannot do what they are required to do. When the ability of each child is known, the teacher can do much to adapt requirements to meet the needs of each.

Knowledge of how an individual's mental ability compares with that of others is also of help to judges of juvenile courts. A bright boy who has broken the law needs different treatment from that needed by a dull boy. Placement bureaus also need similar

knowledge. To place an exceptionally bright boy with dull foster parents is to invite trouble. The quick-witted child is likely to be a jump ahead of the parents, with the result that he is denied needed discipline, guidance, and mental stimulation. On the other hand, to place a dull child with superior foster parents is to invite hardships and disappointment for both parents and child. Exact knowledge of intelligence is also of value to employers. Some types of work can be done only by those who have superior intelligence. Other types of work are done better by those who have inferior intelligence.

(2) *Binet's pioneer work.* The first successful attempt to measure intelligence was made in France by Alfred Binet. Early in the twentieth century the school authorities of Paris became interested in the problems of individual differences in intelligence and of the bearing of intelligence on school work and conduct. Binet was asked to devise a way of separating the bright and dull pupils. He was guided in his efforts by the very simple observation that older children are, on the average, more intelligent than younger children: that is, five-year-olds are more intelligent than four-year-olds, six-year-olds are more intelligent than five-year-olds, and so on. In these differences Binet saw a natural yardstick. With this simple observation as his guiding idea, he proceeded to calibrate the measuring stick provided by nature. He set out to discover the abilities of children of different ages to perform various tasks requiring intelligence, such as repeating short sentences and digits, solving simple problems, and learning from experiences common to all children of a given culture. In the first investigation about 200 children were studied. Each child was asked to do a number of tasks, in order to get an approximate idea of what children of a given age level can do. On the basis of this preliminary survey, Binet arranged the tests tentatively and gave them to a larger number of children between the ages of three and twelve. He was then able to state with assurance what the average child of Paris of any age could do. From a knowledge of the average, it was simple to determine how far any particular child rose above or fell below that point.[7] This process of obtaining average scores from a large group of subjects tested on experimentally selected material is called *test standardization.*

(3) *Development of Binet's work.* Almost immediately Binet's work was heralded as a great scientific advance, and psychologists

all over the world began to adapt his test to meet the needs of children in different cultural groups. Some of the men who quickly recognized the value of Binet's approach and began to use it in America were H. H. Goddard, F. Kuhlman, and L. M. Terman. The most recent and probably the best American revision of Binet's scale is the Terman-Merrill revision, which was made available for use in 1937. This revision is based upon extensive experiments, which have revealed many tasks that children of different age levels can perform and that younger children cannot execute successfully. For example, it was found that children between 3 and $3\frac{1}{2}$ years can string beads on a shoestring, repeat three digits, and locate familiar animals in a picture. The average child between $3\frac{1}{2}$ and 4 can, in addition, obey such simple commands as "Put the spoon in the cup"; he can select the longer of two sticks which are two and two-and-a-half inches long; and he can reply correctly to simple questions, such as "What must you do when you are thirsty?" Still older children can, on the average, perform these tasks just as well, and many other more difficult ones besides. Difficulty advances steadily with age. Since the test is scored in terms of years, the average child of a given age will score on the scale the number of years equal to his own age. The score on the test is called *mental age.* It is not expected that an average child will pass all the tests in the group corresponding to his age. In fact, he will probably fail to pass some tests in that group, but he will pass besides, enough tests in the groups above his chronological age to give him a mental age score equal to his chronological age. For example, an average child of 10 may pass all tests in year 8; this will bring his score to 96 months. He may fail one of the tests for year 9; of tests for year 10, he may fail on two. Therefore, to make the average score for his years, reckoned chronologically, he must pass enough tests above 10 to make up for the points lost on tests in his own age group and below.[8]

(4) *The concept of mental age.* Mental age, often expressed as M.A., represents the level of mental development attained by a child (or adult), stated in terms of the average mental development of children of a given age. If the mental development of a child of 6 is equal to that of the average six-year-old, we should say that his mental age is also 6. If his mental development equals that of the average child of 8, we should say that his

mental age is 8 and should class him as a superior child. If he should score less than 6, his mental development would be below average. Since mental age indicates the level of intelligence attained, it is a measure of what the child can actually do. Hence, in selecting a child for a given task, or in classifying children in terms of their learning ability, it is important to know their mental ages.

If, however, we should be more interested in the future of a child, it would be more important to know his rate of mental growth than the level that has been attained at any particular time. Two boys may have the mental age of 8. But one may have attained it in six years, and the other may have required ten. In that case, the former would be developing one and a third times as rapidly as the average, whereas the latter would be developing only eight tenths as rapidly as the average. Since both will develop for approximately the same number of years, it is evident that the rate is important in order to determine the level of mental development each can be expected to attain eventually. It is also frequently desired to compare the intelligence of individuals of different ages. To do this the rate of mental development, or of the degree of brightness or dullness, provides a common denominator that makes possible such comparison.

(5) *The intelligence quotient, or I.Q.* The rate of mental development is found by dividing the level of mental development (M.A.) by the time taken to attain the level, that is, by the chronological age (C.A.). The quotient thus obtained is multiplied by 100, and the product is called the intelligence quotient, or I.Q. For example, if a child whose chronological age is 6 has a mental age of 9, his rate of mental development would be 9 divided by 6, or 1.50. This means that he is developing mentally one and a half times as rapidly as the average child. Since the quotient 1.50 is multiplied by 100, which eliminates the decimal point, this gives his intelligence quotient as 150. The intelligence quotient of the average child is, of course, 100. If a child's mental age is less than his chronological age, his I.Q. is less than 100. The smaller the I.Q., the greater the retardation of development indicated. The concept of the intelligence quotient was devised by Stern, a German psychologist. Its popularity in this country is due in no small measure to Terman.

Since the I.Q. is used as a measure of rate of mental growth, one meets a serious difficulty in using it with adults or after mental maturity has been reached. Take, for example, an individual who at the age of 16 earns an M.A. of 16. At this time he has an I.Q. of 100. Now let us suppose that at the age of 20 this individual still has an M.A. of 16 because mental maturity as measured by this particular test is regarded as being reached at the age of 16. We obtain by the customary procedure an I.Q. of 80. With advancing age the individual's I.Q. would continue to drop if we continued to calculate the I.Q. in the customary way. It is obvious, of course, that some adjustment should be made to take care of the fact that mental maturity *as indicated by M.A.* does not increase after age 16. This adjustment is made by dividing the M.A. earned at any time after maturity by the C.A. at which the particular test in question regards mental maturity as being reached. Terman and Merrill set 15 as the average age of maturity for the 1937 revision of the Stanford-Binet Scale,[9] but psychologists are not in agreement on the matter. The average age used differs from one test to another. This is due to the fact that all tests do not measure exactly the same functions. Different mental functions, of course, develop at different rates and reach their maxima at different times. The ability to discriminate between lifted weights, for example, may reach its maximum level at about the age of 10, whereas the ability to repeat digits (memory span for digits) may reach its maximum level at the age of 18.

Since the I.Q. concept is designed primarily for the purpose of describing the rate of mental growth of children, its use with adults, except those mentally retarded, is questionable even when adjustments are made. The common practice in testing adults, therefore, is to use other types of tests (these will be described in a subsequent section). There is one notable exception to this practice, however. The Bellevue Scale, an individual intelligence test devised by Wechsler, makes use of M.A. and I.Q. in testing both adults and adolescents.[10] The I.Q. used with this test, however, is not defined in exactly the same way as the I.Q. which has been defined above. In the usual formula, I.Q. equals M.A. divided by C.A. In Wechsler's definition, I.Q. equals the score earned on the Bellevue Scale divided by the expected mean score for individuals who have the same C.A. as

the person being tested. For example, let us suppose that a 43-year-old person earns a raw score of 40 on the Bellevue Scale and that the average score made by a typical group of 43-year-olds on this test is 40. The earned score of 40 divided by the expected score of 40 for persons of this age gives an I.Q. of 100. In this way the concept of I.Q. is refashioned to make it comparable for all age groups from 10 to 60 years.

(6) *Limitations of the Binet method.* There are several limitations which apply both to the original Binet scale and to its revised forms. First, the test is an individual test — it must be given to one person at a time and it requires approximately an hour for its administration. Obviously, this greatly limits the number of persons who can be tested by a single examiner. Second, it can be administered reliably only by a trained examiner, usually called a psychometrist. The examiner must have memorized thoroughly every detail of the test, and must also have a thorough knowledge of how to score the innumerable responses which a child may make in the test situation. Finally, a number of the items in the scale are so-called "language" items. They presuppose at least an average ability to understand, speak, and read the English language. As we shall find later (see Chapter XV), the test may penalize severely a child who is for any reason retarded in language development, as, for instance, children are apt to be who are brought up in homes where a foreign language is spoken.

(7) *Performance tests of intelligence.* In order to overcome the language difficulty of tests of the Binet type, psychologists very early turned to the development of what has come to be known as a *performance test.* This type of test generally requires the subject to manipulate materials with his hands; for instance, to place blocks of different geometrical designs into their appropriate places in a board, to put together parts of a picture very much as in a jig-saw puzzle, or to complete a picture by placing cut-out pieces into the proper holes. The earliest test of this kind was devised by Seguin and later modified by Goddard. In 1917, Pintner and Paterson assembled into one scale and standardized a series of fifteen performance tests. Parts of the materials of this scale are shown in Figure 28.[11] In 1930, Arthur published a restandardization of ten of the fifteen tests in this scale. The Arthur Performance Scale is now used extensively in psychological

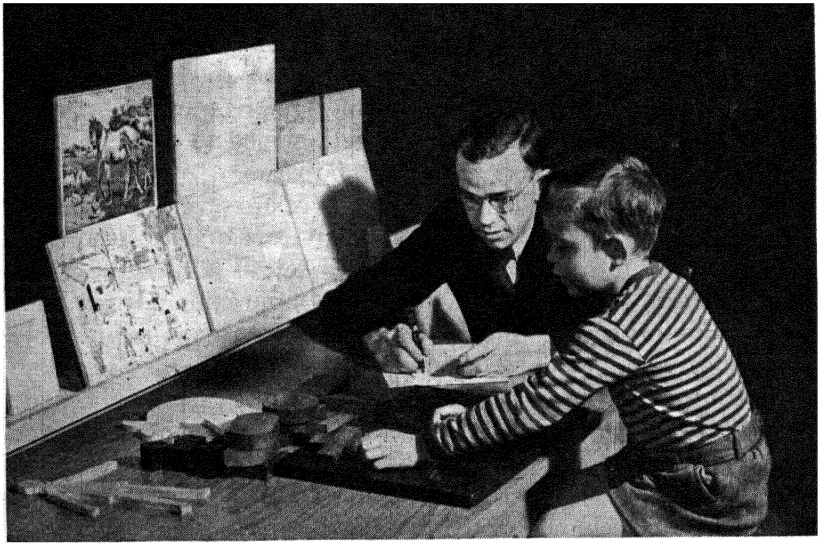


FIG. 28. A NON-LANGUAGE INTELLIGENCE TEST

Equipment for Pintner-Paterson Performance Scale. Intelligent parents, as well as teachers and pediatricians, want to know the objective, impersonal facts concerning children.

clinics when there is evidence of a language handicap or when it is desirable to check or to supplement the results which have been obtained by other tests.[12]

Most performance tests are individual tests. The descriptive term "performance" is widely applied, however, to any kind of test, either individual or group, which makes little or no demand upon language. It is even used to describe paper-and-pencil tests without true language items. An example of a group non-language or performance test is the Visual Classification Test used at Army Induction Stations to test all non-English-speaking and illiterate inductees. Another non-language test, known as Test "2abc," was given in Replacement Training Centers in pantomime to Grade V men and to men who could read little or no English. It might be stated, however, that these tests are not, strictly speaking, intelligence tests, having been devised to determine the inductee's ability to profit from army training.[13]

(8) *Group tests of intelligence.* Many group tests of intelligence, tests which may be given to many persons at the same time, have been devised. These tests are clearly more suitable than the Binet tests for measuring large groups of persons, as the children in public school systems or applicants for industrial jobs.

Among the group tests most widely used with school children are the Kuhlman-Anderson Intelligence Tests designed for grades one through twelve [14] and the Otis Quick-Scoring Mental Ability Tests designed for grades one through sixteen.[15] The California Tests of Mental Maturity are designed for individuals from kindergarten age to adulthood.[16] The American Council Psychological Examination prepared by L. L. Thurstone and T. G. Thurstone is used extensively in high schools and colleges.[17] A group test designed for use in industrial situations is the Wonderlic Personnel Test. This is an adaptation of the higher form of the Otis Self-Administering Test of Mental Ability. The word *personnel* rather than *mental ability* or *intelligence* is used in the title to avoid the negative reaction of many applicants and employees to a test dealing with mental ability.[18] Another test of this type adapted to the needs of business and industry is the Purdue Adaptability Test.[19] The Army General Classification Test, which was given to all enlisted men during World War II, resembles the ordinary group intelligence test in many respects although it was not called an intelligence test. It was designed to measure the enlisted man's ability to learn. Five levels of learning ability were designated: Grade I, very rapid learners; Grade II, rapid learners; Grade III, average learners; Grade IV, slow learners; and Grade V, very slow learners. Men were assigned to these grades according to the army standard scores (not I.Q.'s) earned on the test.[20]

As already indicated, most of the group tests, especially those designed for testing adults, do not measure intelligence in terms of M.A. or I.Q. In such tests it is customary to give the testee a raw score based upon the number of test items answered correctly, and then to convert this raw score into a derived score, such as a *percentile score.* The percentile score corresponding to a given raw score indicates the per cent of individuals in some standard group that earns this score or a lower one. For example, suppose that the American Council Psychological Examination has been given to all of the freshmen at Purdue University. John

Doe, who is a freshman at Purdue, takes this test and makes a score of 107. Having calculated the per cent of the Purdue freshmen who have scores of 95 and less, 96 and less, 97 and less, and so on, we are able to tell John Doe that he has a percentile score on this test of 40, since 40 per cent of the Purdue freshmen have been found to score 107 or less on this test. If this test had been given to a representative sample of the entire population, assuming that it had been designed to measure the entire population, we could by the same procedure tell John Doe what per cent of the general population have scores of 107 or less on the test.

An examination of various group tests of intelligence reveals that these tests contain a wide variety of materials or test items which measure a variety of mental functions. The more common kinds of test items found include: vocabulary items, arithmetic reasoning items, number series completion items, disarranged sentences, verbal and spatial analogies, general information items, and reading comprehension items. Like the Binet tests, these tests place a great deal of emphasis upon language ability. In fact, the ability most commonly measured by the ordinary group intelligence test is verbal ability. It is not surprising, therefore, that group tests of intelligence show very high correlations with achievement tests — those tests designed to cover achievement in specific school subjects — and with success in school as indicated by school grades. Indeed, many of the present group tests were constructed for use in school situations. This is true of several of those listed above. Another is the Ohio State University Psychological Test, which was devised by H. A. Toops for use in testing high school and college students.[21] A trend toward the construction of group intelligence tests for specific purposes or for particular groups can be seen not only in these tests designed for school use but also in the tests designed for use in army placement, vocational guidance, and industrial situations.

AMOUNT AND SIGNIFICANCE OF DIFFERENCES IN INTELLIGENCE

Differences in intelligence are normally distributed; that is, there are more people of average ability than there are very bright or very dull ones. This is shown in Figure 29 by the distribution of the I.Q.'s of 2,904 children between the ages of 2 and 18. On this curve, the base line represents I.Q., and the

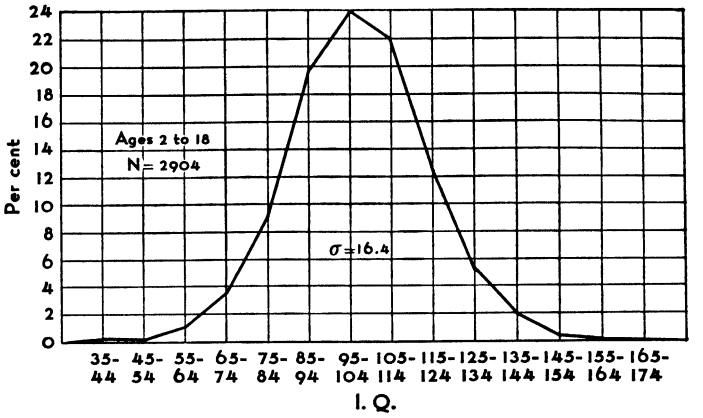


FIG. 29. DISTRIBUTION OF I.Q.'S OF 2904 CHILDREN ON THE 1937 STANFORD REVISION OF THE BINET TEST

(From L. M. Terman and M. A. Merrill, *Measuring Intelligence*, Houghton Mifflin, 1937, p. 37.)

height of the curve represents the per cent of children. More persons have I.Q.'s between 95 and 104 than at any other point on the scale. As we go above or below this average, numbers decrease. This graph is based on the composite results of the two forms of the 1937 Stanford revision of the Binet Test. Data obtained from other standardized tests confirm the findings summarized in this curve. On the basis of these results, Table VII was constructed to show the percentage of persons in a "randomly" selected group with I.Q.'s above a certain point.

TABLE VII

PER CENT OF PERSONS IN A RANDOMLY SELECTED GROUP HAVING I.Q.'S ABOVE A CERTAIN POINT [22]

10%	of	persons	have	an	I.Q.	of	115	or	above
20%	"	"	"	"	"	"	110	"	"
30%	"	"	"	"	"	"	106	"	"
40%	"	"	"	"	"	"	103	"	"
50%	"	"	"	"	"	"	100	"	"
60%	"	"	"	"	"	"	97	"	"
70%	"	"	"	"	"	"	94	"	"
80%	"	"	"	"	"	"	90	"	"
90%	"	"	"	"	"	"	85	"	"

It is clear from this table that the great bulk of people, in fact 80 per cent of the total, have I.Q.'s between 85 and 115. One conclusion that may immediately be drawn from the facts is that when we classify a person as dull or bright — as we are apt to do all too frequently — the chances are about eight out of ten that we are wrong; that is, he is probably neither stupid nor bright, but of average intelligence. The statement that God must have loved the common people because he made so many of them is entirely in accord with the measurements of intelligence which have been obtained.

In recent years, excessive emphasis has been placed on intelligence as a condition for successful living. But for a person to achieve vocational success, to be a good citizen and neighbor, to win the love, confidence, and respect of his family, to enjoy beauty in nature, in art, and in social relations, it is not important that he excel in intelligence. If we leave aside the extreme lower end of humanity and the extreme upper end, the 80 or 90 per cent that remain do not differ greatly in the fundamental human traits. The great bulk of them experience the same joys and sorrows; they have similar ideas of right and wrong; they think about the same things. The fact that some can solve problems in algebra or can read Greek is, after all, a matter of little importance when seen against the background of their common characteristics. Neither a man's humanity nor his success in living depends upon excelling his neighbor in intelligence.

At the extremes of the distribution, however, there are persons who do need special treatment. This is especially true of those at the lower extreme. The definitions of such terms as *genius*, *feeble-minded*, and *moron* in terms of the I.Q. are given in Table VIII.

The feeble-minded group, that is, those with I.Q.'s of 70 or below, need special treatment or observation. Many of those in the upper division of this group, those with I.Q.'s of about 50 to 70, can and do lead fairly independent lives as long as no emergency or need of original thinking arises. A person with an I.Q. below 50 almost invariably calls for institutional care, since such an individual is unable to avoid the common dangers of everyday living without constant supervision.

The adjustments of individuals at either extreme of the intelligence range, however, are not entirely a matter of their I.Q.'s.

TABLE VIII

I.Q. LEVEL OF DIFFERENT CLASSIFICATIONS OF INTELLIGENCE [23]

Classification	*I.Q.*	*Per cent of all children included*
Genius or near genius	above 140	.25
Very superior	120–140	6.75
Superior	110–120	13.00
Average	90–110	60.00
Dull normal (backward)	80–90	13.00
Dull (borderline)	70–80	6.00
Feeble-minded	below 70	1.00
Morons (mental age of 8–10 years)	50–70	.75
Imbeciles (mental age of 3–7 years)	25–50	.19
Idiots (mental age of 2 or below)	below 25	.06

(By permission, adapted from L. M. Terman, *The Measurement of Intelligence*, Houghton Mifflin).

The term *genius* may be applied to individuals with an I.Q. below 140, or it may be withheld from individuals who have an I.Q. above 140. In short, there are other criteria upon which we normally base our judgments of genius. An individual with a very high degree of some special ability may be labeled a genius although his tested intelligence is only slightly above normal. Some individuals who have very high I.Q.'s may never impress the general public with their accomplishments. At the other extreme, several factors in addition to I.Q. are taken into account in the diagnosis of feeble-mindedness. The individual's I.Q. must be viewed against a background composed of such elements as his medical history, his family history, his school history, and his adjustment to his present social environment. The lines of demarcation between "normal" and "feeble-minded" and between the various grades of the feeble-minded are not fixed but subject to change or variation in particular cases.

THE VALIDITY AND RELIABILITY OF INTELLIGENCE TESTS

Psychological tests are customarily evaluated in terms of a number of criteria, chief among which are the criteria of *validity* and *reliability*.

Validity is the degree to which a test measures what it is supposed to measure. Or stated in terms of the methods of determining it, validity refers to the relationship between the scores of a test and some recognized index or criterion of the thing which the test reputedly measures. Remmers and Gage have pointed out that validity is a specific concept. That is, it must always refer to a specific purpose (what is reputedly measured) and a specific group of individuals.[24] If a test is supposed to measure the intelligence of preschool children and does so, it is a valid intelligence test for preschool children. It would not be a valid measure of musical ability; neither would it be a valid measure of the intelligence of high school pupils.

The general validity of present-day intelligence tests is indicated by the fact that the results obtained correlate with those of other indicators of intelligence, such as success in school, educational level, occupational level, social competency, and previously validated tests or measures.

Almost any intelligence test, and especially one designed for use in school situations, shows a significant correlation with success in school as measured by grades. Correlation coefficients between college grades and intelligence test scores range from around .35 to .65. These are useful degrees of validity. The higher coefficients, at least, make it possible to pick out with great accuracy those who will leave college on account of poor grades and those who are most likely to win scholastic honors. That the intelligence scores of men in different occupations agree fairly well with what our experience would lead us to expect is shown in Figure 30. As we go from the occupations which require high degrees of intelligence to those which require lower degrees of intelligence, the average scores decrease. The same picture is obtained when test scores are compared with educational level as seen in Table IX. Here the results agree quite well with what we should expect. The higher the educational attainment, the higher the average intelligence score. It was found in using the General Classification Test with enlisted men in the army that men who made high scores usually did best in various army training courses, and that those who made low scores were likely to learn slowly and be less alert in their army work.[25]

From these facts we can conclude that intelligence tests enable us to predict with considerable accuracy the likely success of

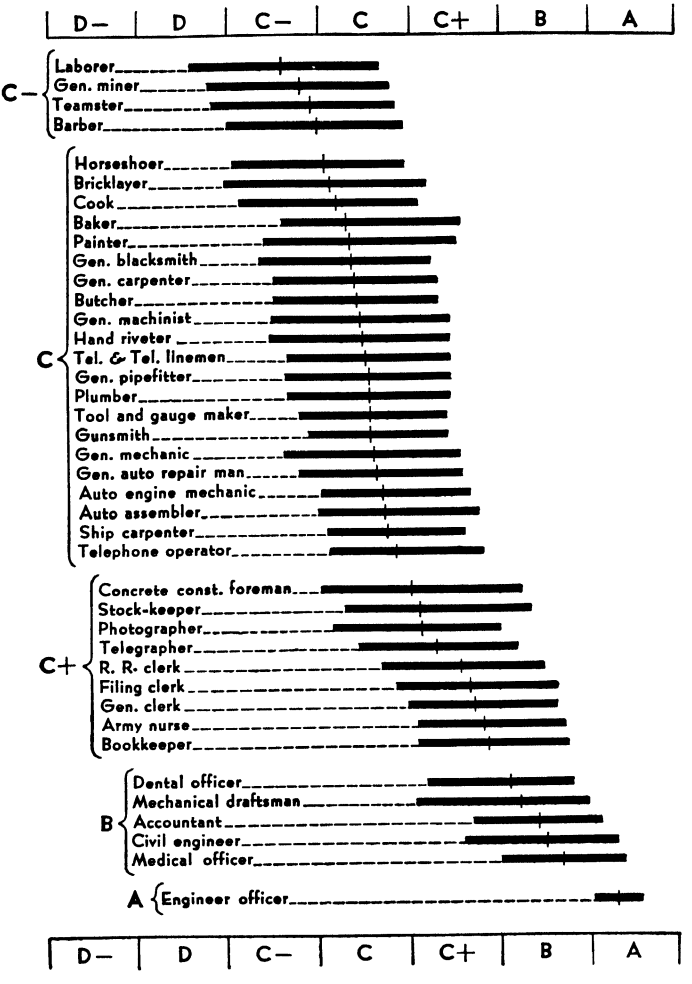


FIG. 30. DIFFERENCES IN THE AVERAGE INTELLIGENCE OF MEN IN DIFFERENT OCCUPATIONS

For each occupation, the small vertical dash represents the mean, and the length of the horizontal bar the middle fifty per cent. Classifications from A (high) to D– (low) are arbitrary. (From R. M. Yerkes, ed., "Measurements of Intelligence in the United States Army," *Memoirs of the National Academy of Science*, XV, 1921, 829.)

TABLE IX

AVERAGE SCORES ON PERSONNEL TEST ATTAINED BY EDUCATION AND SEX GROUPS [26]

Educational Level	*Sex*	*No. of Cases*	*Average Score*	
			Male	*Female*
8th grade and under	Male	2249	10.96	
	Female	1601		10.87
1st, 2nd year high school	Male	1845	19.69	
	Female	2533		21.0
3rd, 4th year high school	Male	5361	24.40	
	Female	8981		22.48
1st year college or equivalent	Male	2302	28.92	
	Female	2714		24.75
2nd, 3rd year college	Male	2827	28.38	
	Female	1560		26.04
4 years college (graduate)	Male	3227	30.84	
	Female	1042		29.12
Beyond 4th year college	Male	478	31.50	
	Female	144		30.65

individuals in situations where intelligence is recognized as a large and an important factor.

The second criterion used in evaluating a test is *reliability*. The term refers to the self-consistency of a test; that is, the extent to which a test yields the same result when one part of it is compared with another, when one form of it is compared with another form, or when the test is repeated. To determine the reliability of a test, it is necessary to obtain two sets of scores from the same population. This can be done by giving the test twice, by giving two comparable forms of the test, or by dividing the test into two parts (for example, odd items and even items). The two sets of scores are then correlated. If the resulting coefficient, known as a *reliability coefficient*, is high, the test is said to be reliable. Most intelligence tests yield coefficients of reliability between .85 and .95. For example, the correlation between Form L and Form M of the 1937 Stanford revision of the Binet-Simon tests as reported

by Terman and Merrill was .93 for children above six years of age.[27] The reliability coefficient for the Bellevue Scale determined by the test-retest method was .94 for adults.[28] Group tests yield correspondingly high reliability coefficients. The reliability coefficients for the four batteries of the California Tests of Mental Maturity range from .90 to .96.[29]

One of the persistent problems in the use of intelligence tests is the prediction of intelligence at one age from measurements made at an earlier age. The problem is only indirectly related to reliability, since the test-retest method of determining reliability, while it involves comparison of scores earned at different times, is a very specialized case of retesting. The problem is basically one of validity; for one of the expressed and specific purposes of intelligence tests is the prediction of intelligence.

An examination of the literature reveals that intelligence cannot be predicted with a very high degree of accuracy on the basis of tests given before the age of four or five years. It can be seen in Table X that tests given before a child is four months old have practically no validity for predicting the child's intelligence four

TABLE X

COMPOSITE OF TEST-RETEST CORRELATIONS FROM SEVERAL STUDIES OF INFANT AND PRESCHOOL GROUPS [30]

Age at earlier test	*Interval Between Test and Retest*							
	Less than 4 months	*4 to 9 months*	*10 to 15 months*	*16 to 21 months*	*22 to 29 months*	*30 to 41 months*	*42 to 53 months*	*Over 53 months*
Under 4 months	.57	.33	.10	− .03	− .09			
4– 9 months	.77	.53	.49	.23	.16	.46	.00	
10–15 months	.78	.66	.50	.45	.33			.55
16–21 months	.76	.68	.51	.44	.38	.41	.25	.33
22–29 months	.82	.74	.68					.43
30–41 months	.87	.68	.66	.49	.57	.57	.56	.66
42–53 months	.81	.65	.72	.71	.66	.63	.63	.41
54–65 months			.76		.73			

(By permission of the American Psychological Association.)

to nine months later. A test given at four years yields a validity coefficient of about .70 for an interval of about eighteen months.

There are a number of factors which contribute to this lack of consistency. The immaturity of such a mental function as attention makes it difficult to obtain an accurate initial record of the few mental functions which can be tested. The rapidity of growth during early infancy, the appearance of new modes of behavior, the unreliability of the tests, and the relatively large increment of growth represented by an interval of a month or three months during infancy all contribute to the inconsistency. Then, too, there is the possibility, if not the fact, that the tests measure different kinds of behavior at different age levels. This factor affects the predictive value of tests at all ages, but it undoubtedly plays a larger part in preschool tests than it does in the tests for older children.

Regarding the predictive value of tests for school-age children and adults the situation is quite different. The facts seem to indicate that it is possible to predict intelligence at one age from measurements at an earlier age with a high degree of accuracy. If the tests are properly administered and the individuals examined remain in fairly stable surroundings, predictions can apparently be made with a range of accuracy which varies between a correlation of around .90 for immediate or short-time predictions and one of around .60 to .70 for long-time predictions (from 6 to 10 years). Putting together data from various studies bearing upon the interval between test and retest of school-age children, Thorndike worked out a curve for all of the data. From the curve he estimated that the correlation for an immediate retest was about .90 and the correlation for a test given after a five-year interval was about .70.[31]

The high correlation for an immediate retest agrees with what has been said above regarding reliability. It means that if the tests have been well administered, shifts or changes in test-retest results are likely to be relatively small in the majority of cases of immediate retest. With a correlation of .93, Terman found that for 6 per cent of a group of 435 children the I.Q. remained the same, for 37.2 per cent it varied three points or less, and for 81.2 per cent it varied nine points or less. In only 18.2 per cent was there a variation of as much as ten points.[32]

The correlation of .70 for a retest after a five-year interval indicates that we can predict intelligence over a five-year period with as much accuracy as we can predict success in school or the

occupational level likely to be attained. Even if the accuracy of prediction drops still further with an increase in the interval between test and retest, it will remain in the neighborhood of the validity coefficients reported for various intelligence tests. It is important, however, to note that the accuracy of prediction decreases as the interval for which the prediction is made increases, at least up to a certain point.

To summarize, shifts in tested intelligence do occur from one testing to another, and these shifts tend to increase as the interval between the test and retest increases. Now the question is, Why do such shifts occur?

First of all, it should be pointed out that we are talking about tested intelligence, that is, performance on an intelligence test, not some hypothetical potentiality which underlies such performance. Keeping this point in mind, we can see that there are several factors which are or which might be responsible for the shifts in results from one testing to another. For one thing, shifts may occur because of inaccuracies in the administration and scoring of the tests. Or they may result from the fact that the subject has had increased practice in taking tests. The practice may be a larger factor in one case than in another. Or shifts may be due to changes in the subject's attitude toward the tests. Or the tests may not measure exactly the same mental functions at different age levels. This is very likely to be the case when the test-retest interval is large, necessitating the use of a different test or a different form of the same test at the later testing date. Finally, a shift may result from differential rates of mental growth due to the favorable or unfavorable opportunities for development. In view of the fact that intelligence tests are measuring certain kinds of behavior, we can expect an individual's tested intelligence to increase, decrease, or remain relatively constant depending upon the favorableness, unfavorableness, or constancy of the developmental conditions affecting his growth over a period of time. If a child, during a given period of time, is subjected to extremely unfavorable environmental conditions, it is entirely possible that his rate of growth will be slower than that of other children who have remained in fairly stable surroundings. In relation to these children, he would show a drop in I.Q. from the beginning to the end of the stated period.

Since several of the factors just enumerated may be operative

at the same time, it is of course extremely difficult to attribute a measured shift in intelligence to any one factor. In order to attribute a loss in intelligence to unfavorable environmental opportunities, one would have to know or be reasonably sure that the loss was not due to any of the other factors which might contribute to a shift.

The fact that appreciable changes or shifts in intelligence occur in certain cases under certain circumstances does not invalidate or change the reliability of the intelligence test. The data on validity which we have presented indicate that these tests possess high predictive value for a variety of purposes. The fact that the predictive value is not perfect does not mean that the tests should be discarded. A more thorough knowledge of intelligence tests, what they are related to and how well we can predict from them, should make it possible to predict the kinds of shifts needed for adequate adjustments. Perhaps we could actually control such shifts. Facts are needed for the prediction and control of human behavior. Intelligence tests provide some of the facts and frequently lead to the discovery of other facts.

DETERMINANTS OF INTELLIGENCE

An individual's behavior is the product of two sets of factors, heredity and environment. No single trait or characteristic of an individual, structural or functional, is due entirely or exclusively to heredity or to environment. There is no set of traits which can be classed as hereditary, and no set which can be classed as environmental; any trait or set of traits is affected by both heredity and environment. Yet heredity and environment can be described and their influence on any given trait can be studied.

In order to study the part played by environment in determining a given trait, it is necessary to arrange an experiment in which hereditary factors are constant and where environment is a variable factor. Similarly, to study the influence of heredity, it is necessary to hold the environmental factors constant and let heredity be the variable factor. In such experiments it is possible to obtain data which provide some indication of the contribution of each factor to a given trait.

(1) *Heredity.* The part played by hereditary factors in determining structure and mental characteristics is indicated by the

similarity of organisms within the various animal and plant species. In the same soil we plant and cultivate two seeds, one of corn and the other of wheat. One will grow into a stalk of corn; the other, into a stalk of wheat. The importance of heredity is shown even more strikingly when animal species are crossed. The offspring of a donkey and a mare is a mule; that of a horse and a mare is a horse. The mule and the horse develop in the same environment, yet they have many differences. The contribution of heredity is also indicated by the fact that breeders, by selecting for breeding purposes the animals that show the qualities they desire, have produced hogs and cattle that not only grow faster on less food, but make better meat as well. Similarly, horticulturists, by selecting their seed, have produced many improvements in grains, vegetables, and flowers.

The part played by hereditary factors in determining structure is too generally appreciated to require emphasis. Though the importance of environment is equally evident, it is not so generally recognized. An individual can, by proper exercise and diet, strengthen his body and improve his physique. The greater height of Americans and Australians compared with Europeans is evidence of the effect of environmental conditions in determining physique. So is the greater height of the Japanese in Hawaii and California compared with the Japanese in Japan.

The foregoing judgments of common sense are amply supported by the findings of biologists. When fed thyroid extract, the young axolotl, a large salamander adapted to living in the water, undergoes physical changes which result in its becoming a land animal, going to the water only to lay eggs. The changes are similar to those which a tadpole undergoes on becoming a frog. Living on land under certain temperatures will produce the same changes in the axolotl. Many similar instances of the importance of environment can be cited. Maize that will produce reddish leaves when grown in the sunlight will produce green leaves in the shade. Certain drosophilae that will develop abnormal abdomens in a moist environment will develop normal ones when they mature in a dry environment.[33]

Many facts show that heredity and environment coöperate to determine mental traits as well as physical ones. A comparison of the mental characteristics of different species emphasizes the part played by heredity. A puppy may be given as nearly as

possible the same environment and treatment as an infant; yet their mental differences will be as marked as their physical differences. The one becomes far more intelligent than the other.

A consideration of the two extremes of human beings, idiots and geniuses, also shows the part played by heredity in determining intelligence. Idiocy may, at times, be caused by lead poisoning or other environmental conditions, but more often it is caused by heredity. No known environmental change can appreciably improve the mentality of an idiot. On the other hand, the early environment of many brilliant men has been, for all practical purposes, the same as that of millions of boys and girls. Yet for some reason these men have outstripped their fellows. Such superiority cannot be explained entirely in terms of environment.

The degree of correspondence within a family also suggests that intelligence is greatly influenced by heredity. The members of a family are considerably more uniform in their mental ability than are the members of society at large, or even than other persons of the same social level. Siblings (children of the same parents) are more alike than unrelated persons, fraternal twins more similar than siblings, and identical twins still more alike than fraternal twins. These facts regarding family correspondence are summarized in Table XI.

TABLE XI

CORRELATIONS SHOWING THE INCREASE OF SIMILARITY IN MENTAL AND PHYSICAL TRAITS WITH INCREASE OF RELATIONSHIP [34]

	Identical twins	*Fraternal twins*	*Siblings*	*Unrelated individuals*
Standing height	.93–.95	.50–.65	.50	.00
Head length	.91	.58	.50	.00
I.Q.	.90	.63–.70	.50–.60	.00

Unrelated individuals are no more similar in heredity than chance would allow. Siblings and fraternal twins will have biologically similar heredities. Though they develop from different ova, the heredities are obviously more nearly alike than if they had had entirely different parents. Identical twins are

children developing from the same ovum or egg. Biologically, the heredities of identical twins are considered identical. Identical twins probably do not have a much more uniform environment than fraternal twins. Yet correlations show that identical twins are much more nearly alike than are fraternal twins. The difference between the numerical correlation for fraternal and that for identical twins gives a quantitative indication of the importance of heredity.

A related study is reported by Holzinger, who studied 50 pairs of fraternal twins and 50 pairs of identical twins. He found that the intelligence of fraternal twins correlated .63, while that of identical twins correlated .88. Identical twins when reared apart still show a high degree of resemblance. For 10 pairs studied, the average difference in I.Q.'s was 7.7 points.[35] The significance of this difference can be better understood when compared with the average difference of about 5 points in the I.Q. of a single person when a year intervenes between two tests.

Moreover, if siblings are separated and placed in homes of different social levels, they will continue to show greater similarity than children taken at random and similarly placed. When siblings are reared in the homes of their parents, the resemblance, as shown in Table XI, may be represented by a correlation of .50; when they are separated, but placed in homes of similar cultural advantages, the degree of resemblance falls to about .35; when they are separated and placed in dissimilar homes, the correlation (for 63 pairs) is represented by .24.[36] These figures indicate the importance of heredity and environment. Were heredity of no significance, the relationship for siblings reared in unlike homes should have been zero or negative. Were environment of no importance, siblings should show the same degree of resemblance whether reared together or apart.

Burks studied 214 children who had been adopted before the age of 1 year. She found that their intelligence correlated with that of their real parents .52, and with that of their foster parents only .20.[37]

We may confidently conclude, then, in the light of these studies, that heredity is an important determinant of intelligence. Eugenicists have emphasized this truth, and have urged that upon it can be based a program of race improvement. No doubt this is, in one sense, true. Yet such a program is not so simple as

is generally thought. In the first place, it is very difficult to obtain exact knowledge of the heredity of a given person or of the qualities he will transmit to his offspring. And secondly, heredity is by no means the only determinant of intelligence, as we shall see in the next section.

(2) *Environment.* It is quite unnecessary to conduct an experiment to show that environment plays a rôle in determining an individual's intelligence. We have already pointed out that both heredity and environment are essential to the appearance of any trait. We are interested, however, as in the case of heredity, in finding out as much as possible about the exact part played by environmental factors in determining intelligence. This is ordinarily done by taking individuals of similar or identical heredity and subjecting them to different environments for a period of time. A comparison of intelligence-test scores before and after placement in the different environments will throw some light on the effect of environment upon tested intelligence.

The studies of siblings who were separated and placed in different homes (described above) indicate that environment has an effect upon intelligence. Studies of identical twins separated at an early age and reared in different environments also indicate that environment is a factor in tested intelligence. Newman, Freeman, and Holzinger reported a study of nineteen pairs of identical twins separated in infancy and reared apart. Among the tests used in this study was the Stanford-Binet individual intelligence test. The results of the study showed that the correlation between the Binet I.Q.'s of these identical twins was about .67 in contrast to a correlation of .91 reported for another group of identical twins reared together.[38]

The influence of environment is further indicated in a study of foster children by Freeman, Holzinger, and their associates. A correlation of .37 between the intelligence of children and that of their foster parents was obtained. The expected correlation for adults and children paired at random is zero. The correlation between unrelated children reared in the same home ranged from .25 to .37.[39] The expected correlation between unrelated children paired at random is zero. In contrast to these findings, Burks found that the foster home had little effect upon the intelligence of a group of foster children adopted before the age of twelve months. She estimated the effect of heredity to be as

high as 75 to 80 per cent.[40] Another investigator matched 194 foster children with a like number of children reared by their own parents. The intelligence of the foster children and their foster parents correlated about .25 in contrast to a correlation of about .50 between the other group of children and their true parents.[41] The figures of all these studies seem to indicate rather definitely that part of the high correlation of intelligence between parents and children and between siblings reared together is due to similarity in environments. The effects of environment are superimposed, as it were, on the effects of heredity.

Another approach to the problem of the part played by environment in determining intelligence is seen in a large number of studies which deal with the changes or shifts in intelligence level of children over a period of time or from one testing date to another. These studies have attempted to show that the introduction of some change in a child's environment will definitely and significantly alter his intelligence. Typical of this group of studies is a number of studies by Wellman and her associates at the University of Iowa. In one study Wellman shows the

TABLE XII

DECREASE IN I.Q. IN UNFAVORABLE TYPE OF ENVIRONMENT [42]

Age at test (months)	*Intelligence quotient*						
	Child 1	Child 2	Child 3	Child 4	Child 5	Child 6	Child 7
17–19	103	98	86				
20–22			73	83			
23–25		93			85	80	
26–28	72	83		83			
29–31		80	63	75	85	80	
32–34						74	79
35–37			58			74	
38–40	63	61		63	70		72
41–43							
44–46					71	67	70
47–49			64				67
50–52	60	61		60			69
53–55			62				
56–58						70	
59–61							69

TABLE XIII

INCREASE IN I.Q. IN FAVORABLE TYPE OF ENVIRONMENT [43]

Age at test (years)	*Intelligence quotient*			
	Child 1	Child 2	Child 3	Child 4
3	89			
3½	118	98	98	124
4	128	120		135
4½	129	145	109	137
5	119	167		146
5½			126	144
6	117		125	143
6½				
7	140		134	
7½				
8				
8½	135			
9		155		148
9½				160
10		143	153	
10½	149			165
11	130	152		
11½				
12	139	143		154
12½				
13		(100C)*		
13½	132			
14				(99C)*
14½				
15	(99C)*		(99C)*	
15½				
16				
16½				
17			(93U)*	
17½				
18	(99U)*			

* Figures followed by a C or U in parentheses represent percentage of randomly selected persons (of the same age and education as the person tested) falling *below* the subject on an intelligence test which does not directly yield the I.Q. These figures are called *percentiles*, or percentile ranks. An intelligence score percentile of 99 corresponds roughly to an I.Q. of at least 130, probably higher.

decrease in I.Q. of seven children who were in a very unfavorable type of orphanage (see Table XII). Table XIII gives the results for four children who were in a very favorable preschool environment, later followed by what is described as an unusually stimulating elementary school experience.

A more detailed description of a study conducted by Munroe will serve to illustrate the results and methods of this approach to the study of the influence of environment on intelligence.[44] Munroe kept a record of the school population of a small city long enough to follow a large number of children from the first grade through the high school. By giving each child an intelligence test from time to time, he accumulated perhaps the most complete data we have on an appreciable number of children over a long period. In addition, careful ratings of the homes were made by five trained workers. The homes were rated by each appraiser on a scale of 5 points, the best homes being rated 1, the poorest, 5. Since there were five appraisals the final ratings ranged from 5 to 25. The following factors were considered in rating a home: (a) variety, quality, and preparation of food for mother and child, (b) sanitation and care of health, (c) education of the parents, (d) employment of the father, (e) opportunity for play and companionship, (f) refinement of the home, and (g) ethical and religious ideals of the parents.

Munroe found a significant correlation between the quality of the homes and the changes in the I.Q. A good home tended to raise the I.Q., a poor home to lower it. Table XIV presents a convenient summary of his findings.

This table shows that children with I.Q.'s between 140 and 149 who were reared in homes having the highest ratings increased in intelligence nine points as they grew older. Those between 120 and 129 and in similar homes improved twenty-two points. On the other hand, those with I.Q.'s between 110 and 119 who were reared in homes given the lowest rating deteriorated, on the average, forty-seven points as they grew older. The table shows, in general, that children in superior homes tend to become brighter, and that those in inferior homes tend to become less intelligent. There seems to be no relationship between I.Q. level and the magnitude of the I.Q. changes.

The following are two of the more striking cases reported by Munroe:

TABLE XIV

CHANGES IN I.Q. OF CHILDREN IN DIFFERENT QUALITIES OF HOMES [45]

I.Q. level when first tested	*Environmental appraisals*				
	5	6–10	11–15	16–20	21–25
	I.Q. changes				
140–149	9				
130–139		5.4	− 20	− 15	
120–129	22	5.1	− 10	− 25	
110–119	22	5.4	− 6.2	− 15	− 47
100–109	22	8	− 4.2	− 16	− 18
90–99		3	− 8.4	− 20	− 31
80–89		1	− 3	− 12	− 24
70–79					− 26

Initial I.Q., 126; gain in I.Q., 24 points.

The father is a high school graduate. The mother attended high school to the sophomore level. The father is a successful manufacturer and retailer. Considerable wealth. Congregationalist. Moral, social. Good lineage but no prominent ancestry. A beautiful well furnished home with every convenience and plenty of excellent literature. Plenty of food and good cookery. A stimulating atmosphere in every regard.

Initial I.Q., 103; loss in I.Q., 21 points.

Father and mother both are of American stock. The father is a high school graduate. The mother completed the grades and did about one year of high school work. The father is a barber; his net income from the trade is about $22.20 per week. The home is less than average because of the atmosphere of bickering and quarrelling. The furniture is about average. No library, no magazines, no newspapers, except the local news sheet. Food rather meagre and preparation careless. Clothing insufficient at times. Sleeping quarters crowded. Health neglected. Very poor neighborhood.

On the basis of his study Munroe concluded that: (a) environmental conditions frequently cause a variation of from twenty to twenty-five points in I.Q.; (b) environment is the dominant factor in determining the intelligence of the majority of children; (c) rapidly developing intelligence must be stimulated incessantly,

or else it will cease to develop; and (d) a fair environment may be stimulating to an average child but not to a superior one.

A number of studies have brought out the retarding effect of an impoverished environment upon the intelligence-test performance of various groups of children. One of the first studies of this kind was conducted by Gordon with a group of canal-boat children in England. The canal-boat children had an average I.Q. of 69.6 which, taken at face value, would indicate a low normal or borderline group. Gordon points out, however, that the correlation between age and I.Q. for this group was $-.755$. In other words, there was a marked tendency for the I.Q. to drop as the children grew older, a natural result if the children lived in an environment which did not provide opportunity for the kind of mental growth measured by the tests.[46]

In a study of mountain school children in southeastern Kentucky, Asher found that the average I.Q. of these children dropped gradually from 83.5 at the age of 7 to 60.6 at the age of 15. He points out the serious deficiency in the material environment of these children and suggests that it fails to provide opportunities for acquiring the kind of knowledge measured by the tests.[47] Essentially the same results were obtained by Wheeler in a study of mountain children in Tennessee.[48] In a follow-up study made ten years later, however, Wheeler reports a marked improvement in the intelligence-test performance of children living in the same areas and coming largely from the same families studied ten years earlier. He suggests that this improvement is related to an improvement in the general economic, social, and educational status of the people in the area.[49]

In evaluating these and similar studies, several points should be kept in mind. First, it is necessary, as Stoddard points out, to differentiate between potentiality and delivered power in connection with intelligence testing; it is only the latter that can be measured by intelligence tests.[50] Second, as was pointed out in discussing shifts in tested intelligence (page 210), one cannot definitely attribute a shift to environmental influences unless he is reasonably sure that other factors are held constant or are ruled out experimentally. This has been the basis of Goodenough's criticism of the recent studies of environmental influences and their effect upon mental growth.[51] Finally, it must be recognized that the development of any trait, and any real shift in the rate

of development of that trait, is dependent upon both heredity and environment. It is as much a mistake to suppose that the hereditary factors exert a constant influence in development as it is to suppose that any shift in rate of growth is due wholly to environment. It is not a question as to whether environment plays a part in such shifts, but rather one of finding out what particular factors in the environment will, when combined with given hereditary factors, change the rate of mental growth.

EUGENICS AND EUTHENICS

The ideal of a race of men and women far superior to any the world has yet known has profoundly appealed to serious-minded men and women for thousands of years. Sometimes in their imagination they turned to the distant past and peopled it with magnificent ancestors. Sometimes they have centered their hopes on a heaven, inhabited only by the best of those who have lived on the earth. During the twentieth century thoughtful persons, because of advances in the arts of producing wealth and in the biological and social sciences, have been impressed with the possibility of "humaneering," or of producing an ideal race here and now.

Naturally some of these people are concerned with the importance of improving our heredity (eugenics). Accordingly, they urge that steps be taken to restrict the reproduction of those who are obviously unfit and to encourage the reproduction of the fit. Our account of heredity as a cause of intelligence gives ample support to this program. It will be recalled that Burks found a correlation of .52 between the intelligence of children who had been placed in foster homes and that of their real parents. This degree of resemblance shows the importance of breeding from superior parents, even though the mechanism of heredity is so complex that we cannot predict the nature of individual offspring from a knowledge of parents, nor describe the heredity of a given person merely by knowing his parents. Instead of "Like begets like," we should say "Like tends to beget like"; but even the latter proposition is adequate justification for advocating a eugenic program.

Others interested in race improvement are impressed with the importance of the environment (euthenics). They have noted the

effect of environmental conditions upon intelligence, as well as upon character and personality. They have seen the blighting effects of diseases, when unattended to, on the development of intelligence, as well as on sensory acuity. They, therefore, urge that to produce a race of superior men and women, we must provide boys and girls with a better or more euthenic environment. The investigations of psychologists give ample support also to the program of the euthenicists. Good heredity may be smothered by a bad environment, whereas a good environment brings to light possibilities hardly suspected in ordinary stock.

The eugenic and the euthenic programs are frequently opposed to each other. This is due to misunderstanding born of specialized interests. In reality, the two programs supplement each other. Neither can bring the greatest possible success without the help of the other. An improved heredity means progress; an improved environment means progress. But far more progress will result from the improvement of both than from either one alone.

SUMMARY

Intelligence, or intelligent behavior, depends upon (1) alertness, (2) ability to assimilate and retain, (3) fertile imagination, (4) insight, (5) self-criticism, (6) confidence, and (7) strong motivation.

Beginning with the work of Binet, many tests for the measurement of intelligence have been constructed. Some are scored in terms of the I.Q. (intelligence quotient), a measure of the rate of mental growth or development. The I.Q. is obtained by multiplying by 100 the mental age divided by the chronological age. Some intelligence tests must be given individually; some may be given to groups. Each type of test has its uses, advantages, and limitations. The validity of an intelligence test is indicated by its correlation with such criteria as success in school, educational level, occupational level, and other previously validated tests. The reliability of intelligence tests refers to the consistency with which they yield the same results when they are repeated, when one part is compared with another, or when one form of the test is compared with another.

Studies of heredity and environment show that both affect intelligence as measured by tests but do not definitely reveal their

relative importance. Eugenics is concerned with improving the heredity of the human race; euthenics is interested in bettering its environment.

QUESTIONS ON THE CHAPTER

1. What are the main characteristics of intelligent behavior?
2. State the evidence which shows that memory is an important aspect of intelligence.
3. What was Binet's contribution to psychology?
4. Describe the general theory of the Binet method of measuring intelligence.
5. Define the I.Q. and describe its computation.
6. How do we know that intelligence tests are reliable?
7. How do we know that they are valid?
8. Give the major evidence showing that intelligence is influenced by heredity.
9. Do the same for environment.
10. What was the contribution of each of the following to the problem of heredity *vs.* environment in determining intelligence: (a) Burks, (b) Wellman, (c) Holzinger, (d) Freeman, (e) Munroe?

QUESTIONS FOR DISCUSSION

1. What are the main difficulties in defining intelligence? Is it necessary that a completely satisfactory definition be arrived at before any measurements of intelligence can be made?
2. How might our list of the characteristics of intelligent behavior be expanded or reduced?
3. What problems had to be met in adapting Binet's test in the United States?
4. Discuss the major advantages and limitations of the Binet scale.
5. Compare and discuss the uses, advantages, and disadvantages of (a) individual *vs.* group tests; (b) language *vs.* performance tests.
6. Of what social significance is the fact that intelligence is "normally" distributed?

SUGGESTED READINGS

Anne Anastasi, *Differential Psychology* (The Macmillan Company, 1937), Chapters III, IV, V, VI, VII, and XIX. An excellent discussion of heredity, environment, and mental growth.

H. E. Garrett, *Great Experiments in Psychology* (Revised and enlarged; D. Appleton-Century Company, 1941), Chapters I and II. An ex-

cellent (and readable) discussion of the origin, growth, and present status of intelligence tests and testing.

F. L. Ruch, *Psychology and Life* (Scott, Foresman and Company, 1937), Chapter V. An interesting discussion which includes descriptions of several cases showing the nature and importance of differences in intelligence.

MORE ADVANCED READINGS

Edward B. Greene, *Measurements of Human Behavior* (The Odyssey Press, 1941). A valuable source of information on psychological tests and the experimental literature on testing.

L. M. Terman and M. A. Merrill, *Measuring Intelligence* (Houghton Mifflin Company, 1937). A description of the latest Stanford Revision of the Binet-Simon Scale. Indispensable to those who give intelligence tests.

CHAPTER SEVEN

Abilities, Aptitudes, and Interests: How We Measure Them

An individual's adjustment to his environment involves all of the different kinds of behavior which go to make up his personality. While intelligence plays a prominent part in adjustment and personality, it is by no means the only kind of behavior involved. In many instances an adjustment is dependent primarily upon some specific skill, knowledge, interest, or sensory equipment. For example, in many simple and routine jobs, individuals testing at the very bottom on standardized tests of intelligence are as well or even better adapted to the work than persons testing at average or above because the special skills which they possess are more important for the jobs than a high level of intelligence. Any one can think of numerous jobs and even occupations in which success is more dependent upon a specific skill or kind of knowledge than it is upon intelligence. In educational and vocational guidance and in personnel selection and placement, it is important to know what specific skills and kinds of knowledge are needed for successful adjustments, and even more important to be able to determine the extent to which particular individuals possess these skills and knowledge.

ACHIEVEMENT AND TRADE TESTS

Many psychological tests have been devised for measuring the specific skills and the knowledge which individuals have already acquired and which they can bring to bear on a particular task, job, or situation. The tests used for measuring what an in-

dividual has learned as a consequence of a period of training in a particular school subject, course of study, or school grade are called *educational achievement tests.* Such tests are ordinarily used to determine the achievement status of each pupil in each school subject, the achievement status of a class or grade, or the achievement status of the school. The knowledge thus provided may be used for a variety of purposes, but the purpose of the test itself is to provide information about what pupils know about a subject or subjects at the time the test is administered.

The tests used for determining a person's knowledge of a specific job or trade are called *trade tests.* The trade test is a kind of achievement test, but it is more aptly called "trade test" because its object is to measure an applicant's information about a trade or his skill in the performance of standard tasks. For example, suppose that the use of a micrometer is necessary for the successful performance of a certain job. A man's fitness for the job could be determined, in part at least, by administering the Purdue Vocational Test, Can You Read a Micrometer?[1] The tests in the Purdue Vocational Series are paper-and-pencil tests that measure achievement in technical information related to various areas of trade training. They can be used by vocational teachers in public school systems or by industrial personnel men for measuring an applicant's information about various trades. There are eight tests in this series at the present time. They are: Purdue Blueprint Reading Test, Test for Electricians, Technical Information Test for Machinists and Machine Operators, Technical Information Test in Oxy-acetylene Welding, Technical Information Test in Electric Arc Welding, Can You Read A Scale? Can You Read a Working Drawing? Can You Read a Micrometer?[2]

Some trade testing is accomplished by the use of performance tests. In these tests the applicant is given certain tasks to perform or certain materials to be manipulated in the way in which they will have to be handled on the job. The job may be set up in miniature. For example, the knowledge and skill of punch press operators may be measured by the miniature punch press shown in Figure 31.[3] Trade skills and information may also be measured by the use of standardized *oral trade questions.*[4] Such questions have been prepared for most of the standard trades and are in use in many state employment offices.

FIG. 31. TESTING PUNCH PRESS

For measuring eye-hand-foot coördination of industrial punch press operators. Some of the parts of your automobile heater or radio may have been punched by operators selected by this test. (Use in industrial selection described by J. Tiffin and R. J. Greenly, "Experiments in the Operation of a Punch Press," *Journal of Applied Psychology*, XXIII, 1939, 450–60.)

SPECIAL ABILITY TESTS

There are some complex coördinated skills or restricted groups of performances which are not measured by achievement or trade tests. For example, the motor skills involved in a wide variety of locomotor and manipulative performances and the mechanical skills and knowledge involved in shop work or in other kinds of mechanical activity are measured by motor ability and mechanical ability tests. Tests of this kind are called *special ability tests.* It is common to refer to any particular one of such tests as a test of motor ability, or musical ability, or mechanical ability. These tests, like achievement and trade tests, measure what the individual has learned, what he knows or what he can do in rather restricted areas of activity — areas defined by the titles, musical ability, mechanical ability, clerical ability, etc. In a sense they are achievement tests, but since the word achievement is ordinarily reserved for knowledge acquired as a result of a specific course of training, generally that provided in a school situation, it is not a common practice to call the tests achievement tests.

(1) *Motor abilities.* From infancy into adult years, such motor or muscular activities as those involved in standing, walking, running, grasping, throwing, and the many complex, coördinated skills involved in finger, hand, and arm manipulations play a very prominent rôle in everyday living. One need think only of the earning capacity and the social prestige enjoyed by the professional athlete, or of the high degree of manipulative skill needed by loopers in a hosiery mill, by watch repairmen, or by coil winders to realize that motor skills not only are important but in many cases are the basic framework of personality and adjustment. One of the recognized techniques for overcoming timidity and shyness in children is to teach the child some skill — it need only be dressing a doll or skating — so that he can perform as well as other children or better and then to place him in a social situation where the skill can be utilized. Motor skills like those involved in cutting with scissors, buttoning clothes, tying shoestrings, and walking play such an important part in the total activity of the infant that most of the preschool tests of intelligence or mental growth make extensive use of motor test items.[5]

Prominent among the various motor skills are a number of so-called simpler motor processes. These include speed of move-

FIG. 32. TAPPING TEST

The number of taps on the metal plate in one minute is a measure of speed of muscular movement. Striking one plate, then another, as rapidly as possible gives a measure of accuracy in coördination. (From Purdue Psychological Laboratory.)

ment, steadiness, strength, and accuracy of movement. Speed of movement is most frequently measured by recording the number of taps made in a given time on a metal plate. (See Figure 32.) The subject holds a metal stylus in his hand and taps the metal plate as rapidly as possible. Each tap closes an electric contact which operates a counter. The number of taps per unit of time, usually one minute, constitutes the subject's score. Speed of tapping increases from the age of six to adulthood, with a tendency toward greater speed with the preferred hand at all ages but with no significant differences due to sex.[6]

Speed of movement as measured by the tapping test should not be confused with such kinds of speed as those involved in adding numbers, canceling letters in lines of pied type, or making dots in small squares. These performances involve, in addition to speed, the factors of discrimination and accuracy, which are not

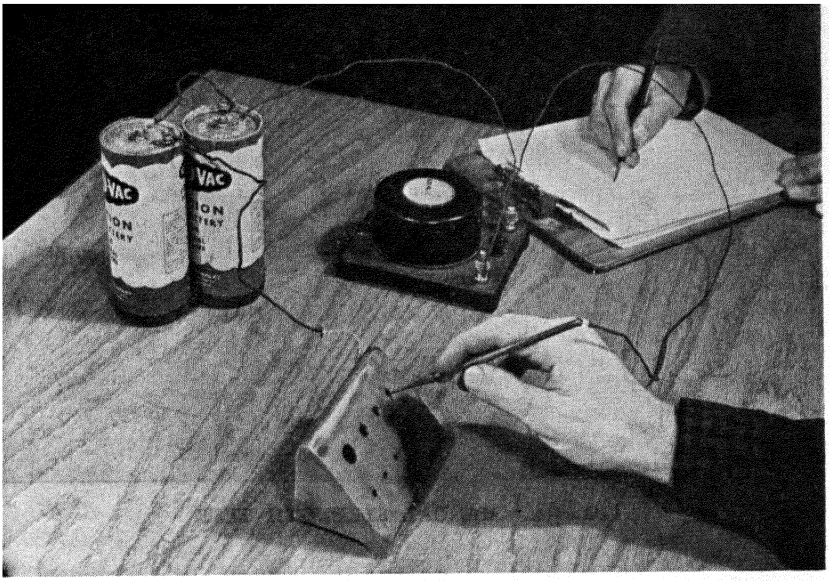


FIG. 33. STEADINESS TEST

The number of times the metal stylus touches the side of the hole in fifteen seconds is a measure of steadiness. (From Purdue Psychological Laboratory.)

involved in any appreciable way in the tapping test. They also involve a series of stimulations, each one of which requires a separate response, in contrast to the simple, repetitive muscular movement involved in tapping. The speed with which an individual can solve problems, answer quiz questions, read a paragraph, or decipher a code is a still more complicated matter, since there is still more mental activity between the stimulus (problem or question) and the final response. Mere speed of movement is a negligible factor in such performances.

The equipment most frequently used for measuring steadiness (see Figure 33) consists of a metal plate containing a graded series of nine holes which vary in diameter from one half to seven sixty-fourths of an inch. The subject is required to hold a metal stylus in each hole for a given period of time, usually fifteen seconds, while attempting to keep it from touching the side. The test is scored in terms of the number of contacts per hole, or

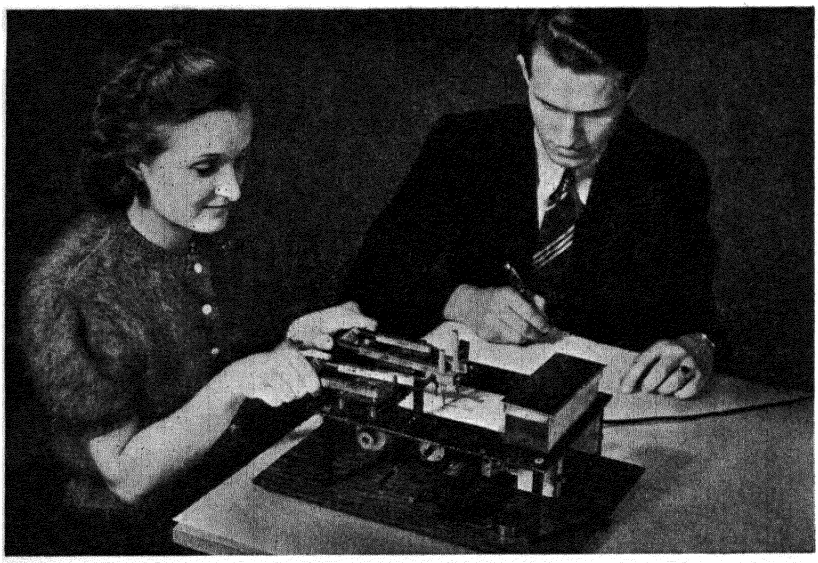


FIG. 34. MANUAL STRENGTH TEST

FIG. 35. TRACING TEST

in terms of the smallest hole in which the subject can make less than some standard number of contacts in fifteen seconds. Steadiness as measured in this way increases with age, although there are wide individual differences at each age level. An individual's performance fluctuates from time to time according to the presence of such conditions as fatigue, lack of sleep, illness, and emotional states.[7]

Muscular strength is measured by an instrument known as a dynamometer. Strength of hand grip is measured by a hand dynamometer, leg and back strength by a leg and back dynamometer. Another instrument for measuring strength in fingers and hand and ability to withstand fatigue is shown in Figure 34. Studies indicate, as one would expect, that boys are uniformly stronger than girls, and men than women. The difference cannot be attributed entirely to differences in size. Other factors are women's poorly developed muscles and the fact that they have less inclination to exert full muscular strength in taking the test.[8]

Accuracy or precision of movement is customarily measured by the tracing test shown in Figure 35 or by some kind of aiming test. In the tracing test the subject is required to move a metal stylus along the graduated groove formed by two metal strips. The test may be scored in terms of the distance traced without touching either strip or the number of errors made while tracing the entire distance. Each contact of the stylus with the metal strips is recorded on a counter which is attached to the apparatus. Another test for measuring precision of hand movement is illustrated in Figure 36. The apparatus consists of a metal disk with three holes located on the corners of an equilateral triangle. Each hole is .5 of an inch in diameter. The plate is covered by a rotating shutter which exposes the holes at the rate of 126 per minute. The subject is required to punch a metal stylus successively into the holes as they are uncovered. The subject is given a thirty-second practice trial followed without interruption by a two-minute period of punching. The number of contacts outside of the holes is recorded in a counter which is attached to the apparatus. This record is the subject's error score.[9]

A number of tests have been devised for measuring simple motor coördination. One such test measures the coördination of the hands by having a subject trace the grooves of a three-sided

FIG. 36. PURDUE HAND PRECISION TEST

The subject punches the stylus successively into three holes as they are exposed by the rotation of the disc on top of the apparatus. The number of misses is recorded in the counter on the front of the apparatus. (From Purdue Psychological Laboratory.)

figure with his right hand while at the same time he is tracing the grooves of a four-sided figure with his left hand. Metal styli are used in tracing and the number of contacts with the sides of the grooves is recorded on a counter which is attached to the metal board in which the figures are cut.

The simpler motor processes measured by these tests, taken singly or in combinations, may be important in determining a worker's qualifications for simple, routine jobs. For example, a study of tin-plate inspectors resulted in setting up four qualifications that a girl must meet before being trained as a tin-plate inspector. These requirements were that she must (1) pass the near and far visual discrimination tests and the vertical balance test, (2) be at least 5 feet 2 inches tall, (3) weigh at least 118 pounds, and (4) score not over 2.00 (low scores are indicative of high proficiency) on the Purdue Hand Precision Test. It is interesting to note that a measure of hand precision proved to be

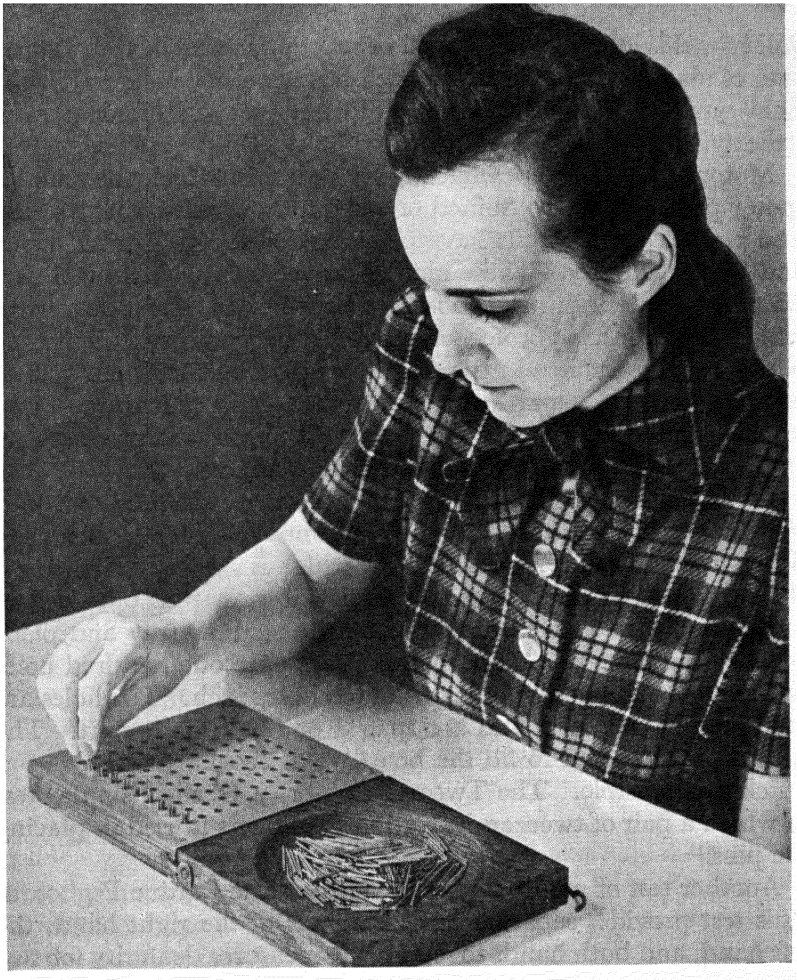


FIG. 37. O'CONNOR FINGER DEXTERITY TEST

For measuring a skill required in many industrial jobs, such as radio assembly, electrical fixture assembly, and "looping" in a hosiery mill. (Described in M. Hines and J. O'Connor, "A Measure of Finger Dexterity," *Personnel Journal* IV, 1926, 379–82.)

valid for this job. Tests of speed of reaction, strength of grip, and rate of manipulation were also tried but were not included in the final qualifications because they did not yield useful degrees of validity.[10]

Motor skills of a somewhat higher order, in which the simpler motor processes are combined or integrated in various ways, can also be measured. Tests have been devised for measuring finger and hand dexterity. These manipulative skills are involved in a wide variety of industrial jobs, household tasks, and office work and in some kinds of professional work. Their measurement is of particular importance in the selection of workers for such jobs as assembly, packing, and the operation of certain machines — jobs in which success is largely dependent upon rapid, precise, and coördinated movements of the hands and fingers.

Prominent among the tests of finger dexterity are the O'Connor Finger Dexterity Test and the O'Connor Tweezer Dexterity Test. In the Finger Dexterity Test, which is shown in Figure 37, the subject is required to take cylindrical brass pins one inch in length and .072 inch in diameter from a shallow tray and place them in the holes of a metal plate. There are one hundred holes in the plate arranged in ten rows of ten holes each. The holes are .196 inch in diameter and are spaced one half inch apart. The subject is instructed to fill the board — three pins to a hole — as quickly as possible. The Tweezer Dexterity Test is a similar test in which a pair of tweezers instead of the fingers is used in placing the pins.[11]

Another test of manipulative dexterity is the Purdue Pegboard. This test provides separate measurements of the right hand, the left hand, and both hands together. It measures dexterity for two types of activity: one involving gross movements of hand, fingers, and arms, and the other involving what might be called "tip of the finger" dexterity. The test (see Figure 38) consists of a board with a series of four trays across the top and two parallel columns of holes near the center of the board. The right- and left-hand trays contain metal pins. One of the two middle trays contains small washers which fit over the pins; the other contains small metal collars which fit around the pins. Separate thirty-second trials provide a test of the subject's speed in placing pins with the right hand, left hand, and both hands together. Finer dexterity is measured in a one-minute trial in which the subject must as-

FIG. 38. THE PURDUE PEGBOARD

This is a test of manipulative dexterity designed to assist in the selection of employees in industrial jobs such as assembly, packing, operation of certain machines, and other routine manual jobs. (From Purdue Psychological Laboratory.)

semble a pin, a washer, a collar, and a washer, using right hand, left hand, right hand, and left hand in order. Norms are available for one, two, and three trials. The test can be given as a group test by providing a board for each subject.[12]

The importance of measures of dexterity and coördination is significantly illustrated by the use of such measures in the selection and classification of air-crew personnel in the Army Air Forces. Six of the battery of twenty tests used as a basis for making recommendations for classification of air-crew personnel were apparatus tests. These included measures of coördination, finger dexterity, and discrimination reaction time. In an article regarding the use of these tests, Flanagan points out that these apparatus tests made a significant contribution to the overall prediction of ability in the various air-crew specialties, and that the aptitudes measured by these tests were not measurable by any of the

printed tests which were available at the time. The significance of the kinds of tests under consideration in this chapter is further indicated by the fact that the selection and placement of air-crew personnel was made on the basis of a composite measure of aptitudes, abilities, interests, and personal characteristics rather than on measures of general intelligence or educational attainment.[13]

(2) *Mechanical ability tests.* A vast amount of everyday activity as well as a great number of occupations and industrial jobs involves a group of special skills and knowledge commonly referred to as mechanical ability or, as some psychologists prefer to call it, mechanical intelligence. The importance of mechanical ability in occupational adjustments is so obvious that we need not enumerate the hundreds of situations in which it is involved. It is significant to note that in World War II the War Department considered the measurement of mechanical ability of such importance that a Mechanical Aptitude Test was administered at reception centers to all enlisted men who could read and write.[14]

Mechanical ability tests can be classified into two main groups: tests of mechanical knowledge or comprehension, and mechanical assembly tests. The tests of mechanical knowledge are group tests of the paper-and-pencil variety. For the most part, they consist of pictures and diagrams of machines or situations which test the subject's information about mechanical devices or his comprehension of mechanical relationships. Mechanical assembly tests are, for the most part, individual tests which provide a number of commonplace mechanical devices, such as a mouse trap, an electrical plug fixture, or a wrench which may be easily taken apart and reassembled.

In these two kinds of mechanical ability tests there is a clear distinction between knowledge or information and manipulative skills. Individuals who have little mechanical skill may earn fairly high ratings on tests of mechanical information. This is especially true in the case of paper-and-pencil tests which may be answered on the basis of the subject's comprehension of relationships given in the materials and do not call for previous experience with mechanical devices themselves. On the other hand, the mechanical assembly test should not be looked upon as just another dexterity test, since some comprehension and discrimination are essential for the manipulative performances called for.

The Bennett Test of Mechanical Comprehension, which may

be considered fairly typical of tests of mechanical comprehension, is made up of a large number of diagrams and pictures about which the subject is to form a judgment and answer certain questions. For example, two kinds of shears are pictured with the question, "Which would be the better shears for cutting metal?" The pictures cover a wide range of materials and situations connected with practical mechanical experiences.[15] One of the oldest mechanical comprehension tests is the Stenquist Mechanical Aptitude Test. Two other tests which are of the same type but which place a greater emphasis upon familiarity with tools, machines, and operations involved in shop work are the O'Rourke Mechanical Aptitude Test and the Detroit Mechanical Aptitudes Examination.[16]

An interesting variation of this type of group test of mechanical ability is the Purdue Mechanical Adaptability Test. It is composed of one hundred "yes, no, don't know" items which deal with simple information of a mechanical, electrical, or related nature. Separate forms of the test are available for men and women. To be included in the test, an item had to discriminate between individuals who had high mechanical information scores and those who had low scores, and, in addition, the item had to show little or no correlation with intelligence test scores.[17]

The Minnesota Assembly Test is a typical example of the manipulative type of mechanical ability test. This test is prepared in two forms: a long form which consists of three metal boxes referred to as Box A, Box B, and Box C, each of which contains a number of mechanical devices; and a short form which is made up from the materials found in the long form. Such devices as a monkey wrench, a bottle stopper, a bicycle bell, a clothespin, a spark plug, a mouse trap, and a radio switch are separated and placed outside a metal tray. The subject is supposed to assemble the parts of each device and place the device in its proper compartment in the box. Scoring is in terms of a number of connections to be made or parts to be assembled. Percentile norms for each age group from 11 to 21 are provided.[18]

That mechanical tests of the assembly type do not depend to any appreciable extent upon intelligence is indicated by the low correlations which have been reported. The quality criterion used in the selection and standardization of the Minnesota Mechanical Ability Tests showed a correlation of .21 with in-

telligence quotients. The correlation between this criterion and the complete battery of tests making up the Minnesota test was .73, while the correlation with the apparatus tests alone was .65.[19] These correlations are indicative of very satisfactory validity.

Stenquist reports correlations of .80 between his Mechanical Assembly Test and ranks in shop work, and some correlations going as high as .87 and .90.[20] In one place he found that of a group of 275 seventh- and eighth-grade boys scoring below average on general intelligence 20 per cent scored above average on the Stenquist Mechanical Assembly Tests.[21] Essentially the same result is shown graphically in Figure 39, in which Stenquist

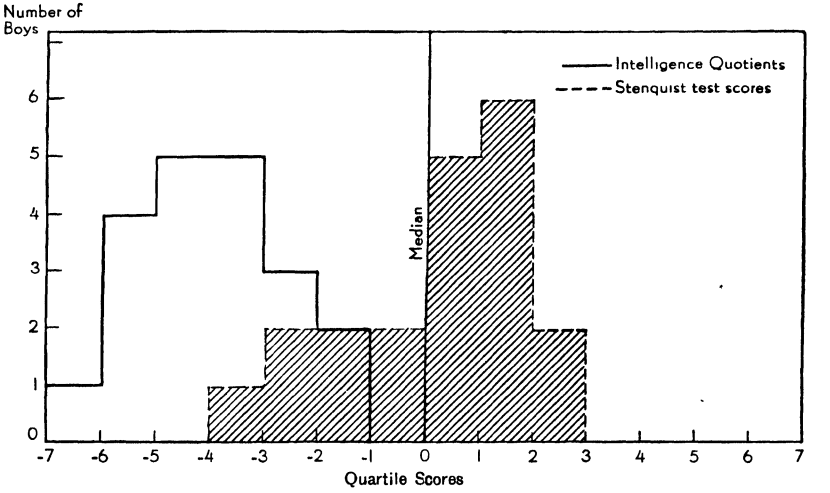


FIG. 39. INTELLIGENCE QUOTIENTS AND STENQUIST MECHANICAL ASSEMBLY TEST SCORES OF TWENTY FOURTEEN-YEAR-OLD REFORM SCHOOL BOYS

The intelligence quotients and mechanical assembly test scores are expressed as quartile deviations from the median score of a normal population on each test. (From E. J. Asher, "The Training Needs of Reform School Boys Experimentally Determined," *Journal of Delinquency*, XI, 1927, 151–158.

scores and Binet I.Q.'s of a group of reform school boys are plotted in comparable units in such a way that the relation between mechanical ability and intelligence can be seen in comparison with the scores for a normal population. All of the boys in

this group are in the lowest quarter of the general population in intelligence, but 65 per cent of them are above the average of normal boys in mechanical ability. This is a very significant fact to consider in arranging a training program for the reform school boys.

The relation of mechanical ability as measured by the paper-and-pencil group tests and intelligence is generally higher than that found for the assembly tests. Bennett reports correlations ranging from .25 to .54 between his test and various intelligence tests.[22] Conover found a correlation of .81 between the General Classification Test and the Mechanical Aptitude Test in testing a group of 1,100 enlisted men at Fort Snelling and Fort Riley. This relationship between the G. C. T. and the M. A. T. for various occupational groups can be seen very clearly in Figure 40.

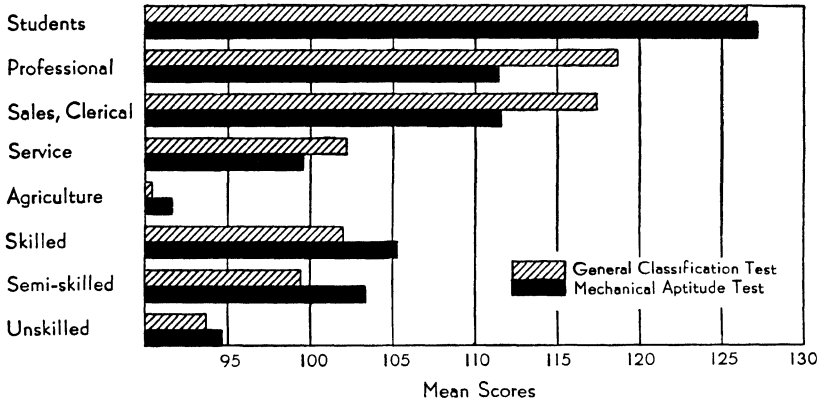


FIG. 40. MEAN ARMY GENERAL CLASSIFICATION TEST AND MECHANICAL APTITUDE TEST SCORES IN MAJOR OCCUPATIONS (MAIN OCCUPATION)

(From D. M. Conover, "Some Relationships Obtaining between the Army Classification Test and the Mechanical Aptitude Test and Other Variables." M. A. thesis, Purdue University Library, 1944.)

It is significant to note that the mean score on the M. A. T. is larger than the G. C. T. score for just those occupational groups that one would expect to score high on mechanical ability.[23] The closeness of the relationship between the G. C. T. and the M. A. T. scores for this group is not surprising in view of the fact

that the G. C. T. was designed to measure a man's ability to absorb army training while the M. A. T. was designed to measure aptitude in learning mechanical duties in the army.

(3) *Clerical ability.* Such skills as typing, taking dictation, alphabetizing, together with knowledge of office practice and business organization, make up another relatively restricted area of knowledge, which is called clerical ability. The skills and knowledge are involved in one degree or another in such jobs as stenography, typing, mimeographing, bookkeeping, accounting, multigraphing, and filing and in the use of a variety of office equipment and machines. It is important here, as in other areas, to be able to measure the knowledge and skills necessary for success in various types of office work. Such is the aim of clerical ability tests. For example, the Blackstone Stenographic Proficiency Test attempts to measure several of the essential abilities involved in stenographic work. Seven parts of the test measure knowledge of English, syllabification, office practice, alphabetizing, abbreviations, business organization, and transcription.[24] The Minnesota Vocational Test for Clerical Workers consists of two parts: a name-checking test and a number-checking test. The test does not attempt to measure specific proficiencies or skills in specific activities but yields an overall indication of ability in various kinds of clerical work. That it does so is indicated by the fact that it differentiates employed clerical workers from workers in general, that it shows a higher correlation with grades in accounting than does an academic ability test, and that it differentiates employed clerical workers from unemployed clerical workers.[25] Other tests in this general area attempt to measure such specific skills as typing, taking dictation, and transcribing.

(4) *Musical ability.* Musical ability is composed of a group of skills and knowledge more clearly restricted and more unrelated to other abilities than any other group of performances. It is our most typical special ability. No other ability is so completely dependent upon one field of sensory stimulation as musical ability is upon audition. Musical ability is special also in that it is not dependent to any appreciable degree upon intelligence and in that measures of motor ability, intelligence, mechanical ability, or any other group of abilities do not afford much indication of an individual's capacities in music. There is also one other way in which musical ability is unique. So far we have been interested

in the measurement of ability as an indication of a person's present condition and the likelihood of his success or failure in an immediate job or situation. Measurement of musical ability, on the other hand, has been more often concerned with predicting future success or potentiality for absorbing training rather than with selection and placement of trained musicians.

Musical talent, according to Seashore, is composed of five major elements: musical sensitivity, musical action, musical memory and imagination, musical intelligence, and musical feeling. Under musical sensitivity he lists eight capacities: sense of pitch, of intensity, of time, of extensity, of timbre, of rhythm, of consonance, and of volume.[26] Seashore has designed tests to measure six of these sensory capacities. In the *sense of pitch* test the subject is required to discriminate between the frequencies of two tones with intensity and duration held constant. In the *sense of intensity* test the subject is to indicate which of two tones is louder. The test of *timbre* measures ability to discriminate between the quality of two complex tones. *Tonal memory* is measured by having the subject indicate which note in a short series has been changed when the series is repeated. In the *sense of rhythm* test the subject hears two rhythmic patterns of tones. He is to indicate whether the two are the same or different. *Sense of time* is measured by presenting two tones which differ in length and having the subject indicate whether the second is longer or shorter than the first. From thirty to fifty pairs of tones or series of tones are used in each test. Each test appears in two series: Series A which is used for unselected groups, and Series B which is used for musical groups. Each series is recorded on three phonograph records with a complete test on each side of each record. Percentile norms are available for adults on Series B, and for fifth-sixth grades and seventh-eighth grades and adults on Series A.[27] Somewhat similar tests have been prepared by Kwalwasser and Dykema and by Ortmann.[28]

It should be recognized that these tests do not attempt to measure all of the factors that comprise what Seashore calls musical talent. Failure to do so has led to the criticism that the tests are invalid or fail to get at the kernel of musical talent.[29] They are, strictly speaking, measures of musical discrimination or musical sensitivity. Such measures of sensitivity can be thought of as basic factors in musical talent only in so far as the lack of them

so handicaps an individual that he cannot go far in certain types of musical training. The possession of them does not mean that a person will necessarily succeed in music or that he has all of the abilities needed for absorbing musical training. One could not expect these tests to yield high correlations with success in a school of music where the curriculum was made up of a wide range of subjects, many of them straight academic subjects. The information provided by these tests should be of greatest value for guidance in musical education and for appraising individuals at various stages during musical training.

Other aspects of musical ability, such as the ability to read music, knowledge of composers, instruments, and compositions, and appreciation of music, have been measured. Kwalwasser has devised a paper-and-pencil test to measure information about composers, compositions, and instruments.[30] Another test by Kwalwasser and Ruch was designed to measure the ability of school children to recognize the names of notes in a scale, note values, rest values, and other items involved in reading music.[31]

(5) *Artistic ability.* Closely related to musical ability is an area of activity which is commonly referred to as artistic ability. In a broad sense, music might be included under this heading since some form of aesthetic sensitivity — the ability to distinguish between degrees of beauty or artistic excellence — is needed both by the composer and the musical performer. Artistic ability is undoubtedly present in some degree in almost all individuals, but the high degree to which it is developed in the musician, sculptor, painter, designer, and other artists tends to set it apart as a special ability.

The appraisal of artistic ability in such individuals is still largely a matter of the subjective estimate of instructors and recognized masters. One attempt at objective measurement of certain components of artistic ability has been made by Meier and Seashore. The Meier-Seashore Art Judgment Test (recently superseded by the Art Judgment Test of the Meier Art Tests [32]) attempts to measure ability to discriminate between the aesthetic merit of pairs of pictures which are identical except in one respect. The subject is to select from each of 125 pairs of pictures the one that is better. Each pair consists of a reproduction of a painting and the same picture altered so as to lower its artistic merit. High scores on the test are supposed to be good indicators of artistic aptitude.[33]

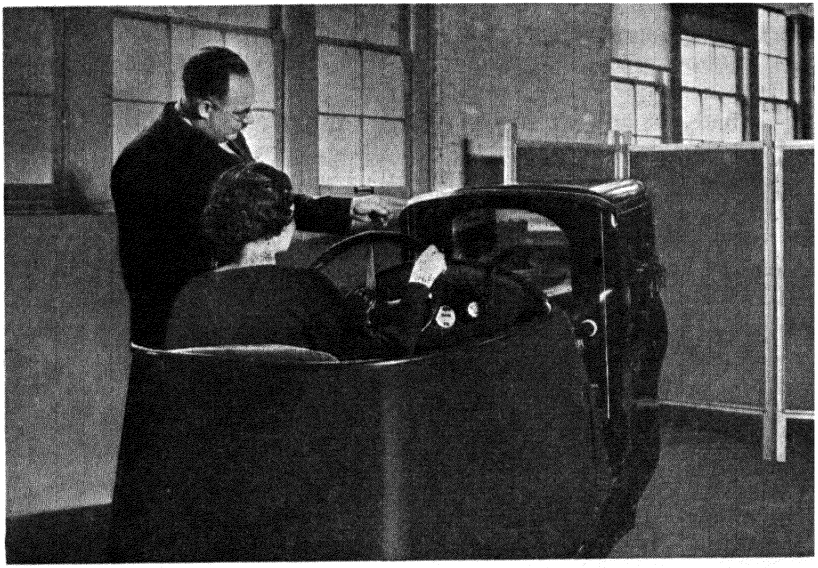


FIG. 41. THE LAUER DRIVOMETER

For measuring ability to operate controls like those of an automobile. This device records the time for a "trip," observation of road markers, and control on highway. (Courtesy of Dr. A. R. Lauer.)

Another application of psychological tests which involves the measurement of ability is related to the problem of measuring fitness to drive an automobile. Little by little, important facts concerning this activity of modern life, often so hazardous, are being discovered by scientific study. An interesting test of fitness has been devised. This is illustrated in Figure 41. DeSilva describes the use of a similar driving test as follows:

The driver sits in a standard automobile seat with regulation steering wheel, brake and clutch pedals, starter, accelerator, ignition switch, gear lever, and emergency brake, all in their usual positions. In the completed apparatus he will be enclosed in a cab so that he can see only through the small wind-shield in front of him. . . . As he turns on the ignition and puts his foot on the starter, he hears the motor start. After he has manipulated the clutch in the customary manner and gone into gear, the road starts moving toward him at a speed which is regulated by the gear ratio he is using and by his acceleration. Cars on his side of the road traveling faster than he does move ahead

of him, while those traveling toward him on the left come nearer. He finds, as he speeds up, that he can pass the cars going in his direction, although in doing so he must exercise caution to prevent a collision with oncoming cars.

To find out how the driver will act in emergencies, he is placed in as many dangerous situations in three minutes as would be encountered in many years under ordinary road conditions. In the perfected form of the apparatus, on at least one occasion during the period of the test, an accident will occur; when it does, the driver's miniature hood and wind-shield will swing back violently with a loud crash. Printed records will be made of the driver's performance during the period of the test. It will be seen that this miniature-highway test is a sort of omnibus test that can be used for measuring a number of different factors. Thus excellence of performance on it can be measured in terms of:

1. The number of cars passed safely
2. The number of accidents
3. The number of cut-ins
4. The number of excursions to the ditch
5. The behavior of the driver in the accident situation
6. The correct use of the brake
7. The driver's manipulative ability in starting up the car and putting it into gear
8. The driver's vigilance shown in anticipating and avoiding dangerous situations
9. The driver's emotional control [34]

Tests of this kind throw light on one's ability to make quick, accurate decisions, and to remain calm under trying circumstances.

APTITUDES

Aptitude is defined as "a condition or set of characteristics regarded as symptomatic of an individual's ability to acquire with training some (usually specified) knowledge, skill, or set of responses such as the ability to speak a language, to produce music, etc." [35] The condition referred to in this definition is some measurable behavior of the individual, some knowledge or skill which he now possesses. Such knowledge and skill is an aptitude if it is symptomatic of ability to acquire knowledge and skill which the individual does not now possess. Thus a knowledge of mathematics may be symptomatic of an individual's ability

to learn chemistry, or a knowledge of physiology may be a good indication of a student's ability to profit from medical school training. An individual's present knowledge and skill is an aptitude to the extent that present knowledge is indicative of future knowledge. The difference, therefore, between the ability tests which have been described and aptitude tests is fundamentally one of purpose. If the ability test is used to predict future knowledge and skill, it becomes an aptitude test.

Ability tests may be classified according to the purposes for which they are used, as follows: (1) A test may be used to find out what an individual is like at the moment — how much intelligence he has, or how much he knows about arithmetic, or how he compares with others in motor ability. (2) A measure of one kind of behavior may be used as an indication of the individual's present status with respect to another kind of behavior. Thus knowledge of mathematics may serve as an index of knowledge of physics or chemistry, or knowledge of English fundamentals may serve as an index of present achievement in other school subjects. (3) A measure of one kind of behavior may be used as an indication of the individual's future status with respect to the same kind of behavior. Thus knowledge of arithmetic at twelve years may be an excellent index of a child's knowledge of arithmetic at fifteen years. (4) A measure of one kind of behavior may serve as an indication of an individual's future status with respect to a different kind of behavior. One might find that vocabulary and knowledge of mathematics are indications of what an individual will know about chemistry after a period of training.

The aptitude test falls in either of the last two classifications. For example, the Seashore Test of Musical Talent, while it may be used as an instrument of appraisal, is intended primarily to measure ability or readiness to acquire proficiency in music. If it were a complete enough measure of readiness to acquire, it could be used to indicate the likelihood of one's profiting from a musical education. Since it is a measure of only a limited portion of the complex of musical ability, it should be used for this purpose with caution.

The reason for calling some mechanical tests mechanical aptitude tests should now be obvious. Some mechanical tests are used primarily as instruments to reveal an individual's present condition with reference to mechanical ability. These fall in the

first class mentioned above. Others, however, are used primarily for any of them may be so used) as measures of ability to acquire mechanical knowledge and skill. Present knowledge is then used as an indication of future knowledge of the same kind after training.

One of the difficult problems in aptitude testing arises in connection with tests of the fourth class. Suppose that a high school graduate enlists in the Army Air Forces. He wants to be a pilot. He does not possess the skills and knowledge possessed by qualified pilots. His present ability as a pilot, which is presumably zero, cannot be used as a measure of his ability or readiness to acquire the requisite skills and knowledge. However, he does have other kinds of knowledge and various kinds of skills which may be used as indications of his ability to acquire with training the specific skills and knowledge necessary for an airplane pilot. An aptitude test for pilots would therefore use a measure of one kind of behavior as an indication of the student's future status in another kind of behavior. It should be recognized, of course, that in talking about different kinds of behavior we are speaking in relative terms. Piloting an airplane and driving an automobile are different kinds of skills not because many of the same elementary responses are different, but primarily because the combinations or patterns of these responses are different. Thus it is possible to find a number of responses or characteristics in an individual which are indicative of skills and habits which he will eventually possess but which are present at the moment only in the form of the raw materials out of which the skills may be developed.

This situation is nicely illustrated in the case of the Medical Aptitude Test developed by Moss for the Association of American Medical Colleges. The test is designed to serve as a measure of ability to succeed in medical school and is used as one of the aids in selecting medical students. Since applicants to medical schools do not possess the technical knowledge and skills which are ordinarily acquired only in medical training, it is necessary to measure knowledge of other kinds known to be related to subsequent knowledge of medicine or to subsequent performances in medical school. That the test does not measure knowledge of medicine is seen in the following list of sub-tests which comprise one form of the medical aptitude test: comprehension and retention, visual memory, memory for content, logical reasoning,

command of scientific vocabulary, and understanding of printed materials.[36] That the knowledge represented in these sub-tests is related to performance in medical schools is indicated in a recent report by Moss. A comparison of the scores on Form 13 of the Medical Aptitude Test with medical school performance in the freshman year shows a progressive increase in failures as one goes from the high to the low scores on the aptitude test. Failures in the top 10 per cent of aptitude scores was 1 per cent, as contrasted with 18 per cent in the lowest 10 per cent. The average freshman grades decreased progressively from 85.5 for the top 10 per cent to 77.7 for the lowest 10 per cent.[37]

Any test, achievement, ability, or even intelligence, is an aptitude test when it is used to predict success in acquiring a specified knowledge, skill, or habit system; but generally speaking, tests are most valid if used for the purposes for which they are intended. If a test is designed as an instrument of appraisal in selecting industrial workers, it should not be used as an aptitude test unless experimentation reveals that it is valid for such a purpose.

A great many tests have been developed specifically for use as aptitude tests. In addition to those already described, aptitude tests have been developed for law, engineering, dentistry, science, aeronautics, nursing, machine bookkeeping, and business administration, and for clerical workers, truck drivers, and other kinds of workers.

INTERESTS

The way in which individuals differ in their interests and values and how such differences affect our behavior was discussed in Chapter II. We are now ready to consider the problem of measuring differences in interests. The term *interest* is used in two ways in psychology. It is defined as an attitude or condition which is characterized by focusing attention upon certain problems or activities. Thus an interest in baseball or chemistry or psychology would be accompanied by attention to and participation in these activities. The other definition characterizes interest as a feeling of pleasure resulting from giving special attention to something or from participating in some activity. Thus interest is defined both as a cause and as an effect, but the two definitions are quite closely related. If satisfaction results from participation in an activity, it may serve as a motive for the

repetition of the experience. Eventually, if the satisfaction is repeated, an interest will develop, and will manifest itself in attention to the activity.

This relationship between interest as the result of activity and interest as the motive for activity is important in connection with educational and vocational guidance where one is confronted with the problem of development of interests. How can one teach a child to be interested in something that he is not interested in? The answer is simple enough: see to it that satisfaction accompanies participation in the activity. Admittedly, this is easier said than done. Strong external stimulations can be used, even strong-arm methods of inducing the child to engage in the activity might be resorted to and would be effective if one were sure that the satisfaction resulting from the activity itself would more than make up for the initial unpleasantness. It is in this situation that ability plays an important rôle in the development of interest. Some activities, to result in satisfaction, must be performed with a certain degree of excellence. The ability to perform well, therefore, is a factor in the ultimate satisfaction. Interests thrive on successful performances. Suppose, for example, that a teacher wants a pupil to develop an interest in arithmetic. She resorts to the most acceptable techniques of getting him to study arithmetic and participate with the other children in solving problems. But suppose that his calculations and answers are always wrong because of his lack of ability to comprehend or understand what he is doing. It is then obvious that he is not likely to develop any interest in arithmetic. Continued prodding will not help. To continue to exhort and force the child will do no good. What the child needs is a taste of success, an experience which he may still get from arithmetic if he goes back to simpler tasks commensurate with his ability.

Methods of measuring interest. Precise, objective information regarding interests is no less necessary for understanding or controlling human behavior than similar information regarding abilities, intelligence, and temperament. A knowledge of the reading interests, play interests, occupational interests, and entertainment interests of children and adults is needed by teachers, salesmen, advertisers, movie directors, writers, and vocational counselors as well as by the individuals themselves. Such knowledge is needed for the intelligent direction or control of the behavior of other

people and particularly for directing one's own behavior in choosing a vocation, a course of training, a place to live, or even a mate.

A knowledge of interests can be obtained by a variety of methods, such as a personal interview, self-estimates, the questionnaire, check lists, and tests. One of the widely used methods in the case of children's reading interests and their interests in games is to make a list of the books most frequently read and the games most frequently played. These lists will show what kinds of books and stories are preferred, what games and toys are most popular, and they may reveal trends away from or toward particular kinds of interests. Since interests are indicated by the focus of attention, it is fairly safe to assume that such lists will provide information which will enable teachers and parents to prepare more adequately for controlling and directing children's activities.

Many methods have been used to obtain self-estimates of interests. Lehman and Witty had a group of high school boys and girls pick from a long list of occupations the three which they preferred. As might be expected, vocational choices were found to change with age. Older boys and girls showed a shift toward the professions.[38] In another study in which high school pupils were asked to express their occupational preferences it was found that about 60 per cent named professional work while less than 10 per cent named mechanical work, industrial arts, and agriculture.[39] That such choices may not be reliable is indicated in a recent study by Moffie. N. Y. A. students whose mean age was approximately nineteen rated their interests on a verbal graphic rating scale for the occupations listed in the Strong Interest Blank. A comparison of the results with the interests as actually measured by the Strong Blank revealed low positive correlations for twenty separate occupations. Moffie suggests that the lack of consistency between the estimated and measured interests is probably due to lack of maturity on the part of the student. This would indicate that self-estimates of adolescents regarding vocational choices cannot be regarded as reliable.[40]

One of the first attempts at a systematic analysis of work interests by a printed schedule was made by Miner. He developed an analysis-of-work-interests blank, the purpose of which was to provide an individual with a means of discovering his special interests and abilities by observing his own likes and dislikes. The

blank asks the subject to indicate two groups of school subjects which have been most interesting, to underline seven of his strongest traits, to indicate three kinds of activity with which he would be content to work permanently, and to check one of each of several pairs of interests. The blank enables the subject to come face to face with his own likes and dislikes and working interests and with the problem of making a vocational choice. It does not provide any numerical score which can be used for making comparisons with other people.[41]

One of the oldest inventories for measuring vocational interests and perhaps the most widely used is the Strong Vocational Interest Test. The test is made up of names of occupations, types of people, school subjects, activities, and amusements for which the subject is supposed to indicate a preference by marking each item with an L, I, or D for like, indifference, and dislike. Different interest patterns have been worked out for men who have succeeded in various occupations. The form of the test for men can be scored for over thirty different occupations. The subject filling out the blank receives a rating of A, B, or C for various occupations. In general, if a score on the test falls within the highest 75 per cent of the scores of the men in a particular occupation, the rating for that occupation is A. If it falls within the lowest 25 per cent, it is B. An A rating indicates that an individual's interests are quite similar to those of persons successfully engaged in an occupation. The B rating indicates a slight similarity and the C rating no similarity. The test has been shown to be useful in vocational counseling, in hiring men, and in the admission of students to college.[42]

Since the test is scored for several different occupations, each of which requires a separate key, and since the items have different numerical weights, such as 3, – 2 and – 1 for different occupations, the scoring is time-consuming and costly. A simplified scoring procedure has been developed by Harper and Dunlap. Their scoring keys were made up for several of the occupations of the Strong Vocational Interest Blank and were used in scoring the tests for 551 women at the University of Rochester. A comparison of the scores obtained from Strong's keys and the new keys seems to indicate that the new keys are valid for all practical purposes. They certainly make a great saving in scoring time.[43] A further validation of the simplified method was

made by Kogan and Gehlmann. These investigators scored 208 test blanks with both Strong's and Dunlap's keys. The correlation between the scores obtained ranged from .957 to .989 for fourteen occupations. A comparison of the letter grades earned by the two scoring procedures revealed that 74.2 per cent of the letter grades did not shift, 24.76 per cent shifted only half a letter grade, and only .97 per cent shifted a whole letter grade.[44]

A rather ingenious self-scoring interest test has been developed by Kuder. This test, known as the Kuder Preference Record, consists of a booklet composed of a long list of activities arranged in groups of three. In each group the subject is to pick out the activity which he likes most and the one which he likes least. He indicates his preference by punching a hole with a pin in the appropriate place in an answer sheet. After the test is completed, the subject removes the answer sheet, turns it over, and counts the number of pinholes in a series of circles drawn on the back of each of the several pages which, fastened together, form the answer sheet. Scores are obtained for nine general areas of interests as follows: mechanical, computational, scientific, persuasive, artistic, literary, musical, social service, and clerical. The score for each of the areas is plotted on a separate profile sheet, which makes it possible for the subject to determine his percentile rating for each area, and to see how he compares with other individuals. There is no attempt to give the subject a rating in a specific occupation. A number of specific occupations or jobs are listed for each area of interest merely in order to call attention to vocations which involve interests of the type for which the testee has expressed preference. Kuder suggests that this preference record can be used for pointing out vocations with which the student may not be familiar but which involve activities of a type for which he has expressed preference, and for indicating whether a person's choice of an occupation is consistent with the type of thing he ordinarily prefers to do. Separate percentile norms are available for high school boys and girls for each of the areas of interest.[45]

THE INTERPRETATION OF TEST RESULTS

One psychologist, in describing a series of experiments, stated that upon the completion of one experiment he found it necessary

to conduct two others in order to find out what the first one meant. This is another way of saying that a fact derives its meaning from other facts and must be interpreted in terms of other information. A particular fact of human behavior is meaningless when it is viewed in isolation from other behavior or when it is lifted from the behavior situation in which it was obtained.

It is particularly important to keep this fact in mind in dealing with the results of psychological tests. The very act of measurement makes the interpretation of the result difficult because in testing we seek to isolate and measure a specific part of an individual's behavior. The score or rating of a test is supposed to tell us what we want to know. Actually, however, it is only the beginning of our understanding of the individual. We must have a great deal of additional information in order to interpret the score and evaluate the individual.

There are a number of general facts that are important in interpreting test scores. First, a test measures a particular portion of an individual's total behavior. It may be a very specific portion, such as auditory reaction time, finger dexterity, or knowledge of algebra. It may be a relatively complex portion, such as mechanical ability, intelligence, or interests. It may be a larger portion of the total in one case than in another, but in no case is it a satisfactory index of the psychological whole.

Second, a test is based on a sample of all of the responses that go to make up the particular portion of behavior under consideration. A test of mechanical ability is made up of a number of items which are samples of all of the kinds of responses that go to make up mechanical ability. This is true of any kind of testing. If one wished to determine the ash content of coal from a certain mine, he would run a test on a sample of the coal from this mine, not wait until all the coal has been mined and burned.

Third, a test provides us with a cross-section picture of the behavior which it measures, a picture of behavior at the moment of testing. This picture is in contrast to a longitudinal picture, which can be obtained only from a complete record of every act (of the sort under consideration) of the individual, or which might be approximated by means of a case-history record or a succession of cross-section pictures. Any kind of behavior which we attempt to measure by means of tests has had a developmental history, a beginning and a period of development. A view of this behavior

from its beginning to the present is a longitudinal view. A test, however, provides a picture of the behavior only at a particular stage in its development.

These facts are part of the background of information that a trained mental examiner or psychometrist brings to bear upon the problem of administering and interpreting psychological tests. The examiner knows that the behavior measured is part of a dynamic whole (the psychological whole, as it is called throughout this textbook), that the cross-section picture represented by a test score is what it is because the behavior in question has had a developmental history, that many factors have contributed to its development, and that its true significance is to be found in its relation to these factors and to other portions of the individual's total behavior.

In addition to these general facts, one must have in mind a number of more specific facts properly to evaluate and interpret the results of psychological tests. First, one must know the test which is being used. He must know what the test measures, the evidence in favor of its measuring what it claims to measure, how it was constructed, its reliability, and what purposes it is supposed to serve. Here it is extremely important to go beyond the title of the test itself to see what the test actually measures and what it is good for.

Second, one must know on what group the test was standardized. When an individual is tested, his raw score is compared with the scores of some standard group of individuals. The scores of the group are so scaled as to represent a sort of human measuring stick. The measure of the individual is a statement, in numerical terms, of the individual's position in the group. It is adequate just so far as one obtains an accurate description of the group as well as an accurate record of the individual's performance on the test itself.

Third, one must know to what extent an individual's performance on a test is determined by other aspects of his total behavior. We have already pointed out that a score on a personality questionnaire is dependent upon the individual's willingness to answer the questions honestly. Rust has shown how the performance of children on intelligence tests may be affected by negativism; 58 per cent of the items initially refused were answered correctly when presented to the children again within a few days.[46]

Fourth, one must know what developmental factors have conspired to make the test performance what it is. Two twelve-year-old children are given the Stanford-Binet intelligence test. Each earns an I.Q. of 80. A case history reveals that one child lives with his grandmother in the slums. His father is dead and his mother works in another city. He has attended school irregularly and can scarcely read. The other child's father is a physician. The child has had the very best educational opportunities, including tutoring during three summers. It is clear, in the light of these facts, that the I.Q.'s of the two children do not mean the same thing. The prognosis for the first child is much better than for the second because we can see possibilities in his case that are not apparent in the other.

A problem which arises frequently in vocational and educational guidance and in industrial selection and placement is the overall evaluation of an individual's behavior or of some relatively large portion of it. The problem has been met by the use of test batteries, groups of tests which together provide a picture of the individual's behavior which appears to be the key to his success. This practice is illustrated in the psychological testing in the Army Air Forces, where test batteries were used in testing air-crew men (see page 235).

In using test batteries we try to obtain a single unified picture of an individual from a group of tests each of which measures a limited portion of the total behavior pattern and each of which overlaps the others in varying degrees. It is true that the scores of the several tests may be combined by statistical procedures to yield an overall prediction of success or failure in some specific life situations, as was done in the Army Air Forces; but the picture of how the parts work together, the pattern of behavior represented by the several scores, is likely to be lost in the process. Several different patterns may yield essentially the same overall statistical result. For example, suppose that individual A earns scores of 40, 50, and 60 on three different tests, while individual B earns scores of 60, 40, and 20 on these tests. A statistical analysis reveals that these tests should be weighted 3, 2, and 1 respectively for predicting the individual's success in college. The combined score of individual A and individual B is the same, yet the patterns of behavior represented by the three tests are quite different. Some device is needed for bringing the several scores

together in such a way as to reveal the pattern or profile of the behavior represented by the several scores, and in such a way that each score can be seen and interpreted in relation to all of the others.

The *psychological profile* or *psychograph* is just such a device. It consists of a list of behavior traits (or names of psychological tests) each of which is accompanied by a scale on which an individual's rating is represented. The traits may be listed along the vertical axis of the graph, with a horizontal scale after each, as in Figure 42; or the traits may be listed along the horizontal axis, with a vertical scale. In the former case the horizontal line for each trait represents the percentile scores, or other derived scores, of some standard group of individuals. Ideally the same group should be used as a standard for each trait. Under no circumstances should the scales represent the scores of different groups unless it is known that the groups are equivalent. Such a practice would give an individual a very distorted picture of himself. For example, suppose that John Doe's percentile position in his freshman class in college on three tests is 52, 37, and 81. In each case he is being compared with college freshmen. But suppose that on the first test we compare him with college freshmen, where he receives a percentile score of 52, and on the second we compare him with a sample of men from the general population. In this group he has a percentile score of 76 instead of 37. On the third test we compare him with still a third group, and here his percentile score is 69 instead of 81. Since the standard of measurement in psychology is the behavior of a selected group of individuals, it is clear that the same group or equivalent groups should be used throughout in comparing an individual's performance on one test with his performance on another, or in combining scores on several tests to obtain a profile.

A psychograph of John Doe is shown in Figure 42. The raw score and percentile score on each test is listed after the name of the test. In constructing this psychograph, the percentile score for each trait was plotted on the horizontal scale at the right of the trait. The plotted points were then connected by straight lines to form the profile. This psychograph gives us a picture of John Doe that does not show up in the test scores themselves. It is easy to see his relative strengths and weaknesses not only by noting the high and low points in the profile, but by noting the

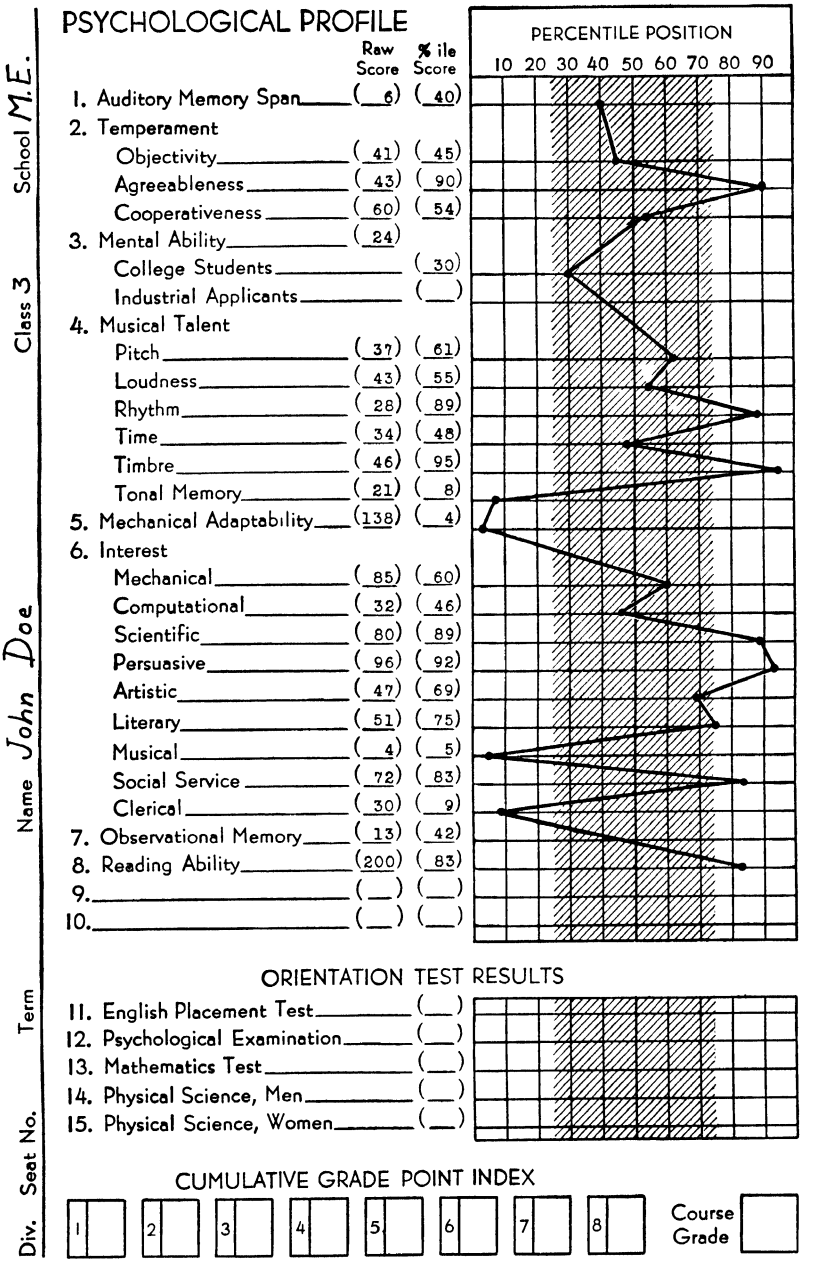


FIG. 42. SCORES IN SEVERAL PSYCHOLOGICAL TESTS GIVEN TO ONE PERSON, PLOTTED TO SHOW HIS PSYCHOLOGICAL PROFILE

position of the profile with reference to the 50 percentile line, which represents the averages of the standard group, or with reference to the shaded portion of the graph, which represents the middle 50 per cent of the standard group.

SUMMARY

Various tests have been devised for measuring specific abilities, aptitudes, and interests. Tests which measure knowledge of school subjects are called achievement tests. Trade tests measure knowledge of some specific job or trade. Such special ability tests as tests of motor ability, mechanical ability, clerical ability, and musical ability measure the knowledge and skills involved in the rather restricted areas represented by the titles of the tests. Motor abilities include the simpler motor processes of steadiness, strength, speed, and accuracy and the more complex skills involved in finger and hand dexterity.

An aptitude test measures an individual's ability to acquire with training some specified knowledge or skill. The ability measured is some present condition of the individual which is symptomatic of some future condition. Any ability test is an aptitude test to the extent that the ability measured by it is indicative of ability to acquire additional skill and knowledge of a specified kind. Aptitude tests have been developed for law, engineering, dentistry, music, art, science, aeronautics, nursing, and other fields of endeavor.

Interest is defined as an attitude or condition which is characterized by focusing attention upon certain problems or activities. Two of the most widely used tests for measuring vocational interests are the Strong Vocational Interest Test and the Kuder Preference Test.

The interpretation of test results requires a knowledge of the tests used, of the groups used in standardizing the tests, of the relation between the test performances and other kinds of behavior and between the test performance and such developmental factors as family background and educational opportunities. The test performances of an individual may be plotted on a psychograph as an aid in understanding the interrelation of the various performances, and as a means of evaluating a relatively large portion of an individual's total behavior.

QUESTIONS ON THE CHAPTER

1. What is an achievement test? A trade test?
2. What is the difference between an achievement test and a special ability test?
3. Describe the instruments used in measuring speed of movement, steadiness, accuracy, and strength.
4. How is finger dexterity measured?
5. What is the difference between mechanical ability tests of the paper-and-pencil type and the assembly type?
6. What are the five major elements of musical talent according to Seashore?
7. What is measured by the Seashore Test of Musical Talent?
8. What is the relation between mechanical ability and intelligence?
9. What is an aptitude test? How does it differ from a special ability test?
10. For what purposes may ability tests be used?
11. List as many different kinds of aptitude tests as you can.
12. In what two ways is the term interest used in psychology?
13. How does the Strong Interest Test differ from the Kuder Preference Record?
14. What general factors should be considered in interpreting a test score?
15. What specific facts are needed for interpreting a test score?
16. What is a psychograph?

QUESTIONS FOR DISCUSSION

1. Defend the notion that all special ability tests are in reality achievement tests.
2. Are aptitudes learned?
3. Should an individual who makes low scores on the Seashore Test of Musical Talent be given musical training?
4. What does a psychograph tell about an individual that cannot be determined from test scores themselves?
5. What is the value of a measure of an individual's vocational interests?
6. Can one learn to be interested in any vocation? Explain.

SUGGESTED READINGS

Edward B. Greene, *Measurements of Human Behavior* (The Odyssey Press, 1941). Chapters XII and XV are devoted to performance, me-

chanical and motor tests and tests of academic and vocational interests.

J. J. B. Morgan, *Psychology* (Farrar and Rinehart, 1941), Chapter VIII. A discussion of the acquisition of motor skills.

Joseph Tiffin, *Industrial Psychology* (Prentice-Hall, 1943), Chapters III and IV. A description of the use of manipulative and mechanical ability tests in industry.

MORE ADVANCED READINGS

G. V. Bingham, *Aptitudes and Aptitude Testing* (Harper and Brothers, 1937). The use and interpretation of modern aptitude tests.

E. K. Strong, Jr., *Vocational Interests of Men and Women* (Stanford University Press, 1943). A comprehensive discussion of the measurement of vocational interests.

CHAPTER EIGHT

Our Feelings and Emotions

No one needs to study psychology to know that at times he is angry; that it is easy to be afraid or even panic-stricken; that to love and to be loved are of great value; that both remorse and pleasure "happen" to most of us; that envy, jealousy, generosity, and pride are natural to human beings, whether they are black or white, male or female, bright or stupid, rich or poor. We know through experience a great deal about feelings and emotions. What a study of psychology can do is to systematize our present knowledge of emotions; increase our sense of their importance; and, by contributing insight into their nature, give us more control over the feeling fraction of our total selves. But we must bear in mind all through this brief study of emotion that no one but ourselves can give us inner peace and strength, since it is gained only by self-management and by our own direction of the emotional aspects of our whole personality.

The mere possession of scientific knowledge of emotions will not prevent even a psychologist from acting in immature ways when his pride is pricked, or when some long-forgotten fear is somehow touched off. A verbal mastery of the long list of ways, overt and hidden, in which an adult may "bite his fingernails," so to speak, or otherwise make a futile waste of energy does not prevent bad self-management. Knowledge of emotions is basic to wise self-direction, but book learning is not enough. Knowledge cannot save us. But wisdom may. Wisdom in the use even of an elementary knowledge may greatly improve any one's basic strategy. This fact is stressed at the beginning of this chapter in the hope that it may encourage more than one reader to make the study

of the chapter an occasion of questioning himself about himself — before it is too late. These pages supply a very small fraction of knowledge about human nature. With this the reader must try to discover for himself wisdom in daily living.

When things begin to matter to us, we have feelings about them. When they matter very much, we experience strong emotional reactions. The feelings, or emotional aspects, of life lie pretty close to the value and significance of life itself. The emotional phases of a total experience are what make the whole thing worth fighting for, or worth loving or hating; they make it absolutely necessary, despicable, or fearful, as the case may be. Emotions are the appraisers of the worth of things. Our ancestors were feelers, strong feelers, long before they were thinkers. In the practical affairs of life today, do not bother much about what a man *thinks* of anything if you can find out how and how deeply he *feels* about it. Much of our thinking is in the service of our feelings. Man is forever wanting something and doing something about his wants. He is forever feeling and doing something about his feelings. Only on occasion is he really thinking and perhaps doing something about his thoughts. Attempts to understand behavior without counting in emotions are about as pathetic as attempts to understand a watch by studying only its case, a radio by turning the dials without noticing the tubes, an automobile without looking under the hood, a book without knowing what words mean. Perhaps enough has been said about the importance of emotions; for if the reader does not already know that the worth of life lies largely in the emotions, it is too late for him to learn it now. Consider the following telegram from Martha to John.

WESTERN UNION

ALL MY LOVE WILL MARRY YOU NEXT SATURDAY IN NEW YORK REGARDS TO YOUR MOTHER AND SISTER

LOVE

MARTHA

The intellectual meaning is approximately the same to the clerk who received it in Boston, to the operator who sent it, to the clerk who typed it in Norfolk, to the younger sister who opened it before John got home, to John's mother, and to John himself. They

all understand it. But its worth, or value, differs immensely. To the clerk it is Message 67 for the day; to the sister it is exciting and a cause, perhaps, of envy and wonder; to the mother it may bring tears, for few women like to lose any man to any other woman; and to John, we trust, it is a source of great joy and ecstasy.

(1) *Emotions and adjustments.* The first duty of this chapter has been to stress the important rôle emotions play in human life. Its next task is to present several considerations which will help to systematize our thinking about them. Why are we sometimes afraid, angry, jealous, or spiteful, and at other times confident, happy, understanding, and coöperative? Of what value, if any, are emotions to us? How can we understand and control them?

During much of the time we are awake (and sometimes during sleep) we have experiences that seem very important and which often have a profound, if illogical, effect upon our behavior. These experiences, some of which are fear, anger, jealousy, love, and hate, are known as feelings and emotions. For the most part, we do not simply adjust our behavior to the needs of the situation in a logical and intelligent manner, but we adjust it to the needs, or the imagined needs, of our emotions. The suits or dresses which we buy because new clothes are really necessary or because an article is really a bargain are few compared with those we buy to satisfy our emotional demands.

When we are called upon to act on important occasions or when we experience difficulties in making a satisfactory adjustment, we put forth more effort. If this brings about disturbed organic states, we make what is called an emotional response. We also make an emotional response when we attain or lose something that we value — when we feel joy at the news of success, or sorrow at the death of a person we love.

In getting along as best we may with our own internal wants on the one hand and the demands of the world on the other, we are constantly thinking, acting, and feeling. All of these activities are adjustments, or attempts to relieve tension, to make things fit, to supply suitable responses to constantly changing situations. Our adjusting responses usually involve a feeling or an emotional factor. Sometimes this element is relatively unimportant; such is the case with the emotional component of the reader's response to the question: $2 \times 3 \times 7 = ?$ Sometimes it is of overwhelming

significance, as would be the case in the reader's response to a deadly insult. Our present purpose is to make clear the fact that feelings and emotions are one of man's favorite and most constant ways of making adjustments. Later on, we shall see that these adjustments vary in wisdom all the way from that of Socratic self-control down to that of idiotic activity.

(2) *Informal definitions.* Popular speech refers to emotional states as forces acting upon us from within. It speaks of *anger* as *blinding* a person, of *fear* as *driving* him on. Actually, an emotion is not a thing in itself, but a way of acting or a general condition of the organism. We can more correctly speak of a *person* as *burning* with rage, *trembling* with fear, *intoxicated* with joy. We *act* excitedly, or angrily, or fearfully, or remorsefully. Feelings are a mild type of emotion. To *feel afraid* is not so severe an attack as actually *being afraid;* to *feel sorry* is not so intense an experience as *weeping.* The difference between a feeling and an emotion is mainly one of intensity. If an experience is relatively mild, it is called a feeling. If an experience is more intense, it is more usually called an emotion. *Affective state* is synonymous with feeling and emotion.

Though every one has experienced emotions many times, it is not easy to give a satisfactory definition of emotional behavior. It is easier to describe specific types of emotion. Anger is the excited response to a threat or insult; it is coupled with an impulse to take aggressive action. Fear is the excited response to danger, coupled with the impulse to seek safety through withdrawal. Kindliness is the response to the weak, plus the impulse to befriend or to comfort. Other emotions may be defined in similar terms. In all emotional responses, bodily changes play an important part. An emotion, then, seems always to involve three things: some value about to be attained or lost or enjoyed, a disturbed condition of the body, and an impulse to act. Putting these three things together we may define an *emotion* as *an experience involving a disturbed condition of the organism brought about by the prospect of some value's being gained or lost, and involving also an impulse to act.* You can verify the usefulness of this definition by observing in yourself such emotions as joy, envy, fear, or jealousy.

But a description of the situations in which emotional behavior arises does not tell us *why* we act emotionally rather than from cold, logical calculation. Since all behavior is an adjustment of the individual to his environment, emotional behavior must also

be a kind of adjustment. We use emotion, as we use other adjustments, in solving, or trying to solve, the problems which confront us.

THE SOURCE OF EMOTIONS

Emotions, like all our experiences and behavior, are outgrowths of the psychological whole. Sometimes they are chiefly the result of physiological conditions or of drugs, at other times their causes may be mainly external, and again the causes may be found in an interplay of past and present experience.

(1) *Internal conditions affect emotions.* An example of the part played by internal conditions in arousing emotions may be found in the severe depressions which often follow toxic diseases such as influenza, and the manic excitement which accompanies intoxication, and in the delusory sense of well-being caused by opiates. Every one is familiar with the effect of fatigue and loss of sleep upon emotion. These conditions act to increase one's susceptibility to emotional stimulation as is seen in the irritability of small children who have been kept awake past their bedtime or who have been fatigued by being taken about too much. A further example of the effect of internal conditions upon emotion is seen in a recent study of thirty patients suffering with peptic ulcers. All of these patients showed intense reactions of anxiety, insecurity, resentment, guilt, and frustration.[1] The effect of internal glandular secretions upon emotion is seen in the fact that adrenalin, the secretion of the adrenal glands located near the kidneys, when injected into the blood stream, will induce many of the organic changes characteristic of emotional excitement.

(2) *External conditions affect emotions.* Sometimes emotions are caused chiefly by external conditions. Separation from friends causes a feeling of loneliness; some music puts us in a festive mood; walking under the trees on a beautiful moonlight night makes us feel that "deep calleth unto deep." Sometimes emotions are due chiefly to recent experiences, as when a person feels confident because of repeated successes or discouraged because of repeated failures. The stream of our reactions to our immediate environment is heavily weighted with emotional components. Only the psychologically naïve think, upon observing men and women at work, that the click of the typewriter and the meaning of words written, said, and heard constitute what is really going on. All

the activities of an office are expressions of like and dislike, love and hate, generosity and parsimony. The commonplace external conditions are eliciting emotional responses from most of the people involved most of the time. Observe with rigor your own behavior during the working day. You will be impressed with the incessant reappearance of emotional responses.

(3) *The accumulation of experience affects emotion.* There is a carrying over, or *perseveration*, from one emotional response to another. Experiments have shown that a person in whom pleasant or unpleasant feelings have been aroused will tend to react to succeeding situations with the same feeling.[2] This tendency has been called *affective assimilation*, though it might more simply be called *emotional assimilation.* The housewife who does not ask her husband for money for a new hat until after he has eaten a hearty meal is unconsciously making use of this tendency. Emotional assimilation accounts for feelings that are the result of long-continued habit. At any particular moment the love for one's country is such a feeling. Sometimes feelings are due chiefly to desire, as when a person feels that he is going to be lucky, or that he ought to go to the theater or buy a new suit.

After reading the above paragraphs in which physiological conditions and differentials in the immediate environment are considered the major sources of emotional reactions, the student ought to ask: What about the person who is always jealous, unduly fearful, chronically depressed, or shy and diffident without any obvious reason? In other words, how explain abnormal emotional behavior which is out of tune with reality? That many people show such behavior is well known, and it is also recognized that a good proportion of those who at times show closely similar behavior are, nevertheless, normal people. These are important matters, but an adequate study of abnormal or semi-abnormal emotional behavior lies beyond the scope of this book. The suggested readings at the end of the present chapter will attract students who have a particular interest in abnormal emotional development. In studying the queer behavior of the emotionally abnormal, remember that many normal people (and quite possibly you yourself) at times act in ways which are similar in kind if not in degree to the behavior of the truly abnormal. But remember also that one may manifest characteristics which are similar to those of the abnormal without being truly abnormal.

EMOTIONS AS SATISFACTORY ADJUSTMENTS

The emotional aspects of one's attempts to get along with himself and others, to adjust inner needs and outward circumstances, often vary all the way from shrewd and adequate solution down to grave and dangerous errors. First, we shall discuss four of a long list of emotional adjustments which are usually useful. Later we shall consider less fortunate attempts to *feel* rather than *think* one's way out of difficulty. The student of psychology is impressed by the fact that man's feelings get him into and out of difficulty far more often than his powers of logical analysis. Is it by clear-headed thought that one allows his grudges, jealousies, and selfishness to set the world against him? Any calm appraisal of life as it is really lived leads to the conclusion that it is far more important for one to manage his emotions shrewdly than to manage his bank account well. In fact, good management of one's bank account and many other seemingly unrelated activities are largely dependent on sound emotional adjustment. A study of the last hundred men convicted of fraud — or of the next hundred to be convicted — will show that emotional maladjustment, not low general intelligence or inability to add, subtract, or read, is the root of their personal mismanagement. The successful man is the man who has put to work his emotional resources strictly in terms of reality. The psychology of the unsuccessful man is largely the psychology of emotional mismanagement. The gulf between useful emotional adjustments, on the one hand, and "unlucky" emotional adjustments, on the other, can be brought into sharp focus by thinking over these questions:

(a) Does it pay me to bear this grudge?
(b) Is this haunting fear a sound investment for my energy?
(c) Is envy a promissory note that can be collected or is it counterfeit coin that cannot be passed without my becoming a hunted man?
(d) Which is the better bet, courage or cowardice?

(1) *Emotion and immediate energy.* Emotional behavior prepares the individual for a physical emergency. Of the many changes that occur in excitement, the numerous organic changes are the most striking. If a friendly cat is fed and strapped to a table, and a tube is inserted into its digestive organs, a plentiful amount of clear gastric juice will be found to be secreted. The churning

movements of the stomach characteristic of the digestive process will proceed smoothly. But if a dog enters the room while the cat is thus peacefully digesting its food, many changes occur. The churning movements of the stomach cease abruptly; the pancreas, instead of secreting clear gastric juice, secretes only a few drops of thick mucous matter. The liver releases its sugar, thus providing the muscles with an abundance of food. The adrenal gland secretes into the blood its fatigue-resisting and generally stimulating fluid. The heart, by beating faster, sends food more rapidly to the places where it is needed, and at the same time eliminates waste products more readily. The lungs, by working at a greater rate, provide the angry and frightened cat with more oxygen and dispel the carbon dioxide more rapidly.[3]

These effects are made possible through the action of the autonomic nervous system (shown schematically in Figure 17, page 127). It can be seen from this diagram that most of the vital organs are supplied by two sets of nerve fibers, one from the cranial or sacral segments and one from the sympathetic segment. Under normal conditions the cranial and sacral segments play the dominant rôle in the activity of the vital organs. Upon emotional stimulation, the sympathetic segment is thrown into gear, so to speak. The result is an inhibition of digestion, an increased secretion of adrenin, increased heart rate, more rapid breathing — in short, the entire group of changes described above.

The importance of these changes made in preparation for violent exertion is apparent. An organism, to survive, must carry on processes of assimilation, and it is important to build up reserves of energy. But there are times when it should cease storing up energy in order to act vigorously. The cessation of digestion and the other organic changes that occur in fear and anger are ways of rapidly mobilizing reserves to meet the emergency.

Though these energy-releasing aspects of emotions are of great value in dog fights, human as well as sub-human, their value shrinks in polite society. Not that the fights are no longer present, but the techniques have changed. It should also be held in mind that the energy prodigally spent during the height of anger is not a gift to us from our bodies, but rather a debt that has to be paid back, usually with compound interest. Anything approaching a habit of emotional orgies is far beyond the limit of the average man's physiological expense account.

(2) *Gestures in emotion.* The expressive changes that accompany an emotional response frequently help the organism to meet a special kind of situation. The angry dog growls and shows his teeth. He holds his tail rigid and makes his hair stand on end. By so doing he may frighten his enemy and thus render serious fighting unnecessary. Furthermore, such expressive acts seem to stimulate the courage of the dog and to prepare him for the struggle. There are similar changes in man under similar conditions. When a man becomes angry, his muscles become rigid; he makes himself big by becoming more erect; he may even froth at the mouth. All these things make him more dangerous-looking and may possibly help him to intimidate the opponent.

The expressive changes in tenderness are of an opposite nature and have a very different effect. The dog instead of making his body rigid becomes as supple as possible. On approaching, he drags his belly on the ground. Instead of growling he makes plaintive sounds. He does not hold his tail rigid. Instead of bristling, his hair lies in place.[4] Similarly, when the adult human being feels the emotion of tenderness for a child, he becomes relaxed; his face beams kindliness; and as he cautiously approaches the child, he makes an effort to entrance it with funny noises or queer stunts.

Though society teaches us, almost from birth, to conceal our emotional responses, our success in doing so is poor at best. The narrowing pupil of the eye, the change in color of the cheeks, the tense, white lips, the quivering of the body, the unconscious blink, the strained breathing — all these give the lie to protestations of friendship when two hated rivals greet one another with a "genial" handshake.

(3) *Emotions and thinking.* Emotional excitement stimulates greater activity at the mental level. In an effort to meet the situation, the individual begins to think more rapidly. The person who has been made angry by another is likely to think of all sorts of ways of getting even. The jealous person is apt to plan ways of restoring his feelings of positive worth and of getting ahead of his rival.

But though emotions stimulate the *quantity* of thinking, they certainly do not improve its *quality.* Emotions do not make thinking more reliable nor do they increase our ability to size up situations in an intelligent and logical manner. Indeed, as we

shall discover presently, they are apt to have the opposite effect. For this reason we are inclined to excuse a person for his poor judgment when he is emotionally aroused. But, though the plans of action that come rushing into consciousness may not be the best, all kinds of suggestions do come pell-mell into mind. This is because an emotional situation is one that demands, that teases and taunts us for action. Under these conditions, a poor plan of action is more satisfying (at least temporarily) than no plan at all. Even the scholarly psychologist may find himself catapulted into an emotional state in which the drive for action is not to be denied. Act he must. But his action need not be disastrous. He knows that actions under emotional stress, if not tempered, will almost certainly be extravagant or even stupid. Viewing himself as the general of his emotional forces, he has long had in mind that the heedless plunge is only one — and often not the best — of many lines of action. Active and rapid retreat may be better. "I am so mad at Professor So-and-So that I am going over and tell him that he is dishonest and crooked and deceitful!" This cry for action can be altered to: "I am so mad at Professor So-and-So that I am going to play three vicious sets of tennis before I see him." In this way the wise man gets both his action and also the benefit of less hasty judgment.

(4) *Emotions liberate.* The fact that emotions free us from inhibitions may sometimes be of considerable value. A man who is ordinarily slow and dignified in his movements may act energetically in moments of danger. Likewise, tender emotion may cause a person to throw off inhibitions of caste and reserve in order to help a sufferer. Sorrow, elation, and other emotions may produce similar effects. Adequate emotional adjustment does not depend upon starving the emotions or lynching them, but upon feeling and feeling vigorously in ways that pay, and in attaching our feelings to actions and objects which are genuine and worthy.

EMOTIONS AS UNSATISFACTORY ADJUSTMENTS

While emotional adjustments are in general useful, they sometimes are a definite handicap. Awareness of some of the more common emotional malpractices serves as insurance against clumsy blundering in our own self-management. It also helps us to understand what others are really trying to do, however masked

their behavior may be when the psychological whole is heavily weighted with emotion. The following comments are by no means exhaustive, but they suggest some of the possible clumsy blunders in the management of the emotional phases of the psychological whole.

(1) *Adults may respond like children.* Emotional behavior may be a reversion to childhood behavior. The child not only is father to the man but also *is* the man. Given sufficient pressure, adult control weakens and childish behavior reappears. Even a mature bank president under the wear and tear of an exhausting disease must be "babied" by his nurse. For the moment he *is* a baby. Further examples of the presence of childish tendencies in mature persons are the first-name complex of the Rotary Club and the undue interest on the part of old graduates in homecoming and in athletic scores. Some adults, and even more adolescents, weep or cry, or have temper tantrums. Such behavior is an emotional adjustment that is considered good form in babies, somewhat less than good form in young children, and entirely out of place in adults. But if, time after time, such infantile emotions have obtained for a person his "own" way, it is easy to understand why he continues to make this form of adjustment. *After all, our behavior is no more nor less than the adjustments which we have found will get us what we want.* Fortunate is any organization — be it an industrial plant or a university faculty — that does not have its fifty-year-old baby asking for special favors. "I am a special case," "If I don't have my way, I'll throw a temper tantrum." Such reactions, in whatever words they are put, constantly appear, to show us that many who are mature in years and even in intellect are still burdened by emotional immaturity. Emotional immaturity sooner or later exacts its penalties in this rough and ready world. Only the absolute dictator is above the laws of everyday living, and he only until he is assassinated.

(2) *Emotions may mutilate skill.* Emotional behavior may do more harm than good in adjustments which call for fine coördination of nerve and muscle, as in any act of delicate skill. We admire William Tell for the self-control that left his skill unimpaired in a difficult situation. Likewise, we admire the person who, under trying situations, can think clearly or who, as we say, "keeps his head." The ordinary person becomes agitated and is apt to act in a way that he later regrets. It is sound psychology as well as

common sense that supports the custom of a surgeon's not performing an operation on his own children or other kin. Many a complicated football formation which worked perfectly time after time during Wednesday afternoon practice fails to click during the excitement of the real game Saturday afternoon. Emotional fervor, valuable as it may be, is no substitute for skill. "Good intentions," "trying hard," are often mere excuses for skill that fails when "the heat is turned on." For most kinds of work today vivid but relatively cool interest is better than intense concern. One difference, and an important difference, between the amateur and the professional is that the amateur is often literally overwhelmed by a flood of emotion, while the professional, with his apparent unconcern, does a better job.

Sometimes the organic changes characteristic of emotional fervor, instead of resulting in increased activity, lead to paralysis. A bird, for example, is paralyzed by the approach of a cat; a man may become so terrified by an object or situation that he is unable to act. This is because action involves integration. Even the simple act of running involves many coördinated responses, such as rhythmic contraction and extension of the leg muscles. Holding the body upright calls for the integrated functioning of many muscles and nerves; the heart and lungs must be active; the eyes and the visual areas of the brain must serve as guides. When emotional upheaval becomes so violent as to disrupt the integration necessary for action, paralysis results. Do not for a moment believe that this matter of momentary paralysis is of textbook interest only. One of the really important things which psychology should teach is that one should always be prepared for a championship battle and that the first round of an important contest is likely to be the most important round of all. Gene Tunney, an excellent critic of boxing as well as a performer, in commenting on the second Louis-Schmeling contest, observed that emotional pressure had apparently brought on approximate paralysis on the part of one of the contestants. As a result, there was actually no contest at all. Who of us cannot remember when we recited (or failed to recite) our first piece at a Sunday School recital — our trembling knees, our thick-sticking tongue, the overwhelming assault of a thousand eyes, friendly in fact, but simply staring at us?

(3) *Emotional responses are long-lived.* Emotional responses that

have been learned or conditioned during childhood often have an unfortunate effect upon later adjustments. Perhaps the most frequent case of this type is fear. Most people are afraid of some things, snakes, perhaps; many have to contend with fears which take the form of embarrassment or timidity. That most fears, including the fear of snakes, are learned is shown by numerous experiments with infants and young children.

Figure 43 shows a little girl whose parents did not teach her to fear snakes. She has preserved the natural reactions with which she was born, and in addition has acquired a no less natural taste for snakes as pets. If the picture creates an unpleasant reaction in the reader, it will indicate how much *his* environment has changed the personality with which *he* started life. Of course, it would be unwise for a child who lives where poisonous reptiles are found to regard snakes as candidates for pets. But, while this would be dangerous, it is quite possible for a child to do so, if not taught otherwise.

Some fears are of value in keeping the individual from becoming too reckless and in stimulating him to take action necessary to insure the safety of a cherished object, but for the most part fears are handicaps. Fears range in intensity and duration from brief states of anxiety to persistent fears that place a heavy burden on a person. Sometimes they take the form of vague anxiety and nervousness. At other times they are directed toward a specific object or class of objects. Persistent and irrational fear of some object is known as a *phobia*, from the Greek word for fear. In designating the object of such fear, Greek derivations are also usually used. Thus the extreme and persistent fear of high places is known as *acrophobia*, the fear of open places is known as *agoraphobia*, the fear of closed places is called *claustrophobia*.

The following is an instance of claustrophobia. A medical man had from childhood suffered from a fear of closed places. The fear had caused little inconvenience until he went to war and was sent to the front. There, while he needed the protection of dugouts, he could not control his fear of being in a narrow closed space. As a result, he soon went to pieces mentally and was sent to a hospital for treatment. Under the direction and encouragement of his physician, he was able to recall that when he was four years old, he had stolen something and sold it to an old rag merchant. In order to get to the rag merchant he had to pass

FIG. 43. NATURAL REACTIONS

Annette Avers's early fondness for snakes is an example of how most children might feel if not taught otherwise. The study of very early reactions in children is basic to an understanding of the more complicated, and often reorganized, reactions in adults. (Courtesy of Franklin H. Avers.)

through a long narrow passage. When he had sold the article and was on his way out, he found the door at the end of the passage closed. His return was barred by a dog that began to growl. Alone in the passageway, he was terrified. The experience was soon forgotten, but the fear of closed places persisted. On the recollection of this experience, however, his fear was greatly reduced.[5]

Why had the medical man forgotten his painful childhood experience? Why had it, though ignored, continued to play such an important rôle in his behavior? The experience was, no doubt, allowed to slip from memory because it was, on the whole, a humiliating experience. Perhaps it was a shameful one, since the boy had stolen the object he sold. For some such reason it was driven from consciousness; and just because the boy did not permit himself to think of the painful and fearful experience, it continued to carry a heavy charge of fear. When it was later brought into consciousness, he was able to deal with it as a man, and it lost its emotional charge. The experience of this sufferer from a phobia is typical. Phobias involve repression due to shame or humiliation. When the experience is recalled, the phobia becomes far less intense. Shaffer gives a good interpretation of phobias and repressions in terms of conditioned responses.[6]

From this account of phobias parents can draw an important lesson. When children seek to tell their terrifying dreams or humiliating experiences, some parents urge children to forget them. By so doing they encourage the child to repress painful experiences, and thus to deprive himself of the opportunity of divesting the emotional experience of its emotional charge. In addition, the effort to forget or repress in itself involves tension. Parents, therefore, should be sympathetic listeners; by their suggestions they may help the child to handle the situation in a more constructive way than by nursing his fear or humiliation. Children thus treated are far less likely to develop phobias or any other disorder due to repression.

A second observation on such behavior should be made impressive. Forgetting like that of the physician noted above (in fact, forgetting in general) means only that the person is no longer *aware* of his emotional experience, although it may have been one of considerable force. Do not for a moment think, however, that such an experience has evaporated or that the slate has been wiped

clean. Often the organism has not, in any real sense, forgotten, and the experience affects the person in subtle and indirect ways for years to come. The mere *conscious* forgetting of the experience should not disguise the fact that everything that happens in one's emotional life is likely to have an enduring, or even a permanent effect. A mere sidelong glance of a teacher in the third grade when the psychological whole is just right (or wrong) has been known to affect a youngster's whole life.

(4) *Wide influence of emotions.* Emotional tension may impair the efficiency of an individual in his studies or occupation. Bronner has shown that the performance of a person taking an intelligence test is markedly affected by his emotional attitude.[7] For this reason, a clinical psychologist makes every effort to get the subject into a proper frame of mind before giving mental tests. For the same reasons, school authorities and employers are interested in the emotional difficulties of students and employees.

Excessive emotion is also responsible for much of the behavior which we label immoral. Immoral acts may be performed because a person is violently swayed at the time by mob feeling, or by anger, or by sexual passion. Indeed, Hughes has defined the term *moral* as the restraint of emotional activity.[8]

Judgments made during the course of, or as a result of, feelings and emotions are often poor ones. No small amount of money has been lost on bets made because of a "feeling" that the team was going to win. One young man who won $75.00 on a lottery said he had a "feeling" he was going to win the lottery. It would be interesting to know how many of those who lost on this occasion had the same "feeling." Because we feel we can trust a person, we lend him money. Because we feel we shall be lucky, we take a chance. Many of our most important decisions are based on feelings. And this is easily understood; for making important judgments involves our whole personality — our likes and dislikes, our ambitions and fears. In deciding upon an occupation, it is doubtful if many make their choices on logical grounds. These may point to one course, but deep within the individual, unformulated desires may decide the issue; and desires often lead us to take a course which we later regret.

Calm, clear thought is seldom as evident in man's actions as are the feeling and emotional phases of personality. Touch human life where one will, one is sure to find the feelings and emotions

of human nature at work. No decision is important, no experience significant, until man begins to care about it or to take an emotional attitude toward it. It is not thinking, but feeling that makes us marry; no price is too great to pay for friendship, for our emotional lives are starved without it. Man will not make so very many concessions as a result of his thinking, but he will do almost anything as a result of his feeling. Civilization is not yet dominated by logic. We live largely in a *feeling* rather than a *thinking* world.

BODILY EXPRESSION OF EMOTIONS

Emotional behavior is largely an effort of the organism to muster its resources to deal with a situation. Bodily changes are, therefore, an important part of all emotional behavior. Many of these changes have been given careful experimental study.

(1) *Facial expression.* The man in the street relies a great deal on his interpretation of facial expression. He says, for example, that some one "looks" afraid, or angry, or sorry. Several investigations in this field have been reported, beginning with the work of Feleky.[9] One series of photographs which has been widely used was published by Ruckmick.[10] While these studies show that certain major emotions may be correctly identified, they also reveal an astounding disagreement in many cases. It is true that emotions which involve laughter or surprise may be readily interpreted from facial expression (see Figure 44). The drawings on the blackboard show the simplicity and distinctness of the lines of the face which are so revealing in these two emotions. But facial expression alone may lead one astray in judging more complex emotions.

Other investigators have attempted to discover which emotions are most apparent in facial expression as well as which part of the face is most revealing of emotional states. Buzby reported that honor, disdain, disgust, and bewilderment are more accurately judged than anger and dismay. He also found that the upper part of the face, the eye, and the brow are more important for correct judgment than the mouth.[11] There should be considerable hesitation, however, before concluding that the upper part of the face is for all subjects more important than the mouth; for in an experiment conducted by Dunlap the mouth was found to be more important.[12]

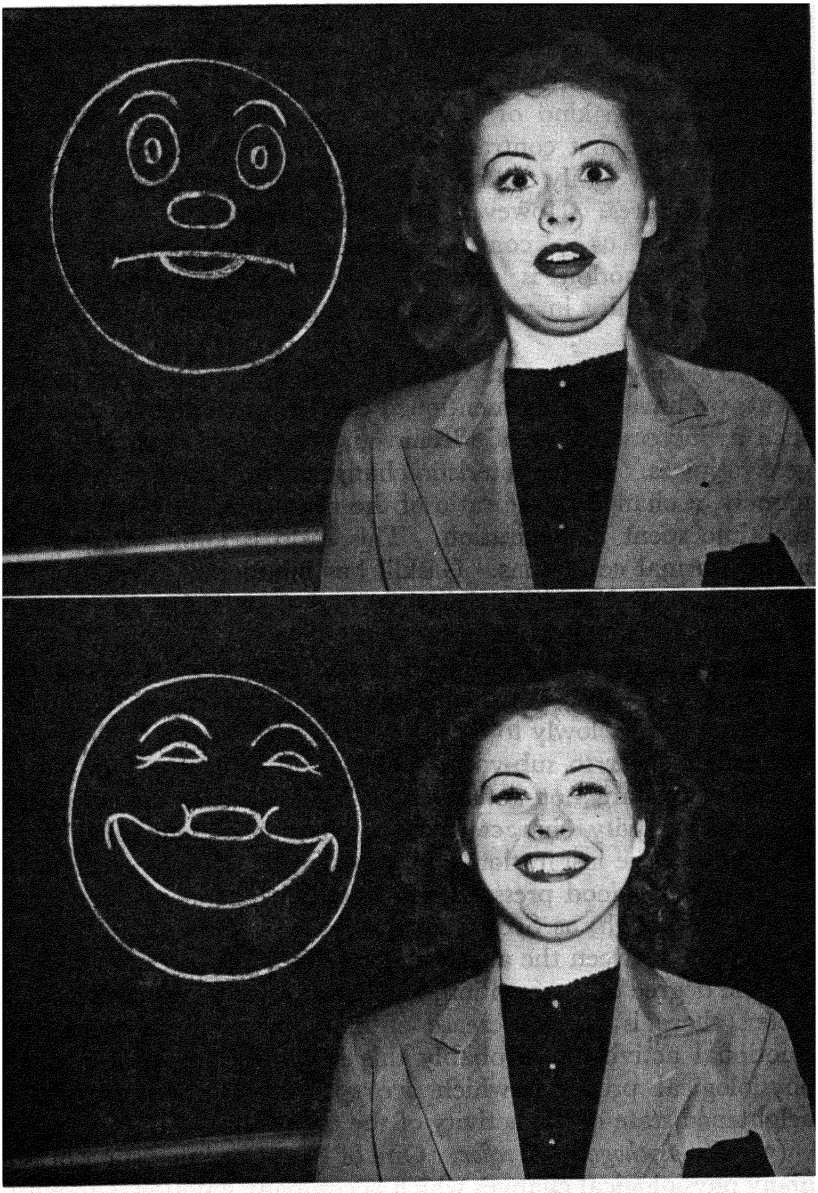


FIG. 44. SURPRISE AND LAUGHTER ARE INDICATED BY SIMPLE FACIAL LINES

More complex emotions are not revealed accurately by facial expression. (Photo: Acme.)

We may conclude that facial expression, while it yields some knowledge of emotional conditions, is by no means a certain guide as to the kind or degree of emotion being experienced. This seems at first contrary to common sense, especially when we recall how easily we understand the emotions portrayed by motion pictures. However, we should remember that motion pictures give us a complete setting of the situation under which an emotion is aroused. Knowing the situation, we have no difficulty in recognizing and naming the emotion portrayed.

(2) *Physiological changes.* In considering emotion as an adjustment, we have already mentioned certain physiological changes, such as increased flow of adrenin and decreased secretion of digestive juices. A characteristic change in breathing also occurs: namely, a change in the ratio of the time spent in inspiration to the time spent in expiration. This ratio is approximately .70 under normal conditions. Gaskill has found that the ratio falls in response to disgusting situations and that it rises in response to situations that provoke noble sentiments.[13]

In speech, the ratio greatly decreases — in fact, it is reduced to .20 or .25 — because the breath is drawn in quickly and allowed to escape slowly to form the stream of words. This reduction carries over to sub-vocal speech, that is, to the forming of words which are not actually vocalized. Thus, the increased sub-vocal activity characteristic of lying is accompanied by a reduction of the inspiration-expiration ratio.

Changes in blood pressure also usually occur in emotional activity. Although, as Scott has pointed out, there is no definite correlation between the amount of systolic blood pressure change and the degree of the emotion, as introspectively reported, nevertheless there is some increase of blood pressure in nearly all emotional activity.[14] Probably this is simply one of the many physiological processes which are speeded up because of the heightened state of the activity of the organism.

(3) *The psychogalvanic reflex.* One of the most interesting of the many physiological changes which accompany emotional activity, and probably the most serviceable to students of emotions, is the change in the resistance of the skin to an electric current. By placing properly constructed electrodes on the surface of the body, we can demonstrate that resistance of the skin to an electric

current decreases during an emotion.[15] This change is known as the *psychogalvanic reflex.*

By recording this change in electrical resistance, one may determine when an emotion is present and approximately how intense it is. So far no one has discovered a means of determining from the record *what* emotion is being experienced, but in spite of this limitation many interesting investigations on the emotions have been made possible by this technique. Some of the investigations of the effect of movies on children already referred to (see page 89) have used the psychogalvanic reflex. Other studies have shown that it is possible to condition an emotion, that is, to cause a stimulus which originally had no emotional effect to arouse an emotion. Freeman found that persons would respond with an emotional reaction to an electric shock, but gave no response at all to a clicking sound. After shocks and clicks had been given a number of times simultaneously, the click alone produced an emotional response.[16] The records from a typical subject are shown in Figure 45.

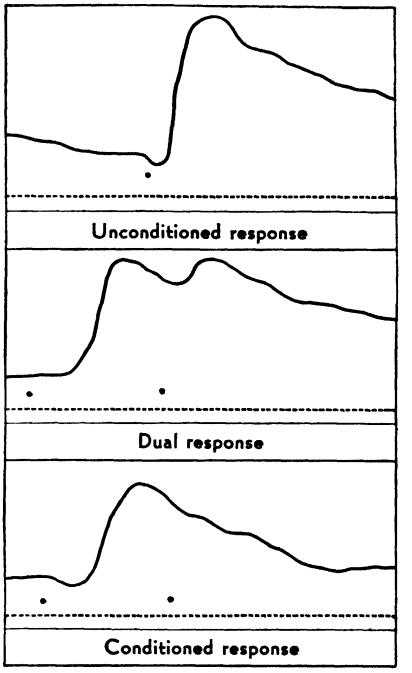


FIG. 45. A CONDITIONED EMOTIONAL RESPONSE MEASURED BY THE PSYCHOGALVANIC REFLEX

(From G. L. Freeman, "The Galvanic Phenomenon and Conditioned Responses," *J. Gen. Psychol.*, III, 1930, 529–39.)

(4) *The startle pattern.* Probably you will recall an occasion when you were sitting peacefully and were suddenly disturbed by an abrupt and intense noise. You jumped a little and were "startled." During the half-second following the sound your startle pattern of facial and bodily behavior included "blinking of the eyes, head movement forward, a characteristic facial expression, raising and drawing forward of the shoulders, abduction

of the upper arms, flexion of the fingers, forward movement of the trunk, contraction of the abdomen, and bending of the knees." [17] This pattern of behavior following a sudden loud sound (a pistol shot in the experiments) was observed by Strauss.[18] Landis and Hunt in a comprehensive series of experiments found essentially the same pattern in response to sudden stimuli of other kinds, such as a jet of ice water between the shoulder blades or an electric shock.[19]

The behavior pattern in the startle response should not be thought of as essentially emotional behavior, since it occurs very quickly and "may or may not be followed by emotion proper," but it is closely related to emotional behavior and "there is strong justification for treating the startle pattern as a form of emotional behavior for most classificatory purposes."

One of the most interesting and valuable aspects of the startle pattern is the variation in the response which accompanies certain nervous diseases. For example, in catatonia, a state in which the patient ordinarily loses much of his mobility and allows his skeletal musculature to remain in any position in which it is passively placed, the startle pattern is, strangely enough, quite exaggerated. Epileptic patients, on the other hand, who are ordinarily subject to severe convulsive seizures, show a "lack of response or disorganization of response" in the startle pattern.

The complicated behavior response found in the startle pattern "obeys all the conventional laws governing simple reflexes" and is a basic reaction found in all normal persons, "infants as well as adults, in the primates and in certain of the lower animal forms." Its presence does much to indicate the innate character of at least this form of emotional expression and furnishes a powerful instrument for the diagnosis of certain types of mental disease.[20]

(5) *Emotional expression in the voice.* Every one recognizes the rôle of the voice in revealing the presence or absence of emotional states. (See Figure 46.) In the dramatic arts and in daily life we continually form judgments of the mental states of others from their vocal utterance. Vocal expression has recently been approached experimentally by photographing the sound waves of the voice. Using this technique Lynch has shown that in anger the pitch and intensity of the voice rises, polysyllabic words are shortened, and pauses between phrases are shortened.[21]

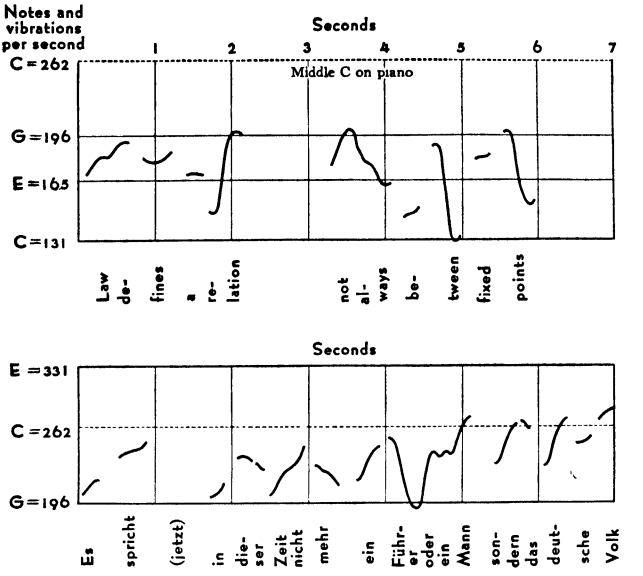


FIG. 46. EMOTION AS REVEALED BY THE PITCH OF THE VOICE

The calm though emphatic speech of Roosevelt was pitched half an octave lower than the emotional speech of Hitler. These curves were obtained with the apparatus shown in Figure 82 (page 522). The pitch in vibrations per second is shown at the left of the graphs. Middle C is indicated by the dotted lines.

Upper curve: From radio speech broadcast by Franklin D. Roosevelt on December 5, 1938. Median pitch, 166 vibrations per second.

Lower curve: From radio speech broadcast by Adolf Hitler on September 26, 1938. Median pitch, 232 vibrations per second. The word *jetzt* did not record.

An investigation by Fairbanks and Pronovost shows that the emotions of contempt, anger, fear, grief, and indifference, as simulated by actors, are correctly identified from the voice alone in from 66 to 88 per cent of the trials, when mere chance would account under the same conditions for only 8 per cent correct judgments.[22] In a subsequent report by Fairbanks and Hoaglin, objective measurements of the duration aspects of the voice changes of the five simulated emotions were made by means of sound-wave photography. An analysis of these sound waves revealed that anger, fear, and indifference differed from contempt and grief but did not differ in any significant way from each

other. All three involved rapid rate and duration of phonations and pauses.[23] These results lead us to believe that one's voice is more indicative of his emotional states than is his facial appearance or his bodily activity.

We should realize, however, that there are no secret tricks by which one can tell from the voice what emotions are really being experienced even by a close friend, much less by a casual acquaintance or an enemy. Deception is a technique of great survival value. It is found throughout the biological series, from the "broken" wing of the partridge to the press reports of unexpected injuries just before a championship game. Shrewd persons rarely give themselves away through their voices. Only through the use of elaborate instruments can emotional states be accurately analyzed from vocal expression.

MEMORY FOR EMOTIONAL EXPERIENCES

Of the numerous factors which determine whether or not we shall remember an experience (these will be discussed in detail in Chapter XI), the emotional quality of the experience has unique importance. It is a basic principle of psychoanalysis that we tend to remember events which are pleasant and to forget experiences which are unpleasant. While there are many exceptions to this principle, its general truth seems to be fairly well established from numerous case histories. Some thirty-five experimental studies also indicate that experiences which were originally pleasant tend to be recalled more readily than those which were originally unpleasant.[24]

Meltzer, who has given a convenient summary of the experimental work in this field, has himself conducted one of the most significant investigations. On the day following a Christmas vacation, Meltzer asked 132 college students to list briefly all their experiences during the vacation. Of the 2,231 experiences reported, 62 per cent were pleasant and 37 per cent unpleasant. Six weeks later the students were again asked to recall their Christmas experiences. Fifty-three per cent of the pleasant experiences were again recalled, whereas only 40 per cent of the unpleasant ones were recalled. There were, however, some individuals who recalled a greater proportion of unpleasant experiences than pleasant ones.[25]

Results somewhat contradictory to these findings were reported by Anderson and Bolton, who believe that pleasantness and unpleasantness show no decided difference in their effect on memories, but that both show an advantage over indifference.[26] Lanier, studying incidental memory for words differing in affective value, found no general relationship between memory and pleasantness or unpleasantness.[27] In discussing such contradictory results, White and Ratliff suggest that more experiments should be performed in order to establish the facts and, if possible, to explain the divergent conclusions in previous experiments. In three separate experiments these investigators showed that the recall of pleasant and unpleasant materials varied with the method of measuring recall and with the time interval between learning and recall. They suggest that such factors as differences in the intensity of pleasantness and unpleasantness, differences in the familiarity with various pleasant and unpleasant stimuli, and differences in the instructions to the subjects in the experiments might be responsible for the inconsistencies in the results of the various experiments on this topic.[28]

The great majority of experimental studies, however, shows that pleasant experiences are, in general, remembered longer and more accurately than unpleasant ones. This does not mean that the unpleasant experiences have no effect on one's personality once they have been driven from consciousness. They may continue for a very long while to exert a profound and unhealthy effect upon one, as in the case of the patient described on page 272. But the conscious aspect of unpleasant experiences seems to disappear fairly rapidly in most cases.

We can all make very practical use of the foregoing discussion of memory for emotional experiences. It is economical for a person to forget what tends to deflate him. If we had to carry on our shoulders memories of all our defeats and humiliations, we should have little energy left for the work of the day. It is useful to remember what was successful and pleasant, because the memories of success give us courage with which to meet the contests of the present. "How dear to this heart are the scenes of my childhood." We find this true because we have forgotten most of the scenes that were not dear. Listen to an old graduate tell of the wonderful teachers and brilliant lecturers he used to have when "you really learned something in college." You

will be talking that way too in thirty years. The old oaken bucket deludes only those who have forgotten how it really worked on a cold morning or who have never had any manual contact with it. In appraising reports of what really happened, made by witnesses that were emotionally involved, the experienced student of human nature always makes allowances for emotional distortion. Resolutions made during a period of severe depression or remorse usually last little longer than the memory of the remorse, which is soon forgotten. Every convalescent is going to take excellent care of his health just as soon as he gets well.

COMPLEXES

A *complex* is a group of related interests and activities organized around an emotional core. A complex may be beneficial, worthless, or harmful to the well-being of the total personality. For an example of a beneficial complex take the information and interests organized around the subject of chemistry by a research chemist who, while he makes his living from his research, is truly "in love with" his work. He has a complex for chemistry. His thinking, his life outside the laboratory, and his interests are all extensively influenced by this dominant activity. When he sees a new plastic material, his thinking immediately turns to the chemistry which made the new material possible. A complex of this type is of value to the individual and to society. For the individual it relates a wide variety of things to his dominant interest, and thus broadens his whole horizon of enjoyable mental activity. Society profits because the individual concentrates his abilities and training in a direction which makes for new developments and discoveries. The person whose daily work has become a complex is in the fortunate position of Professor George Herbert Palmer, who said he had the best job in the world because "Harvard College pays me for doing that which I should gladly do whether Harvard College paid me or not."

Other complexes may be somewhat less general in their effect upon a personality. One's hobbies, for example, are complexes which are relaxing, stimulating, or entertaining, but which influence one's thoughts or activities only "after business hours." Photography, stamp collecting, and sports may become complexes which, practiced in moderation, are wholesome and con-

tribute greatly to general happiness and satisfactory adjustment to life. Link has pointed out that the feelings of unhappiness, restlessness, and insecurity which sometimes develop during middle age can be largely eliminated by deliberately taking up again some of those hobbies which were so important a part of our childhood life. With the increasing amount of leisure time resulting from modern industrial methods, the importance, if not the actual necessity, of complexes around which to weave the activities of our leisure time is becoming greater and greater. Perhaps a part of our modern restlessness and of our tendency to be "on the go" we can explain by the fact that leisure time has increased during the past twenty years more rapidly than interests, in the form of complexes, have developed.[29]

Not all complexes, however, are desirable. Indeed, the term was first used to describe those constellations of ideas which are injurious to the individual. Many complexes are of this type. Best known in popular thinking is the so-called "inferiority complex" — the possession of an ill-recognized feeling of inferiority, which may bring about many undesirable consequences. It may cause one man to assume an air of bravado, another to become a downright bully, another to become a silent recluse or a bashful and timid soul. It is very serious when it causes a person to feel himself beaten at the outset of any project which he undertakes. The particular form which an inferiority complex takes depends upon many factors, including the native ability of the person involved. It has recently been said that an inferiority complex is usually an asset to the sufferer because it prompts him to greater efforts to overcome his handicap. In a person who is endowed with some rare ability, this is no doubt true — for instance, Steinmetz was a hunchback, Demosthenes a stutterer — but in the absence of a very high level of ability the effects of a marked inferiority complex are usually detrimental. One should not, however, feel at all unusual if he is afflicted occasionally with feelings of inferiority. Any one with an ounce of ability to appraise his own powers must, at times, feel quite insufficient. To experience a *moderate* amount of annoyance because of inferiority feelings is doubtless more of an asset than a liability. These feelings are usually quite justified by the facts of the matter and arouse us to action.

We must note that much behavior which, at first glance, ap-

pears to be energized by a superiority complex is really a compensation for feelings of inferiority. When one gets down beneath the surface of the braggart, the boaster, the strutter, or the man who goes only with the best people, he usually finds definite feelings of inferiority, insecurity, and uncertainty.

DETECTION OF EMOTIONS

Numerous efforts have been made to detect emotions. Many of these are based on the internal changes during an emotional experience described in our treatment of physiological changes in the emotions. Instruments are available for measuring these physiological changes. Changes in the rate of breathing or alterations of depth of breathing are recorded by a *pneumograph*. Pulse rate is measured by a *sphygmograph*, which is commonly attached over the artery at the wrist. Changes in blood pressure level, which are frequently regarded as the most reliable indications of emotion, are measured by the instrument commonly used in medical examinations, the *sphygmomanometer*. Changes in blood volume are measured by a *plethysmograph*. Changes in the electrical resistance of the skin, the psychogalvanic reflex, are measured by a galvanometer. It is a rather common practice to use two or more of these instruments at a time and to record the measured changes with an apparatus known as a *polygraph*.

The "lie-detectors," which have recently been given considerable newspaper publicity, consist of a polygraph which shows heartbeat, blood pressure, breathing rate, and the psychogalvanic reflex. The theory is that lying involves more emotional tension than telling the truth, and that the apparatus, by revealing this emotional condition, will indicate the veracity of the subject. Much headway has been made in this direction, and this instrument, no doubt, will become valuable to detectives in inducing criminals to make confessions and in getting clues leading to evidence admissible in court.

A more strictly psychological method of detecting emotions is the free-association test discussed briefly on page 94. This test consists of a number of words to which the subject is asked to respond with the first word that comes to mind. It rests on the assumption that, in responding to an emotionally charged word, a subject will "give himself away," so to speak, by hesitating, thus increasing his reaction time to the word; by repeating the stimu-

lus word; by responding with more than one word; by using the same response word more than once; by using one of the emotionally toned stimulus words as a response word; or by responding very quickly. These indications of emotion in a word-association test are referred to as *complex indicators* because the test is commonly used to study complexes. The free associations of a depressed person contemplating suicide are given in Table XV How many complex indicators can you find in this table?

Attempts have been made to apply the method to criminal detection by requiring the suspect to respond to a number of words, some of which, called the *key* or *critical words*, are closely connected with the crime and the rest of which are padding. It is assumed that the critical words will cause the subject to think of the crime, and that the emotional state so caused will influence his response in some significant way. Perhaps he will hesitate; perhaps he will become confused. As a means of detecting criminals, however, the method has not been successful. It has been more successful as a means of discovering the hidden emotional disturbances of the mentally sick. An individual suffering from an emotional disturbance may be unaware of the source of his trouble. Under these conditions the psychiatrist or psychologist may find a free-association test helpful as a starting point in the task of discovering the hidden emotional disturbance.

Another method used by psychologists, especially by the psychoanalysts, to discover the source of persistent emotional tension is to study the dreams of the sufferer. If the patient cannot recall any, he may be asked to fabricate a few. The important thing is to get the patient to talk freely, to throw off his usual sense of propriety, both logical and moral, and to give expression to all thoughts that come to consciousness, however fanciful or improper they may be. If this is done, his thoughts often lead to the source of his disorder. This method and its underlying assumptions are discussed more fully in connection with the psychoanalytic interpretation of dreams (see pages 476 and 478). Suffice it to say here that the psychoanalysts have been reasonably successful in discovering the emotional troubles of their patients.

Slips of the tongue and other mistakes in action that are made in spite of the individual's being on guard also give evidence of emotional difficulties, often hidden even from their owner. "I had a very ice time at your party. Pardon me, I meant *nice*

TABLE XV

REACTION TIMES IN FREE ASSOCIATION TEST TO INDIFFERENT WORDS AND EMOTIONALLY "CHARGED" WORDS [80]

Stimulus word	*Reaction word*	*Reaction time in seconds*
1. Head	Hair	1.4
2. Green	Meadow	1.6
3. *Water*	*Deep*	5.0
4. Stick	Knife	1.6
5. Long	Table	1.2
6. *Ship*	*Sink*	3.4
7. Ask	Answer	1.6
8. Wool	Knit	1.6
9. Spiteful	Friendly	1.4
10. *Lake*	*Water*	4.0
11. Sick	Well	1.8
12. Ink	Black	1.2
13. *Swim*	*Can swim*	3.8

time," was said by a girl attending the coming-out party of a successful social rival. If you are becoming a psychologist rather than just taking another course for credit, make it a point to study the next half-dozen slips of the tongue that you hear (or make).

Another everyday indicator of emotional tension which often betrays one unwittingly is very rapid conversation and overactive behavior. The overhearty laugh, the unduly strong handshake, gay chatter in excessive amounts, all indicate dis-ease. Your dinner partner may brag, "I have been to four teas this week; and, oh dear, next week there are five teas and three dinner parties. I never get any time to myself." Be polite and interested, but also be sympathetic; for the speaker is, in all probability, under an emotional tension so severe that to be alone with herself is intolerable. She finds that the imps that whisper to her the truth of an unsatisfactory emotional life cannot be heard above the din of dinner-party chatter. May the writer add that he hopes hostesses who invite him to dinner will not read this page.

A consideration of the efforts to detect what emotion is portrayed indicates, as we have previously stated, that emotions must be defined in terms of the situations that produced them. The various instruments that are employed to detect emotional

excitement are of little value in determining what emotion is being experienced. They indicate excitement, not what kind of excitement. A disturbed condition, such as those characteristic of the patients of the psychoanalysts, does not in itself indicate the nature of the emotion, as may be inferred from the disagreement of psychoanalysts as to the nature of the underlying emotional disturbance. Even pictures of actors trying to portray emotions are frequently misjudged. Knowledge of the whole psychological situation out of which the emotion emerged is necessary if we are to know definitely the emotion experienced. The reason psychoanalysts have been as successful as they have in detecting the nature of emotional disturbances is that they make thorough investigations of the problems and situations that produced the emotional disorders of their patients. No psychoanalyst or psychologist who has studied deeply a single individual as he really is has ever reported that emotions are relatively unimportant. Man feels *always;* he thinks *occasionally.*

THE JAMES-LANGE THEORY OF EMOTIONS

According to Professor William James, a leading American philosopher and psychologist (died 1910), and Professor Carl Lange, a leading Danish physiologist and psychologist (died 1900), an emotion is the *awareness* of the various bodily changes we have described. Imagine, they challenged, a person angry without experiencing bodily changes. Do the same with fear, sorrow, tenderness, and all the other emotions. Could there be an emotion without bodily changes? James and Lange, not content with insisting that there could not, insisted that the awareness of the changes *was* the emotion.

In support of the theory, James called attention to the fact that an actor may induce an emotion by portraying it; a person by acting in a kindly fashion toward another may generate a feeling of kindliness. Perhaps all of us can recall outbursts of anger following what we intended to be mild censure; giving expression to our irritation apparently caused us to become more angry. Whistling to keep up courage is no mere figure of speech. On the other hand, if we "sit around all day in a moping posture, sigh, and reply to everything in a dismal voice," melancholy lingers.[31]

In further support of this theory, it may be urged that we frequently make an appropriate response and feel the emotion later, as when we dodge a car. Also in some cases of lost bodily sensations, the emotions are lacking in intensity. A case of this latter type is reported by Meyerson.[32] The patient continued to eat because she knew she needed food, but she never experienced hunger. She went to bed because she knew she needed sleep and rest, but she never felt tired. She got out of the way of automobiles because she knew they were dangerous, but she never experienced fear. She cared for children in her charge because she knew it was her duty to do so, but she felt no tenderness or love. Objectively viewed she lived normally, though she claimed to experience no emotions whatever.

These considerations are sufficient to show that bodily changes are important in emotional experiences and that persons differ in the intensity of their emotional responses. But several lines of evidence indicate that there is more to an emotion than simple awareness of our bodily or organic changes. Actors do not universally experience the emotions they portray. In Archer's investigation it was found that emotion appropriate to the part played usually masters an actor whenever the part is played well.[33] But it was also found, according to James, that "many actors who perfectly mimic the outward expression of the emotion in face, gait, and voice declare that they feel no emotion at all." [34] Furthermore, there is a good possibility that even those who report that they experience an emotion may, in many cases, be experiencing satisfaction or dissatisfaction with the job they are doing, rather than the emotion which they are portraying. Indeed, Metcalf found that the affective quality of an actor's consciousness is one of pleasantness or unpleasantness only, depending on whether he feels he is succeeding or failing in his portrayal.[35] The fact that some actors, even if they be few in number, can portray the emotion without experiencing it, casts doubt on the James-Lange theory in its extreme form.

Differences in organic changes do not seem sufficient to account for differences in emotions as experienced. For example, fear and anger as experienced are radically different. Yet their physiological counterparts are very similar. Indeed, the most noticeable difference between them, viewed physiologically, is that in anger the salivary glands become more active, giving

rise at times to frothing at the mouth, while in fear the salivary glands cease to function. A practical application of this difference was made in the ordeal of rice formerly used in the Orient to determine whether a person accused of a crime was guilty. The accused person was given some rice to moisten in his mouth. If he could do this, his innocence was regarded as established; if he could not, he was declared guilty. Whatever the origin of this ordeal, it probably worked in the majority of cases; for a guilty person who had been taught to believe in the ordeal would obviously be more afraid than an innocent one, and fear, as we have stated, is apt to inhibit the secretion of saliva. On the other hand, if an innocent person were made angry rather than fearful by the unjust accusation, there would be a free flow of saliva.

By cutting the spinal cord of a dog physiologists have demonstrated that an animal may continue to show emotional responses even though it is deprived of sensations from the organs of the body. This experiment seems to prove that the awareness of the organic changes is not essential for an emotional response. However, such experiments do not make untenable the James-Lange theory, for the muscles having to do with all responses are obviously not anaesthetized. Hence, a defender of the James-Lange theory could contend that all bodily sensation had not been eliminated. Moreover, we do not know that animals, merely because they respond "emotionally," experience an emotion. This experiment is therefore not conclusive. It shows merely that an animal may act emotionally when deprived of sensations from the organs of the body. How the animal really feels we have no way of determining.[36]

Of more importance is the discovery that adrenalin injected into the blood stream will induce the various organic changes characteristic of emotional excitement without the subject's experiencing an emotion. Instead, he feels tense, on edge, or jumpy. In other words, a mood or emotional set is produced, but the emotion is not experienced, if there is an absence of an object or situation appropriate to arouse it. Another consideration of some weight against the James-Lange theory is that we sometimes laugh and cry under inappropriate circumstances. Laughter does not always mean joy, nor does crying always mean sadness. Finally, the expression of an emotion, such as anger, may some-

times actually lessen the emotional excitement. Frequently the greatest emotional excitement comes before action.

It must be admitted that these arguments do not definitely decide the point at issue. The injection of adrenalin shows the importance of the organic states in producing conditions favorable for an emotion. On the other hand, the severing of the spinal cord shows that the organic conditions are not essential to responding emotionally, though we have no way of knowing the conscious condition of the animal. Again, consideration of pathological cases strongly suggests that awareness of the organic states is essential to an emotional experience. Keeping in mind all the facts, we may reasonably conclude that James and Lange pointed out an essential element in emotional responses as they are normally experienced, but that they mistook an essential condition for a complete description. Emotional responses are not merely the awareness of the organic and muscular changes that occur. They are responses that are concerned with awareness of those changes, but that also involve the anticipation of some value (real or imagined) about to be gained or lost, and an impulse to act.

EMOTIONAL DEVELOPMENT

Emotional development is determined by the original nature of the organism at birth, its process of maturation, and the amount of learning it achieves.

(1) *Emotional responses present at birth.* One of the earliest investigators to study the emotional responses of newborn infants was John B. Watson. We have already discussed one contribution which Watson made to psychology: namely, the founding of the school of behaviorism, which emphasized the objective study of activities. Watson's work on the emotions carefully followed principles of his general behavioristic viewpoint. He observed many infants in many situations, controlling external conditions as carefully as possible and noting changes in the infants' behavior as factors in the environment were varied one at a time. Briefly, Watson's conclusions were that the newborn infant shows only three emotions. These are *fear* (aroused by pain, injury, loud noises, or sudden loss of support), *rage* or *anger* (aroused by restriction of movement), and *love* (aroused by soft noises or gentle stroking of the skin). Watson contended that all emotions found

later in life are the result of conditioning these three primary responses to more complex stimuli.[37]

Watson's conclusions have been modified in several ways as a result of later experiments, but one conclusion which he reached and emphasized seems now to be thoroughly established. This is that infants at birth do have very few emotions, and that only a very few stimuli or situations will arouse emotional behavior. Among stimuli which do *not* cause emotional reactions in infants and young children are furry objects, toads, lizards, snakes, and similar things which adults often dislike. At birth, we have no innate fear of them. If they are fearful or repulsive to us as adults, it is only because we were *taught* in infancy to respond to them with fear reactions, though the teaching may have been quite unplanned and, at the time, unrecognized. The child shown in Figure 43 (page 273) is a normal little girl whose parents did not teach her to fear snakes.

Watson's conclusion, however, that fear responses may be conditioned with equal ease to any type of stimulus has not been substantiated by later research. Work reported by Valentine, Bregman, and others shows that it is much easier to condition children to show fear responses to *living* than to *nonliving* objects.[38] It is also felt by many psychologists today that definite identification of *three* specific emotions in infants is not supported by research findings. Dashiell, after studying and summarizing a great deal of this research, concludes that man is not born with definite patterns of visceral responses worthy of being called emotions.[39] Sherman also states that an observer is unable to judge an infant's emotional states at birth.[40] Though psychologists are not in complete agreement on this matter, most of them agree that in the newborn infant the only clearly recognizable emotional response is one of random movement and crying, which for want of a better name may be called excitement.

(2) *Maturation.* Development of the primary emotional response of excitement into the complex emotional life of the adult may be due to maturation, to learning, or to a complicated interaction of maturation and learning. Maturation, discussed briefly on page 35, means development which naturally accompanies growth and which thus takes place largely without reference to the training which the child receives. As human beings, we pass from infancy through childhood, adolescence, maturity, and old

age to death. This cycle of growth and decay is largely determined by our heredity and is, therefore, thought of as the process of maturing. The developmental period is regarded especially as a period of maturing.

Emotional development due to maturation occurs most rapidly in infancy. Though activity similar to excitement is about all that can be observed at birth, in the course of a few months infants show remarkable emotional development. They may sulk or laugh, show anger or love, jealousy or contentment. Bridges has set forth in considerable detail the emotional development of an infant from birth to two years. Figure 47 is a convenient summary of her findings.[41] That this development is to be attributed largely to maturation is the opinion of Goodenough, another investigator of emotional development during infancy. She writes:

> And if crying as a form of emotional behavior can occur without training, there seems to be no logical reason why frowning, kicking, striking, running away, smiling, sneering, stamping, and so on throughout the long list of reactions that appear one after another may not also be the unlearned results of maturation, although . . . their occurrence under particular circumstances may be determined by experience. As age advances, imitation and social custom undoubtedly play an increasingly important part in fixing their exact pattern. An important sign of emotional maturation is to be found in the bringing of these unlearned emotional reactions under voluntary control.[42]

A striking instance of emotional development due to maturation is the development of sex behavior and interest during adolescence. Of course, interest in the opposite sex is aided and abetted by many aspects of the environment. These range all the way from stories which suggest that it is about time to have a girl to the careful coaching of parents. However, it is felt that interest in the opposite sex depends to a large extent upon inner growth, which thus serves, biologically, the very practical purpose of keeping the race alive.

Maternal tenderness is also undoubtedly due at least in part to physiological changes which occur automatically and are not dependent on learning or social custom. When young male rats are treated either by implanting a bovine pituitary gland or by removing the thyroid gland, they develop maternal behavior

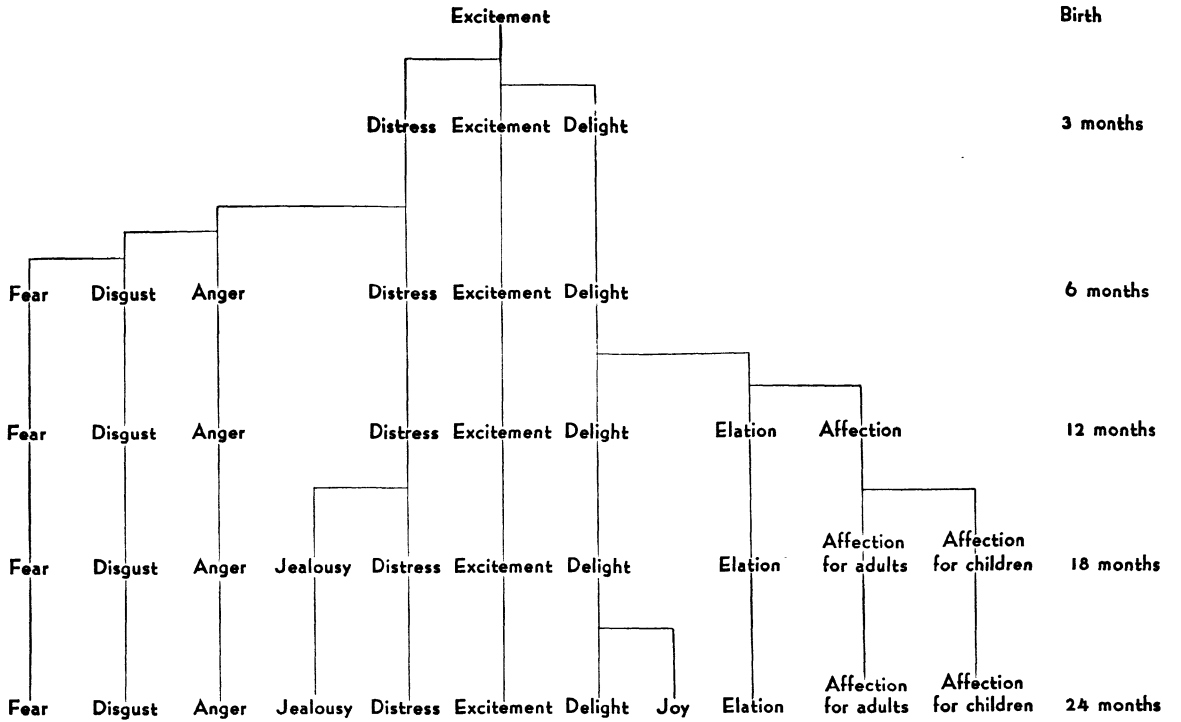


FIG. 47. THE DEVELOPMENT OF EMOTIONAL EXPRESSION FROM BIRTH TO TWO YEARS

Notice how the single undifferentiated emotion of excitement develops in various channels. (From K. M. B. Bridges, "Emotional Development in Early Infancy," *Child Devel.*, III, 1932, 324–41.)

which normal male rats never develop. They will make nests, care for the young, lick them in a maternal way, etc. Control male rats, that is, rats subjected to the same environmental influences but not operated on, develop no maternal behavior.[43] Such experiments suggest that many kinds of emotional behavior may be dependent upon physiological and maturational factors.

(3) *Learning.* Though maturation is important, we know, too, that experience plays an important rôle in emotional development. As a result of experience, we respond emotionally to new objects and become indifferent to others that once aroused an emotional response. A footstep or a voice that formerly awakened no feeling may now do so. Perhaps we were once afraid of thunder, though it disturbs us no longer. After responding to a complex whole, we tend to respond to a part of the whole as we did to the whole. For example, the infant reacts to the appearance, voice, and movements of its mother with signs of pleasure. Later, merely the voice of its mother may arouse similar activity. Or an infant may respond with fear to the simultaneous occurrence of a loud noise and the approach of a dog. The dog alone would not have caused the fear; but after the fear situation, with the dog figuring prominently in it, has occurred, the sight of the dog becomes sufficient to arouse fear. Throughout life, our emotional development is thus influenced. A dangerous experience on a high place may give rise to fear of high places. After experiencing repeatedly in a particular church such religious emotions as reverence, awe, and trust, a person entering any similar place is likely to have the same feelings aroused. A boy who has repeatedly been made to fear his father on account of his sternness may fear to be in the presence of his father; he may even be vaguely ill at ease in the presence of men who resemble his father; or, in extreme cases, he may be afraid of all men. Psychologists speak of such modifications of our emotions as *conditioned emotional responses* and have studied them in the laboratory. We have already mentioned Freeman's work (page 279) in which a fear response was conditioned to a clicking sound. This kind of learning will be discussed in more detail in Chapter X.

If conditioning emotions only increased the number of objects that are emotionally charged, we should live in a state of perpetual emotional excitement. Conditioning, however, operates to eliminate the emotional charge of objects as well as to endow

them with such charges. For example, conditioning might cause a rabbit to become an object of fear to a small boy. The fear, however, may be eliminated by allowing the child to play with other children while they are playing with rabbits, or by bringing a rabbit into the room with, though not too close to, the boy while he is eating. In each case the rabbit is an element in a situation that is on the whole pleasurable. The boy in each case responds to the whole situation. In time, he will, in accordance with the principle that we tend to react to part of a situation as we previously have to the whole, not only overcome the fear of the rabbit but he may even view it with pleasure.[44]

Learning that satisfaction can be gained through acting emotionally may also result in strengthening emotional development. If, for example, an individual finds that the consequences of acting angrily are satisfactory, he is likely to act angrily again and again. Likewise, if he finds that sympathy and tenderness are followed by desirable consequences, these responses become more deeply ingrained in his personality. This tendency in our behavior to repeat the pleasant and eliminate the unpleasant is known as the *law of effect.*

To the credit of learning must also be placed the enrichment of emotion that comes from the development of such sentiments as patriotism, love of truth, and hatred of injustice. The evolution of fear often shows clearly the effect that such sentiments can have on emotions. A person who, as a young child, feared corporal punishment, may, as he grows older, learn to fear physical pain or even injury less and less, and to fear more and more the disapproval of his group, until eventually patriotism or the love of country overcomes almost entirely his fear of physical suffering. This is seen frequently enough in the readiness of men to expose themselves to every danger in order to defend the group. And similarly, many men become so imbued with love of justice that they are willing to risk life and fortune in striving for human welfare.

Emotional development results also from improvement (or changes) in the expression of emotion. In infancy and early childhood the improvement is due largely to maturation. One of the most important improvements of expression comes with language. Goodenough has found that as we pass from infancy to adulthood, we tend more and more to substitute verbal responses

for other types of response to anger-provoking situations.[45] This change is shown graphically in Figure 48. The frequency of anger outbursts also varies with age, reaching a peak at around eighteen months. This is shown in Figure 49. During childhood, there is no particular effort to improve or change our emotional behavior, but as we grow older we consciously seek to control and refine our emotional expression. And it is important that we do so, for in the life of an adult there is little place for the emotional expressions of the child or the adolescent. Illuminating questions to ask about any one are: What is the level of his emotional development? Does he periodically have temper tantrums and outbursts of anger (childish expressions)? Does he easily become embarrassed, annoyed, offended, and "hurt," particularly in social situations (adolescent expression)? Or does he carefully evaluate situations and cope with them in a realistic way, using his resources and energy to *solve* the problem rather than merely to "let off steam" (adult expression)? Of course, *any* adult may at times revert to an immature form of emotional expression, but some adults are *typically* adolescent or childish in their emotional life. It is possible to measure one's emotional maturity with fair accuracy by means of scales such as the one devised by Willoughby. This scale is constructed to give the highest score to those whose emotional expression is habitually characterized by self-reliance and an objective attitude toward his problems.[46]

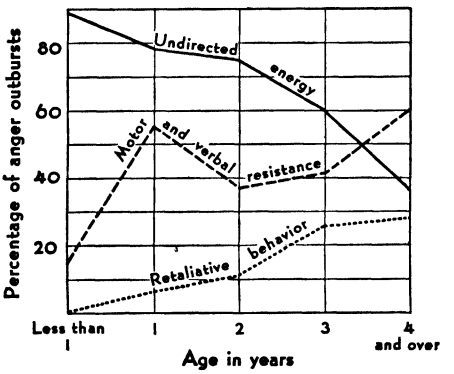


FIG. 48. CHANGES, WITH AGE, IN BEHAVIOR IN ANGER OUTBURSTS

(From F. L. Goodenough, *Anger in Young Children*, p. 72; by permission of the publisher, The University of Minnesota Press, Minneapolis, Minnesota, 1931.)

EMOTIONS AND HEALTH

If emotions involve a generally activated condition within the body, we should expect them to influence health. Common

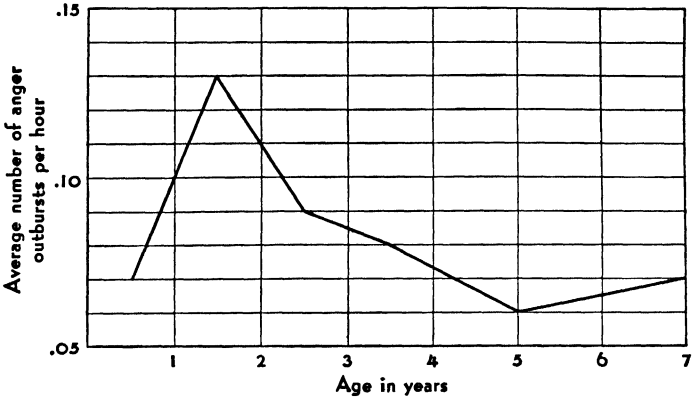


FIG. 49. VARIATION, WITH AGE, OF FREQUENCY OF ANGER OUTBURSTS

(From Goodenough, *Anger*, p. 107.)

observation shows that this is true. The man who is successful in his various undertakings experiences a more or less persistent state of elation. He holds himself erect; his step is energetic; his digestion is good. When failure begins to dog his steps, he begins to break; he does not hold himself so erect; his step is less quick; and his digestive processes are disturbed. States of elation and confidence tone up the organism; states of sorrow and depression sap its vigor. We have already had occasion to refer to the effect on the health of children of anxiety caused by friction between their parents or by their parents' expecting too much of them. The effect of acute emotional states is similar. Because digestion is so easily upset by unpleasant emotions, we take care to make the time of eating a time of pleasure.

Stratton's experiments show that, in general, the more diseases one has had, the more intense are his anger reactions.[47] Analysis of the influence of emotional states upon soldiers in the World War would seem to indicate that the process is circular — not only does bad health increase one's emotional reactions, but severe emotional reactions also tend to undermine one's health. The numerous mental breakdowns during the World War among soldiers who were not physically injured attest the importance of the interplay between emotions and health. When subjected to danger, the body is in constant upheaval. Normal organic proc-

esses are interrupted in order to make available for immediate use the energy possessed by the organism. Recall the bodily changes that prepare the body for violent exertion. In moments of fear there is cessation of digestion, increased activity of the adrenal glands, release of sugar reserves, quickening of the heart-beat, and increased rate of respiration. When soldiers were attacking, defending themselves, or fleeing, these changes stood them in such good stead that they were able to carry on though severely wounded. When, on the other hand, the men were inactive, these changes were like increasing the pressure in a boiler to the highest point and failing to provide a safety valve. As might have been expected, explosions were numerous. Under the strain of constant fear and anxiety, the usual mental integration of many soldiers broke down and their behavior became dominated by unrestrained anxiety. Under such conditions their lives became a continuous nightmare.

These facts suggest that much of the present increase in diabetes and in diseases of the heart may be caused by an increase in the excitement and in the stress and strain of modern life. The speculator, particularly the novice, the man who experiences a prolonged excitement of rivalry or ambition, those who seek constantly to arouse their sexual emotions, the individual suffering from prolonged grief, the person who broods and cherishes his anger — all these subject themselves to strain that may well be the cause of an organic or mental breakdown.

SUCCESSFUL AND UNSUCCESSFUL ACTION IN ANGER-PROVOKING SITUATIONS

To be successful an expression of emotion must relieve tension and be a source of satisfaction to the individual. The best illustrations of the difference between successful and unsuccessful expressions are to be found in the expression of anger. Anger may be expressed in an almost endless variety of ways. It may lead to a fist fight, to a tongue lashing, to an effort to win an honor away from the person who aroused the anger, to an effort to heap coals of fire on the head of the offender by being unusually polite, or to the assumption of an attitude of calm superiority and condescension. Any of these expressions may be successful or unsuccessful, depending upon the aftereffects. In general, the *successful* ways

of meeting anger-provoking situations may be divided into three groups.

(1) *Giving new content to the situation so that anger will not be necessary.* If a person makes an unreasonable criticism of us, we may at first feel angry; but, on second thought, we may notice his haggard appearance and recall his many worries and vexations, and so excuse him. Our anger response is nipped in the bud, and we have a feeling of satisfaction for having acted in a magnanimous manner.

(2) *Changing oneself so that anger-provoking situations do not arise.* A more fundamental technique is to take a look at oneself in order to discover what one is doing, or not doing, that provokes these "unjust" criticisms. To change oneself so that people will have no chance to make one angry may seem, at first blush, a trifle complicated; but so is life. Anger betrays one's judgment; and the accusation which appears so unjust may seem rather justifiable to an impartial observer. A person is always one part of his own psychological whole; and it is far easier to change oneself than another, though it takes both insight and courage to do so. When one is offended, he may give expression to his anger in such a way as to show his feeling of superiority to the offender. If he inflicts on the offender a punishment which he believes (probably wrongly) to be just, his anger is appeased and his equilibrium restored. In either case, however, the satisfaction is usually short-lived. Any form of the revenge motive is strikingly similar to soothing oneself by heavy sedatives. Momentary peace is bought with heavy future penalties. Punishing another is more often than not punishing something in oneself which has been projected into the other person. On a long-term basis, instead of "getting even," no matter how respectable a technique is used, it is better to do something about the following questions: What am *I* doing to be so misunderstood? What am *I* doing that so enrages others that they insult me? How can I change, so that this man, instead of insulting me, will respect me and give me his confidence? One might as well take a kick at a chair he has fallen over in the dark as "blame the other fellow" for one's own failings.

(3) "*Clarifying the atmosphere.*" Let us suppose that bad feeling has been accumulating for some time between two persons, say two brothers. If something happens that is likely to precipitate a fight between them, the sensible thing to do is to indulge in frank

discussion rather than in fighting. An exchange of ideas is always better than an exchange of fists, and one had far better give in on the idea level than on the fist level. But just as in a physical fight one receives blows as well as gives them and even the victor seldom remains unscathed, so in adjusting difficulties on a mature level, one must expect to compromise. Only the fool or the child, the naïve or the perverse man thinks he is wholly right in a quarrel and the other fellow wholly wrong.

It should also be remembered that in the real world one is sometimes caught in anger-provoking situations over which he has little or no control. There are people with whom one simply cannot do business. In such cases — unless one must grin and bear it — the best thing to do is remember that legs were made for walking, and move. In short, if the chair has too many tacks on it, move to another chair.

Some of the *unsuccessful* ways of dealing with anger-provoking situations are:

(1) *Giving too violent an expression to emotion.* If too violent expression is given to anger, equilibrium is not restored; for in this way we "do violence" to our ideals and suffer remorse for having acted unjustly. In order to regain equilibrium, it becomes necessary for us to atone for the injustice we have done. Lovers, under these circumstances, may attempt to make up for their injustice by being unusually kind. An employer who has criticized an employee too severely and unjustly may attempt to atone for the injury by increasing the employee's salary.

Reactions the violence of which is out of proportion to the stimulus are often symptoms of an inner condition which has little to do with the outside circumstances. "Mr. President," said a neurotic professor, "I will resign if I cannot have a private office." This is, other things being equal, an anger response out of proportion to the stimulus. When one finds in himself too frequent and too violent anger responses, he may be pretty sure that there is something wrong with *him.*

(2) *Brooding over offenses committed against us.* Brooding in itself is evidence of failure to make a satisfactory adjustment. When some one has his self-esteem lowered by a slurring remark, he seldom feels anger if he is able to make a fitting reply. The rising emotion is dissipated by the clever retort. But when he cannot frame a suitable reply, he feels defeated. He nurses his anger to

keep it warm. He plans how he will meet the situation next time, or how he will get even; but the next time he is likely to be as unready as he was before. Thus, he carries a load of irritation that severely taxes his good nature and his mental health. Those who have the gift of repartee are able to avoid much of the accumulated irritation others may have to carry with them.

Repartee is but an example of a general principle. When you are angry, get it out of your system; act. Do not by brooding keep the tension within. Brooding is a sick mixture of self-pity, inferiority feelings, and anger. Like a carbuncle, it should be lanced and relieved. But the acting, the letting off, the draining of the boil, should be done with skill, or the personality may be seriously infected in other parts. It does no good, by way of acting, to murder the other fellow; for the murderer, in a sense, always gets the wrong man. Does it seem like nonsense to you to say that if a murderer really understood himself, he would either drop his gun or turn it on himself? That the suicide, if he really understood himself, would either turn off the gas or make it a point to get some one else into the room? A university president possessing some psychological insight once said in all sincerity that he murdered many professors, students, and students' parents each year *in his mind.* Then, having killed them, he proceeded to understand and help them as best he could. He *acted* — in phantom fashion; then he proceeded to the mature way of dealing with people: understanding and helping. Most persons would appear surprised and shocked if they were charged with having felt killing urges toward, or death wishes for, those they love. But to themselves they might admit the facts. If it did not seem unwise to step on psychological bunions which the readers and co-authors of this book all possess, one author of this chapter would write: Never brood; go ahead and kill in fantasy, and then deal with the situation in as impersonal a manner and with as much insight as you can.

(3) *Repression.* One represses his anger when for some reason it is painful to acknowledge that he is angry. This may happen when to admit anger might cause one to act in a way that would be disagreeable to himself. Repression in this instance, as in all others, is not only a failure to solve the problem but it is also dangerous to the total personality. The effects of an emotional drive cannot be eliminated by refusing to recognize it. What

often happens in cases of repression is that the repressed emotion continues to make itself felt in sundry devious ways which keep the individual in a state of anxiety and distress. This does not mean that free expresssion should be given to all emotional states. Emotional response should frequently be inhibited. But this should be done with full realization of what we are doing, and we should seek some other adequate outlet for the pent-up energy generated by our emotion rather than allow it to influence our mental health, as any repressed activity is likely to do.[48]

Without attempting to describe the successful and unsuccessful expressions of all emotions, let us draw a general picture of emotional responses. When the personality is emotionally aroused, it is in a state of disequilibrium and of high tension. If the response restores its equilibrium, and resolves the tension in a way that does not stunt development, it is a successful one. If the tension or dissatisfaction continues, the response is unsuccessful, no matter what the nature of the emotion may be. The reader will find it interesting to classify his various responses of fear, jealousy, and other emotions in terms of success and failure.

CONTROL OF THE EMOTIONS

Popular thought attaches great importance to the control of one's emotions. A person who shows undue elation on winning at cards is regarded as a poor sport; so is the one who is greatly depressed by losing. The behavior of an individual who goes into raptures on every possible occasion is stigmatized as "gushing." The individual who is elated by every compliment and depressed by every criticism is thought to be lacking in self-knowledge and balance. The person who takes offense and who shows anger without sufficient reason is labeled, "Irritable — Handle with Care." The person who is unduly fearful is called a coward. In general, excessive emotional expression is regarded as a symptom of weakness and insufficient self-control. To control or hide one's own emotional states and to read the emotions of others is frequently an advantage. This is especially true in any competetive endeavor. It is true of the physician, who should be able to hide his own emotional states while discerning those of his patients.

Individuals differ greatly in their power of self-control. Some invariably make an emotional outburst in the face of thwarted

desire. We have classified this sort of action as *childish expression.* Others maintain self-control under all conditions, no matter how difficult or trying, and are willing to accept full responsibility for their acts. Their behavior is based upon a consideration of the objective facts. The energy released in them by the organic changes accompanying excitement is rationally directed. Those who act in this way are *emotionally mature.* Such behavior stands in marked contrast to the childishness of a certain man and his wife who insisted on tormenting each other, the man by eating onions before going to bed and the wife by eating crackers in bed. Neither would give up the objectionable habit. Both were willing to sacrifice happiness and companionship in order to preserve their "rights."

One would expect emotional maturity to vary with intellectual and physiological maturity, and this is generally true. Yet the number of bright children who are not as emotionally mature as less intelligent children of the same age and the number of children who are accelerated in their physiological development but retarded in their emotional development indicate that emotional development depends upon other factors as well as on mental and physical growth. Weber reports that the correlation of emotional maturity and mental age is .42 and that that of emotional maturity and school grades is only .18. This study indicates that many children who are succeeding in their school work are not doing so well in developing emotionally.[49]

Emotional maturity, in the fullest sense, is reserved for those who are fortunate enough to have had wise parents and teachers who themselves enjoyed a high degree of inner peace and harmony. If you are a person who has been humored and petted during childhood, who has been permitted to gain his desires through emotional outbursts or an assumption of weakness and appeals to sympathy, you are unlikely to develop the confidence, self-reliance, and strength necessary for full emotional maturity. Yet you may take some steps toward it. If you do, you will find the following suggestions of some value. Remember, however, that other people can mend your broken leg, or that by following the directions of others you may cure yourself of tuberculosis, but that for any one old enough to read this book there are no doctors, no medicines, no ambulances to aid either in curing emotional breaks or in improving habits of emotional control. One must

save himself if he is saved at all. Remember also that many do not save themselves because they do not want to get well. "Why should I improve? I am now famous for my temper. If I get well, I shall not be famous for anything; for I know — do not tell any one — that I am just a common, average, everyday fellow anyway." All that others can do is to suggest a few cautions. Whether they are believed or not is strictly the business of the person involved, and no one can act as proxy for him.

(1) *Avoid situations that are known to produce excessive emotion.* If a person knows that certain situations arouse an undesirable response, he should seek to avoid them. Through such insight and prudence many mentally unstable people have been able to live a reasonably satisfactory life. It should be remembered that imagined situations as well as real ones produce emotions. Therefore, the individual who wishes to control his emotions needs to discipline his thoughts. If he finds himself thinking of subjects that arouse undesirable emotions, he should develop other interests and engage in other activities which will direct his thinking along other channels. There are stories of Malays who, after sitting for days nursing their grievances, suddenly arm themselves and run amuck, killing all in their path. On Thanksgiving afternoon, 1932, in Seattle a Filipino named Julian Marcelino went on such a rampage, and is reported to have killed six people and to have wounded fifteen more.[50] Such tragedies could be avoided, if the moody and sulky people were distracted by outside interference, or if they should voluntarily direct their thoughts away from their wrongs, real or imagined, to happier subjects. In general, a person can avoid much unhappiness by not allowing himself to dwell on thoughts that embitter.

(2) *Develop an ideal of control.* The person who prides himself on acting as he feels, who thinks it a weakness to keep everything under cover, stands a poor chance of reaching emotional maturity. On the other hand, the person who prides himself on being able to keep cool and on acting in accordance with the requirements of the situation instead of being dominated by his feelings has taken a valuable step toward achieving control. This ideal played an important part in enabling the Stoics to attain an unusually high degree of self-control.

It should be held in mind, however, that human nature is frail. It is easy to be too hard on oneself. A gradual working up, a slow

winning of promotions is usually better than setting up overoptimistic ideals only to involve oneself in failure. If one learns to be genuinely honest with himself, surprised at nothing which he finds flitting into his mind, neither praising nor blaming but rather trying simply to get acquainted with himself, he will find that intelligent control and intelligent behavior become more and more natural with him.

(3) *Understand the nature of emotions and view them objectively.* By holding an emotion off and surveying it, one can reduce its intensity. For example, if an angry person fixes his attention on his anger and removes it from the situation that caused the anger, he becomes less angry. Likewise, the nervous speaker by viewing his excitement as a preparatory adjustment may do much to keep his nervousness within reasonable bounds.

(4) *Achieve understanding and mastery of the situation.* A child may be afraid of shadows on the wall. But when he has been made to understand their nature, he no longer fears them. Likewise, a child's fear of thunder is not wholly a fear of noise. It is rather fear of a noise *not understood.* When he comprehends its nature, his fear diminishes and may finally disappear. Subjected to many new experiences, some of which are dangerous, he will naturally experience fear if there is no insight. An understanding of the world reduces fear. This has been one of the most valuable contributions of science to human welfare. Mastery also reduces fear. The unpracticed skier learning to jump experiences considerable fear; but as he masters the art, the fear becomes less and less. So it is with all dangerous sports or occupations. Through mastery we conquer, if we do not completely eliminate, the fear involved in them.

(5) *Prevent the expression of the emotion.* Be thrifty rather than spendthrift in the expression of emotion. To allow oneself to cry too easily leads to crying too often and too noisily — even the noise stimulates more crying. There is certainly enough evidence in support of the James-Lange theory of emotions to confirm the advice here given. By acting as if we were angry we tend to produce anger; by acting sympathetically, to produce sympathy. Conversely, if we do not wish to become angry, we must not act angrily. Act pleasantly. The overt expression is usually within our control. In the presence of a superior we are not as apt to become angry as we are in the presence of a subordinate; and this

is due in no small measure to the greater care we take to prevent the expression. Teachers and parents need to keep this in mind, and also to remember that by expressing their rising irritation they are apt actually to produce a state of anger.[51]

CONTROLLING THE EMOTIONS OF OTHERS

The person who has learned to control his own emotions has taken a long step in achieving for himself the only abiding freedom allowed to man — that of genuine maturity. By refusing to let his inner peace be disturbed by the censure or blame of others, he is no longer a prey to external conditions, and he pursues his objectives unruffled. But a person who has learned to control the emotions of others has mastered an art that increases many fold his value as a leader. This was made abundantly clear in the summer of 1937 by the success of John L. Lewis in reuniting the factions within the C.I.O. Though his success depended partly on his personality and partly on the confidence of the men in him, he could never have accomplished the unification without a remarkable ability to control the emotions of others. Likewise, the success of a football coach depends not merely on his knowledge of the game, but also upon his ability to awaken the enthusiasm of his team and to inspire it with the determination to win.

The technique for arousing the emotions of others may be inferred from what has been said about self-control. Bring into the focus of consciousness some important value and show how it can be achieved or how it is endangered. If one person is talking to another, he may appeal to any of the pet ideas or hobbies of the man he is seeking to influence. If he is addressing a crowd, he must appeal to values that are held in common. Some values that may be safely counted on are love of country, of children, of justice, of the family, and of truth. If the speaker succeeds in bringing these values vividly into consciousness and shows how they are being endangered or ruthlessly violated, he can easily arouse the anger of the group against the source of the danger. This may, in turn, arouse determination to fight for their maintenance. The sight of a child being cruelly treated arouses anger and the impulse to protect it. The vivid narration of stories of children slowly dying of hunger, of children whose horizons are being narrowed by lack of schooling, of children dying or suffering from untreated

diseases may also effectively arouse the emotions of an audience. And if the audience is shown how such injustices can be corrected, it will, at least for the time being, be favorably disposed toward the measures suggested. Unfortunately, such enthusiasm is usually short-lived. Hence the importance of getting an audience to act quickly upon the good impulse thus created. Perhaps nothing more than a show of hands can be secured; or perhaps the signing of a petition. But what can be done should be done. Some overt expression of the new enthusiasm for a worthy cause serves to prolong it and to transform it into effective expression. The principle has been thoroughly drilled into insurance salesmen that they must get some *overt* manifestation of interest in the safety of the family or in security for old age. All men are interested in such values. The agent brings them more vividly into consciousness and tries to elicit action while emotions are still aroused.

We are not always interested in arousing the emotions of others; sometimes we wish to dissipate their emotions. We may wish to help another direct his emotions into more constructive channels. The anger and hatred of the mob need to be dissipated. Skillful verbal appeals which play upon the prejudices and fears of the mob and which tie them to other, loftier motives such as love of justice and love of man are frequently effective. Distraction of attention is also helpful. In dealing with undesirable emotions of individuals, a soft answer really does turn away wrath.

SUMMARY

Emotional behavior is an adjustment which involves an intensified state of consciousness and usually (if not always) a pattern or series of bodily changes. Emotional conditions may be primarily the result of physiological conditions or drugs, of external conditions, or of preceding experiences.

Emotional behavior is usually a satisfactory adjustment when it (1) prepares the organism for a physical emergency, (2) helps the individual meet the situation without further adjustment, (3) stimulates greater mental activity, or (4) frees the organism from handicapping inhibitions. It is an unsatisfactory adjustment if it (1) involves a reversion to childhood or infant behavior, (2) destroys muscular coördination necessary in the situation, (3) is a result of former experiences retained by conditioning but

of no value in the present situation, or (4) causes us to make judgments that are based on wishes rather than on our knowledge of the situation.

Bodily expression of the emotions takes the form of: (1) facial expression, (2) physiological changes, (3) psychogalvanic reflex, (4) the startle pattern, and (5) voice changes. Experiments show that, other things being equal, pleasant experiences are retained longer than unpleasant ones.

Methods of studying or detecting emotions are: (1) measurement of the physiological changes and psychogalvanic reflex, (2) the free-association test, (3) psychoanalysis, (4) the study of dreams, (5) noting slips of the tongue, and (6) observation of overactive behavior.

The James-Lange theory of the emotions claims that an emotion is the awareness of a bodily condition. In support of the theory are the facts: (1) that actors may induce an emotion by portraying it, (2) that emotions are frequently felt after we have made a response, and (3) that persons lacking bodily sensations have an apathetic emotional life. Against it are the facts: (1) that actors do not universally experience the emotions they portray, (2) that operated dogs respond emotionally though deprived of bodily sensations, (3) that injection of drugs which cause the bodily changes of an emotion do not cause the subject to experience the emotion, and (4) that under certain conditions the expression of an emotion may lessen rather than strengthen it. In the light of these lines of evidence we may conclude that bodily expression is an important, but not an essential, aspect of emotional experience.

Emotional development depends upon and includes: (1) emotional behavior present at birth, (2) maturation, and (3) learning. It is known that emotions affect and are affected by general health.

Successful ways of meeting an anger-provoking situation are: (1) giving new content to the situation so that anger is unnecessary, (2) changing oneself so that anger-provoking situations do not arise, and (3) acting to clarify the atmosphere. Unsuccessful ways are: (1) giving too violent expression to emotion, (2) brooding, and (3) repression.

Control over one's emotions is susceptible enough of improvement to make the effort worth while. Much can be done by (1) avoiding situations that produce excessive emotions, (2) de-

veloping an ideal of control, (3) viewing your emotions objectively, (4) achieving insight into the situation, and (5) preventing expression of the emotion. Emotions of others may be controlled by much the same methods.

QUESTIONS ON THE CHAPTER

1. What is an emotion? How does an emotional response differ from other forms of adjustment?
2. What are three main sources of emotional behavior?
3. How may emotions be satisfactory adjustments?
4. How may emotions be unsatisfactory adjustments?
5. What and how much information about an emotion is given by facial expression?
6. Discuss physiological changes from the same point of view.
7. Discuss the psychogalvanic reflex from the same point of view.
8. What effect does the emotional quality of an experience have upon our memory for the experience?
9. What are the main methods of detecting or studying emotions?
10. What is the James-Lange theory of the emotions?
11. What are the main lines of evidence for and against this theory?
12. State the factors underlying emotional development.
13. What effect do emotions have upon health? Health upon emotions?
14. Describe the successful ways of meeting an anger-provoking situation.
15. Do the same for the unsuccessful ways.
16. What are the general principles to be followed if we wish to develop a measure of control over our emotions or those of others?

QUESTIONS FOR DISCUSSION

1. How can emotional behavior be explained as a means developed by an organism to protect itself?
2. Discuss and evaluate the lie detector.
3. Evaluate the James-Lange theory of the emotions.
4. Give some cases of emotional behavior which you have witnessed and which were probably a reversion to an early mode of expression.
5. How may excessive embarrassment be overcome?
6. Cite instances of conditioning (or unconditioning) an emotional response.
7. What is the difference between a rational and an irrational fear?

SUGGESTED READINGS

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MORE ADVANCED READINGS

M. L. Reymert, editor, *Feelings and Emotions; the Wittenberg Symposium* (Clark University Press, 1928). A series of papers by thirty-three leading psychologists on the present status of researches on the emotions.

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CHAPTER NINE

Attention: How We Direct Our Energies

As a dozen people sit around the table after dinner, a dozen minds are occupied with a dozen *different* things. Jones is thinking of the business deal he is trying to make with Smith. Smith is thinking of his stomach-ache, wondering if it is really appendicitis. The doctor is wondering what fee he can reasonably charge Smith if Smith decides to have an operation. Mrs. Jones is thinking of the new dress she saw in the afternoon and wondering whether she can squeeze the money out of the budget to buy it. Mrs. Smith is listening to the radio which is playing softly in the next room. And the minds of all the others are similarly occupied with their own thoughts. At times, all center their attention on the same thing — if some one tells a particularly funny story or if the maid drops a dish. But for the most part the consciousness of each person is occupied with his own thoughts. He is unaware of most of the things in the minds of those about him.

It is often of momentous importance to an individual whether he attends carefully to a particular thing or not. The effect may seem — indeed, may *be* — out of all proportion to the cause. A slight lapse of attention when one is driving a car may result in a fatal accident, yet the inattention may be so slight as to be scarcely noticeable. It is worth remembering that in ways less tangible than this the results of inattention may be just as great and that they may affect our lives just as critically.

As you now read, you are unaware of many things in your immediate environment. You are not conscious of your chair — until now that it has been mentioned. You do not hear certain sounds — until now that your attention has been called to them.

All these things and many more have been excluded from your consciousness in order that *one* thing — the book and the ideas it contains — may be given your full mental powers. You are *attending* to the book. *Attention*, like emotion, is a way of responding that is familiar to every one but is difficult to define.

Every one realizes that of all the thousands and thousands of things which *might* be in consciousness, the many items of our immediate environment plus the memories that have been accumulating since childhood, only a very few things *are* in consciousness at any one time. Our consciousness may alternate rapidly between different things, but we cannot attend to several things at once. It is, indeed, as if our minds were a broad field which we examine at night with a small searchlight. We are located at the top of a tower in the center of the field. We may focus our spotlight where we will; but the farther from the base of the tower we focus it, the less distinctly do we see. Around the base of the tower is an area which may be seen very distinctly as the spotlight falls upon the different parts. This area comprises our present experiences and those which have happened recently or, if more remotely, have been very well learned. Around the edges of the field are immense areas which can be seen, at best, only very indistinctly. These comprise more remote experiences, those which, because of passing time or of unimportance, have nearly faded from memory. Still farther out are areas of unknown size which cannot be seen at all. These correspond to experiences which can no longer be brought into consciousness at all, which cannot be made the focus of our "attentive spotlight" — although there is much evidence that these outlying districts exercise a profound influence upon the more accessible parts of the field. As an invisible hill or mountain on one side of a real field may determine the waterways and wind currents in the closer parts, so experiences which have been lost to consciousness may have an effect upon us which is very difficult to understand without some special means of learning about these past experiences.

But our problem at present is to consider how attention is divided among those things which normally *may* occupy the focus of consciousness. Attention, like emotion, is a way of acting. If we attend at all, as we probably do at all times except during dreamless sleep, we attend *to* something: *to* a business deal, *to* our stomach-ache, or *to* music. One important difference between

an emotional and a non-emotional response is in the aspects of the situation to which we attend. If a man is operating a machine and something suddenly goes wrong, the degree of emotion in his behavior will be revealed by what he attends to. If he should become greatly disturbed and begin to swear and curse and kick the machine, his attention is being given to unimportant external aspects of the machine. If he becomes alert, looks for the cause of the disturbance, makes use of whatever knowledge of machinery he may have in the hope of correcting the disorder — that is, if his response is unemotional — his attention is directed toward the cause of the breakdown. In both instances he puts forth more effort and in both cases he *attends* to something. But the undirected random activities characteristic of emotional behavior indicate one course of attention; and controlled, unemotional activities, another.

THE IMPORTANCE OF ATTENTION

Imagine a frightened deer listening for an approaching danger and you will have a picture of the bodily adjustments which accompany and assist the attentive process. The body is motionless: consciousness of its own movements must not be allowed to compete with the danger signals for the deer's attention. In addition, he moves his ears to hear better, sniffs the air, holds every muscle tense. Experiments show that there is also an unconscious tendency to move toward the object of attention. This tendency can be observed in man. If a person attached to an automatograph (a device which records very slight movements of the body) stands in the middle of a room and listens attentively to a metronome which is moved around the four sides of the room, he will "follow" the metronome around by leaning toward it. (This is shown in Figure 50.) In short, attention involves important physical adjustments. These bodily adjustments, or, as they are called, *motor adjustments*, in the process of attention serve several purposes.

(1) *Sensory discrimination is improved, and in three ways.* By attending we are better able to isolate the parts of a complex whole. For example, in hearing, we can discriminate fine tones of the various instruments of an orchestra by attending carefully. In the second place, by attending we are able to perceive a stimulus that would otherwise pass entirely unnoticed. While listening for danger, the deer will hear a footstep that he would not ordinarily

hear. If we attend to the clock on the mantel, we shall hear it ticking, though a moment ago, while attending to something else, we did not hear the clock at all. During hypnosis (which is a heightened state of attention toward certain things) the ability to detect slight differences becomes so great that a person can distinguish between sheets of paper that are ordinarily indistinguishable. Similarly, the blind and deaf notice differences that are normally unperceived, not because their sensory organs have become more acute, but because they pay more attention to the impressions received through them. In the third place, by attending we receive clearer impressions. Any one can confirm this for himself. Look at the printed page without attending; nothing stands out distinctly. Or eat dinner while thinking of something else, and the chances are that you will be unable to tell offhand whether you are eating pumpkin or carrot pie. As focusing the eyes causes visual impressions to stand out clearly, so does attending make all sensory impressions more distinct.

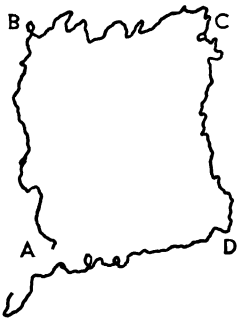


FIG. 50. THE EFFECT OF ATTENTION ON MOVEMENT

Automatographic record of a person's unconscious movements as he listens to a metronome that is moved around the room. (From J. Jastrow, *Fact and Fable in Psychology*, Houghton Mifflin, 1900, p. 326.)

(2) *Efficiency is increased.* Attention involves a heightened state of motor readiness. The startled deer not only listens and sniffs the air, but he is also ready to respond immediately. The runner on the mark is ready to jump as soon as the gun is fired. There is need to respond and to respond quickly. The state of attention is a preparatory adjustment to do what is needed. A person can respond to a signal more quickly if he is given a preparatory or "get-ready" signal which rivets his attention.

(3) *Attention helps us remember experiences more accurately and fully.* We can recall with most assurance and accuracy those things to which we have attended most carefully. For example, if one is shown a series of colors and attends carefully with the purpose of being able to name them afterwards, he can usually do so. But if an experimenter shows a number of

colored cards while he is fixing the attention of his audience on something else, many people will not notice the cards at all; and even those who do will probably be unable to name the colors later.

Münsterberg reports a very simple experiment which clearly illustrates this principle. He instructed his students to watch and describe everything he did between one signal and another. As soon as the first signal had been given, he lifted in his right hand a little revolving color wheel and made it run and change its color. While he held the instrument in his right hand at the height of his head, he took a pencil from his vest pocket with his left hand and wrote something on the desk. Next he took out his watch and laid it on the table. Then he took a cigarette case from his pocket, opened it, removed a cigarette, and closed the case with a loud click and returned it to his pocket. Then came the ending signal. Eighteen out of a hundred students had failed to notice anything of all that had been done with his left hand. Pencil, watch, and cigarettes had simply not existed for them, in spite of the fact that they had been told to observe and report everything that the instructor did. Our memory for things which do not attract our attention is likely to be very short if not non-existent.[1]

But attention increases the accuracy of memory only when the psychological whole is relatively undisturbed by personal concern. The impartial observer or the disinterested witness may, by paying keen attention, remember with reasonable accuracy. But if one's own personal fortune is involved, even intense attention does not save him from amazing inaccuracies. When one's attention is keyed up by unusual self-interest, it is easy for one to "hear" what a dictaphone would never have recorded and to "see" what a camera would not have photographed, to perceive, in short, a curious mixture of what really happens and of a very private vision of what he *wants* to happen. It is good psychology as well as common law not to force a person to testify against himself or his mate. Through the ages we have learned that attention is distorted by our desires. But inaccurate reports from interested persons do not necessarily imply dishonesty; they may well be the normal distortions of attention. More than one young man has been surprised to find his "hand" accepted by a young woman. Though both were paying attention, either the girl heard what was not said or he said what he did not hear. A man awaiting a

crucial long-distance telephone call can easily "hear" a bell which no one else near the phone hears and which the operator reports she did not ring. Experience has led to our insistence on written contracts, because, in spite of our best intentions, attention under pressure tricks us all. Ordinarily, attention will increase the accuracy of observations in direct proportion to our freedom from personal concern.

(4) *Attention directs our energies.* The effect of attention on the higher mental processes is to make us more responsive to relevant and less responsive to irrelevant matters. A person engaged in collecting material for a debate is quick to attend to any idea or fact that will help him. When he is actually thinking through what he is going to say, he finds that ideas come to him in a more or less logical order. To be attentive is to head one's efforts in a certain direction; the ideas that come are then, for the most part, relevant. Attention may be thought of as a kind of sieve or filter which allows certain stimuli to pass through freely and easily and prevents the passage of those which are not wanted for the purpose in hand. It should be noted, however, that man is no magician in solving his problems. There is no guarantee that only the relevant stimuli will come to mind and that the irrelevant will all conveniently stay away. But the skillful problem-solver is the one who does learn to be something of a magician in this respect, and the intellectual flounderer is the one who never acquires control over the topics which flit in and out of the spotlight of his attention.

From the foregoing discussion it is easy to understand why attention greatly increases learning efficiency. Clear perception, clear analysis, fixation and retention, imagination, and logical association are all stimulated by focusing effort on the task at hand, and all of these are essential to efficient learning or study. Even in conditioning the flow of saliva to the sound of a bell, Pavlov found it necessary that the dogs be alert.

Though attention in general increases efficiency, it does not always do so. One does not increase the efficiency of his digestive, respiratory, or circulatory processes by attending to them. Indeed he is more likely to lower their efficiency. Likewise, too much attention to the emotional content of a situation may liberate excessive emotional energy and cause difficulties in executing a task. This is particularly true of anxiety when we attend to the wrong feature of a situation. Similarly, a golf player who

is overanxious to make a good shot and who attends directly to this desire lowers his efficiency. Too much attention to spelling may give poorer results than comparative neglect of spelling. A person may reduce his power of conversing by paying too much attention to his words. Many students, by an excess of effort at an examination — not before — do less well than they might, had they been a little less concerned.

But in all these instances in which attention seems to lower efficiency, close inspection will reveal that attention is fixed in the wrong direction or on the wrong thing. For this reason the control of attention is a matter of great importance. The control of attention can be effective only in so far as definite principles are followed. Attention does not vary willy-nilly, nor can one by some mysterious power force himself to pay attention against the trend of the determining factors in the situation. Every one has had the experience of "reading" a page or two of an uninteresting book only to find that he has been thinking of something else all the time. Attention had unconsciously and automatically left the book, though the eyes continued to go through the movements of reading. All of us know that calling the roll in a college class does not reveal those who are really there and those who are present in body only. Certain laws governing the control of attention have been discovered. These laws enable us to explain the things we have been discussing.

LAWS OF ATTENTION: EXTERNAL CONDITIONS

Attention, like all other responses, must be explained in terms of the whole situation in which it occurs. Because we have changing needs and interests and are in a continually changing environment, we necessarily experience periods of stress and strain as well as periods of easy effort and recesses of relaxation and relief. If we want to know why we attend to a particular object, we must therefore look to the conditions both outside ourselves (objective conditions) and inside ourselves (subjective conditions). We shall describe first the most important external, or objective, conditions of attention.

(1) *Change.* The hunter, if he keeps stock still, may not be observed; but let him move but a fraction of an inch, and his prey will be off. A slight change in the total visual pattern is

very effective to the interested eye. A slight movement of the right foot of the half back may be unnoticed by the crowd — but not by the alert defensive end. Coaches have to impress upon the beginning player the fact that movements so slight they "couldn't possibly matter" often make just the difference between the team's staying where it is and getting down into pay dirt. It might be added that some football players never learn to pay attention to this fact.

We are more likely to observe flickering lights than those that are steady, more likely to attend to a siren than to a whistle blowing a steady blast. Other things being equal, we are almost always more likely to notice a changing stimulus than an unchanging one. Advertisers recognize this in constructing electric signs and in writing magazine and newspaper advertisements. And it is hard to imagine anything more difficult to attend to than a voice that is monotonous and droning — unless it is the monotonous style often found in required college textbooks.

(2) *Strength and intensity of the impression.* Other things being equal, the stronger or more intense an impression is, the more likely it is to command attention. A faint noise may not disturb the reader, when a loud one will. A flash of lightning in the distance may pass unnoticed, while one near at hand compels attention. Talking in the next room may be quite unnoticed, when a shout would immediately attract attention. But while this is true, in general, do not forget that sheer intensity of stimulus is only one factor in the psychological whole. Even in the roar of Forty-second Street after the theater a very slight round pressure in the back and a very soft whisper in the ear, "Walk right along toward that taxi," would be quite effective in securing attention. Meaningful weak stimuli may overpower meaningless strong stimuli.

(3) *Size.* Other things being equal, the larger a thing is the more likely one is to notice it. For this reason advertisers prefer large magazine space and large billboards. However, other things are often not equal. Recent experiments by the authors have shown that a small cartoon in the middle of a printed page will usually attract a reader and hold him longer than a full-page, gaudily colored advertisement on the opposite page. Notice what attracts your attention as you thumb through the next issue of the *Saturday Evening Post.*

(4) *Repetition.* Other things being equal, the more often a thing is repeated, the more likely one is to notice it. This would, of course, be true by the law of chance, but it is due also to the *summation of impressions.* Each sensory impression, whether we are conscious of it or not, leaves some impression on us, and this impression persists for a time. The weight of a second impression, therefore, is added to the weight of a first one. As an example consider the striking of a clock. We may not notice the first stroke, nor the second, nor possibly the third. But when the clock strikes the fourth time, let us say, we may suddenly notice it and realize immediately that it has been striking, and perhaps even be able to tell how many times it has struck before we attended to it. The first sounds, therefore, must have made impressions, though not sufficiently strong ones to arouse attention. The summation of impressions, however, finally made the fourth one so. Take another example on a higher level. We may not notice the first slight of a friend; but when his same act or attitude is repeated a few times and we begin to pay attention, we then recall the previous incidents. Much of the power of propaganda lies in the potency of repetition. Constant dripping will wear away a stone.

(5) *Novelty.* Other things being equal, the more striking the quality of an object, the more likely it is to attract attention. We are more likely to notice a bright red or yellow object than one of a softer color. In listening to music, we are more apt to attend to those parts that have a definite pattern than to those which are nebulous or lacking in form. A false note, one that does not belong in the score, is still more certain to command attention. In looking at a picture, we are more likely to observe the clear-cut foreground than the background. Strictly speaking, novelty or unusualness is a relation between the observer and the object observed. It depends as much upon the individual as upon external conditions. Other things being equal, it means simply that one is more apt to attend to something that is new to him than to an object that is familiar to him. Skillful public speakers search for surprising and unusual ways of expressing their ideas. This may be done by using old words in new settings, or by challenging accustomed ways of thinking. It would challenge a good deal of popular belief to begin a speech by saying: "I have only one minor and trivial objection to the statement

that 'All men are created equal,' and that is that it is an obvious and barefaced lie." Challenging popular belief, such a sentence would arrest attention. It must be remembered, however, that the pricks of novelty soon lose their sharpness. The sophomore may well "psychologize" the greenness of the freshman, since the former has become negatively adapted to the novelties of a college campus. A man in the city for the first time attends alertly to the variety of noises and sights, but the country gawk soon becomes the city sophisticate.

(6) *Nearness to point of fixation.* Other things being equal, the closer an object is, the more apt it is to attract our attention.[2] Persons who make up window displays recognize this principle and put the objects which they wish to emphasize fairly close to each other in the center of the display. Rumor has it that near the end of the term the front seats in a college lecture room are more frequently occupied than they are at the beginning of the term when the semester's grade is still far away.

(7) *Importance of problems.* When a problem arises that must be solved, we are likely to focus our attention upon it. Attention enables us to concentrate our energies upon the problem in hand and, for the time being, to exclude from consciousness other things of lesser importance. Our resources are assembled by attention in proportion to the importance of the problem. In short, we pay attention to that which is of concern to us. The human mind does not do something for nothing, and a high level of attention costs energy. The normal person is not prodigal or spendthrift of his energy, and long-continued, highly concentrated attention is granted most surely to problems of vital interest to us.

To sum up the situation, attention can be more or less controlled by manipulating the environment, and we can do much in controlling and directing the attention of others by manipulating their environment. Were this chapter written three times as well as it is, with more skillful *changes* in rhetorical pace, more *repetition* of ideas, more *powerful* adjectives, more *intense* illustrations, with the use here and there of type of *larger size* and perhaps of some *novel* features such as occasional red ink, the attention given to the discussion would no doubt have been greater. We do not attend willy-nilly to the items in our environment, but are more or less *drawn* to those items which possess the characteristics described above.

LAWS OF ATTENTION: INTERNAL CONDITIONS

The foregoing paragraphs indicate how attention is more or less affected by environmental factors. An adequate account of attention must give corresponding emphasis to factors within the person. It is well known that one person is heedful and another heedless of the same object, and that what may be of very high attention value at one time may have practically no attention-drawing power at another. We need to consider the personal aspects of attention, for they are of special importance in this connection.

(1) *Native desires and urges.* Man has a kind of organization that tends to select for attention certain things instead of certain others because some things directly or indirectly satisfy his native desires while others have only a tenuous connection with them. Just as a chicken is attentive to grain and a dog to a bone, so man finds it far easier to give attention to that which promises fulfillment of his basic desires. Persons in danger, as in war or fire or other disaster, attend quickly and definitely to those features of the environment which seem to promise escape and self-preservation. Advertisers recognize that people notice an advertisement which appeals to native likes. Crane reports that "six hundred copies of *True Story Magazine* were sold to Yale students in contrast to one copy of the *Century Magazine*." [3] Observe the next dozen advertisements that have enough power in them to attract your attention at all and decide for yourself whether the basic appeals are to you as a philosopher, a logician, an analyst, or a rather "human" person. The terrific power of propaganda may be found in its appeal, not to reason or to objective data, but rather to unanalyzed feelings based on native desires. To catch and keep the attention of any but a super-intellectual, long experience teaches us (novelists, playwrights, and politicians included) to appeal, however guardedly, to such native desires as are embodied in the love of mastery, the need of protection against one kind of danger or another, envy, jealousy, and interest in the opposite sex.

(2) *Sentiments and complexes.* The person who has the sentiment of patriotism is likely to attend to what he thinks will affect the welfare of his group. One suffering from feelings of inferiority or burdened with a sense of inadequacy is likely to attend to

anything that may bolster up his self-regard. He will observe the mistakes of others, the slight evidences of weakness in his friends or acquaintances, and he will fail to attend to their accomplishments or strengths. To know a person, watch what attracts (or distracts) his attention from the main drift of the current scene. Little, and often unnoticed, movements of attention to this, that, and the other thing are brush strokes that paint an amazingly accurate picture of a person for the keen observer. Keep in mind that it is not only what one *does* pay attention to but also what he does *not* pay attention to that fills in the perspective of the portrait. A professor learns far more about you than merely your knowledge of his particular subject as he watches the fluctuations of your attention in the classroom — unless, as is sometimes the case, he is dividing his *own* attention between his duties in the classroom and other interests that flit in and out of his mind. The far-away look of the football player as he mentally rehearses formation C, the thirty times that the young lady on the left rearranges her hair, the honest yawn with which Mr. Smith to the right "attends to" any difficult idea, the starry-eyed expression of the girl who is wearing a new and sparkling diamond, the much-envied peaceful slumber of that boy in the back row, the various overt responses to an unannounced quiz, the almost universal brightening of the class when the bell rings — all these things tell the professor many things that he could never learn from examination papers. And do *you* not learn more about *him* than the subject he is teaching?

(3) *Mood.* If one is despondent and downcast, he is likely to attend to things that deepen his depression. He is impressed with the ugliness and drabness of his surroundings. If elated, one will attend to the features of the environment that justify and enhance that mood. When in a "worrying mood," one goes out of his way to find something to worry about. If one has been anxious about his grade in a course and suddenly finds that he got a high one, instead of ceasing to worry he is apt to start fretting about something else which has been entirely out of mind. Mood helps to determine what we attend to and how we evaluate the object of our attention. There is a great deal of psychological insight in the statement that "unto every one that hath shall be given, and he shall have abundance."

(4) *Attitude.* We attend to those things that *confirm* our atti-

tudes. The cynic attends to things that confirm his cynicism; the person who has confidence in men, to things that confirm his optimism. In a sense, we filter out what we want to see and want to hear rather than accept an impartial sampling of what is there. The embarrassment of Mr. Jones seems greater to those who want to see him embarrassed. A decision is very unfair if you suspect the honesty of the judge. People at dinner may get very divergent ideas of the temperature of the soup. The hostess thinks it a little cool. Mrs. Smith, delighted to be invited to the party, thinks it just right. Professor Phillips does not remember the next day that soup was served at all. Mrs. Jones, a social rival of the hostess, pretends to shiver as she tastes it. To a psychologist, more than food is served at a dinner party.

(5) *Education and training.* A bootblack will notice the shoes of a passer-by; a barber, his hair; a haberdasher, his suit; and a manicurist, his nails. We attend to objects we have been trained to observe. The musician notices features in the symphony that the untutored listener does not; the artist sees things in a picture that the untrained layman misses; the student of literature will notice faults of composition that the unread person will not. The eyes of specialists have been opened, as it were, to things which the ordinary person does not observe.

(6) *Purpose of the moment.* A hunter and a surveyor will notice different things, even though they walk across the same field. When preparing for a debate, we may turn the pages of a book or magazine hurriedly, merely glancing at the pages, until our eyes fall on something pertaining to the debate. Then we immediately become alert and read attentively.

(7) *Purpose of the future.* We often attend to things, not because they are interesting at the time, but because it is necessary that we attend in order to reach a certain goal. A student may attend to his studies when other things are much more inviting, because he is striving for the goal of graduation or parental approval. A professional man may work hard to safeguard the interests of his client when he would rather be playing golf, because the goal of professional success or monetary reward cannot be attained without attention to these immediate details.

In short, what man attends to is determined by the outside world, but it is also influenced by his own inner mental world. In the affairs of ordinary life, the nearest one usually gets to a

stimulus is his own interpretation of it. Man edits his world in the service of his needs and at the demand of his tensions. We are our own editors and our own "yes men."

INVOLUNTARY VERSUS VOLUNTARY ATTENTION

No motion picture ever began with the statement: "This is going to be a very interesting picture, so please pay close attention!" And if a picture did begin in this way, we should surely tell ourselves that it could not be very good; for we pay attention to a good picture without being told. The most efficient form of attention is entirely involuntary — when we attend without realizing it. Involuntary attention occurs when we witness an absorbing play or motion picture, when we read a captivating novel, when we are engaged in interesting conversation, or when we become "lost" in our work. In fact, the free giving of ourselves to the task in hand is a necessary element in efficient mental habits. The capable worker, like the child in his play, attends to his work quite involuntarily and unconsciously.

In contrast to involuntary attention is the kind we experience when we find our minds "wandering" and bring ourselves back to the matter in hand with some such statement as, "I *must* pay attention to this book," or "Why did my attention drift away from this problem when it *must* be solved before tomorrow?" Mind-wandering or difficulty in attending to that which in the long run is really important to us is not a trivial matter. Its significance is far greater than the lost time or the superficial discomfort would imply. Inability to attend often implies an emotional blocking the foundations of which may lie far deeper and further afield than one would suspect. Commonly we say that the inattentive man fails. It would be more correct to say that inattention is a symptom of a failure already made but perhaps not recognized. In the last analysis, man attends to what he wants to attend to, to what serves his purposes, and he is inattentive to that which does not serve his purposes. If one is indifferent to what in the long run is really important to him, it is high time for him to take a close inventory of his interests and either to rearrange them so that attention becomes natural or to accommodate himself to his real interests. One foundation of sound vocational guidance is the discovery of what the person really wants to do, the things

to which his whole-hearted attention is given naturally and freely.

All attention, whether it be involuntary or voluntary, is determined by the objective and subjective factors we have discussed. But often — indeed in most cases — these several influences do not all operate together to keep a specific subject in our attention. Our interests may be so divided that, though we realize the necessity of attending to our lessons, we find it hard to exclude an approaching party from our minds. Our attention fluctuates between these two alternatives. In cases like this we speak of our attention to the matter that is difficult to concentrate upon as voluntary, and of our attention to the matter that is easy to concentrate upon as involuntary. Fortunately, after concentrating upon something for a brief time, even though only a small measure of satisfaction or success crowns our efforts, we usually become interested, and involuntary or effortless attention replaces voluntary or effortful attention.

The teacher, lecturer, and advertiser do well to know the general laws of attention, the importance of subjective and objective factors, and the rôle which each plays in developing involuntary attention. The lecturer who continually finds it necessary to pound on the table or wave his arms in order to hold attention is openly admitting that what he has to say does not appeal to his audience. The teacher who finds it necessary to say "Pay attention" is admitting that he cannot present his material in a way that appeals to the real interests of his students. Objective conditions (loud sounds, unusual behavior, large signs) are excellent devices for *attracting* attention, but poor indeed for *holding* it. One's attention is seldom held by anything unless it in some way appeals to his needs, interests, wishes, or desires. One of the most important things which every successful teacher, or any one else who succeeds in affecting others, does is to present his material so that involuntary, effortless attention is developed. The sales talk appears in many different guises — in proposing, lecturing, reciting, examination-writing, and letter-writing to Dad for more money, as well as in selling groceries, automobiles, or what not. The sales talk may be spoken or written or communicated by a complex succession of gestures; but whatever its purpose and whatever its content, its inner purpose is to get and hold the attention of the person to whom it is addressed.

CONTROL OF ATTENTION

(1) *Prevention of distraction.* Distractions may be defined as stimuli which attract a person's attention from a task in hand to something else. The conditions which may prove distracting are varied. We usually think of distraction as being caused by a noise or some such unsettled condition. However, unusual quiet may have the same effect. A person in the habit of studying in a library or in a building on a noisy street may think that if he could only get away from all noise and confusion, he would be able to work more efficiently. Accordingly, he welcomes the first opportunity to take his books and seek quiet in the country. Perhaps he gets a canoe and drifts out on a lake, fondly imagining that under the moss-laden cypress trees he will overcome all difficulties — only to find that he is quite unable to concentrate. The novelty of the situation proves too much for him. He discovers that familiar surroundings, even though noisy, are more conducive to concentration of effort than unfamiliar surroundings, however ideal they may appear. More commonly, however, we are distracted by the stimuli of a busy scene such as noises, people moving about, the click of typewriters, or the hum of machinery. Every one recognizes the importance of overcoming distractions of this kind. Compare two individuals hurriedly making preparations for a trip. One moves about swiftly and smoothly, he takes no unnecessary steps. The other runs about wildly; he retraces his steps many times and responds to many irrelevant things. The former, we say, is proceeding attentively and efficiently to perform the necessary task; the latter is distracted by the emergency. He does not attend to the proper things or restrain impulsive action.

It should be remembered, however, that outside distractions are often an *excuse* rather than a *reason* for inability to attend, and that the one who always blames outside distractions for his inability to work is apt to be indulging in a little self-deception. The student who really wants to study soon learns to do so, even under circumstances that are not the most favorable. Our friend who cannot get his bag packed may simply be expressing the fact that he does not want to take a trip. Many professors who are too busy with their students and classes to take a speaking trip for the good of a cause easily arrange matters so that they can

leave the campus if a fifty-dollar fee is part of the psychological whole. The freshman who finds it too noisy to read his psychology assignment in the fraternity house does not hear a sound when he is reading a letter from home.

Between normal and abnormal behavior in this matter of attention and distraction there is no sharp line of demarcation. Extreme distraction gives rise to manic forms of insanity. The manic is unable to keep any idea in mind more than an instant. He is unable to carry out any consistent line of action. Since every passing thought must be embodied in action, he flies from one thing to another. As a consequence, nothing constructive is accomplished. The opposite extreme is found among those suffering from schizophrenia, some of whom seem utterly indifferent to all outside stimulation. So absorbed are they in their own mental processes that, if their arms are raised over their heads, they leave them there until some one pulls them down. The normal person falls between these extremes. He is responsive to some of his ideas and to some of the objects in his environment, not to everything.

Though the ability to withstand distraction is an outgrowth of one's total personality, yet knowledge of some of the methods of overcoming distraction may be of help. The obvious way is to flee from the distracting influence, but this is not always possible or sure of working. Another way is to make the distracting impression or action a part of the activity one is engaged in. A person who has learned to run the scale on the piano with his right hand may find the use of his left hand a source of distraction. But if he persists, he will soon find it easier to perform the action with both hands than with one.

Another way of overcoming distraction is to become accustomed to it. In such cases we speak of becoming *negatively adapted* to the object. This happens usually when we do not have to respond to the distracting stimulus or when it proves to be a false one. The principle of negative adaptation is of great use when the stimuli are only bothersome. We are ordinarily functionally deaf to the tick of a clock, or the buzzing of a taximeter when we are riding as a guest of some one else. In some circumstances, however, negative adaptation is extremely dangerous. Thus we must not teach others that we are joking when we cry for help. The story of the lad who cried "Wolf!" illustrates this point. It is

foolhardy to be so "tough" that one becomes negatively adapted to a sore throat, or to a stomach-ache that might be appendicitis. One can well give his best thought to the question: To what can I afford to become negatively adapted and to what must I not allow myself or others to become chronically indifferent?

Often the speed with which one becomes negatively adapted to irrelevant stimuli indicates his fitness for the work in question. A person beginning work in a busy office often is distracted by the noise and seeming confusion. Since he does not have to respond to the noise, however, he ignores it and in a short time performs his work undisturbed by what is going on about him; but his companion worker who does not like his job never learns to ignore the noise.

There is some experimental evidence which indicates that conditions at first a distraction actually make for greater attention after the worker becomes accustomed to them. Morgan found that though "a seemingly unfavorable condition influenced the subject to a very slight extent . . . after a slight retardation he exceeded the speed made under normal conditions, doing as accurate work under both conditions." [4] Probably in situations of this type the distraction serves the purpose of shutting out new distractions, while it itself loses the power to distract as the subject becomes habituated to it. We are constantly becoming negatively adapted to all sorts of stimuli — noises, sights, odors, uncomfortable clothes, and so on. In general, we learn to ignore things that are of no consequence. Though the process of becoming negatively adapted is largely passive and unconscious, yet an attitude of indifference facilitates it, while an attitude of annoyance prevents it.

Distraction may also be overcome by extra effort. To become negatively adapted to distracting impressions, we may need to use our determination. When something distracts us, our self-assertiveness may be aroused. We *resolve* not to let it interfere with our work, or we make the experiment of seeing if we can overcome it, or we simply grit our teeth and go ahead with full speed. Under the impetus of extra effort our efficiency is not infrequently increased in spite of the distraction. That a distraction may actually cause one to put forth extra effort is shown in an experiment by Laird. By comparing the amount of carbon dioxide breathed out by girls typing in a noisy room with the

amount breathed out while typing in a quiet room, Laird has shown that typing in a noisy room requires more energy than typing in a quiet room.[5] To maintain efficiency under adverse conditions, the reserves of the organism are mustered and used. This is obviously taxing to the organism's energy, and one should seek working conditions that will make this drain unnecessary.

An alert attitude against the wavering of attention is helpful. If a person knows that his attention is apt to waver, he may assume a watchful attitude. By so doing he will be able to detect quickly any fluctuation of attention and bring himself back to the job he has set for himself. It is especially desirable to keep this in mind while one is studying uninteresting assignments, though the advice is easier to read than to follow. Working with our hands in a laboratory helps to prevent distraction, but reading goes on so automatically that the reader is apt to let his thoughts wander. This is especially true if the material is difficult. If we read an abstruse passage without understanding it, the continuity of our thought is broken; and in place of the author's thoughts we are apt to substitute some of our own fancies. One good practical rule for every student is to be on the alert for the wavering of attention and to understand each thought of the author as he presents it. Another good rule is to assume the physical attitude of attention. When we attend, there is motor readiness for quick response; the runner on the mark is ready for a quick get-off; the soldier at attention is ready to respond to the officer's command. Though we cannot directly exercise control over our train of thoughts, as is shown by the tendency to daydream when we should like to study, yet an active posture of attention does much to prevent such mind-wandering and to keep us on the job we are trying to finish. Most of us find that lying in bed is a poor posture for reading any material other than a very exciting detective story. An attentive attitude may not guarantee attention, but it is helpful. Those who wish to learn to concentrate should cultivate it.

(2) *Attending to uninteresting things.* How it is possible to attend to uninteresting things has already been stated. We attend to them because we know that, in the long run, to attend will be more in accord with our interests than not to attend. The experience of a twelve-year-old schoolboy illustrates the point. The boy had been doing so poorly in school that his teacher decided she would

talk to his mother about his work. When she had told the mother the purpose of her visit, the mother said, "Tommy is a fine boy, isn't he? I was sure you would like him." And she then went on to tell how hard Tommy had worked since his father's death trying to help her support and care for the younger children. With that knowledge the teacher was able to approach Tommy differently. She convinced him that by doing his school work well, he would be in a position to be of greater help to the family. So motivated, Tommy became a satisfactory pupil.

At other times we attend because of our ideals of discipline and strength. Not to attend when we feel we should, we regard as a weakness. Or we may be led to attend through less praiseworthy motives. For example, in the days of the little red school-house the bunch of switches behind the teacher's chair was a powerful stimulus. It was less disagreeable to attend than to pay the fine of inattention, though the quality of the attention so stimulated was not the best. Today, rewards and punishment, though of a less tangible sort, continue to occupy an important place in helping pupils attend to uninteresting things. The desire to excel others is often an important motive in attention. Sometimes competition between groups is made good use of to provoke greater effort. Especially effective is the competition in lower schools between boys and girls. A more healthful motive is the desire to excel one's own record, or to master difficulties.

In general, the importance of attending to uninteresting things can be easily overestimated. One should not, indeed cannot and will not, pay long-continued attention to that which for him utterly lacks lustre. It is often stupid to be too tolerant of that which is boring. Educators should not become negatively adapted to absence of interest among school children and make too heavy demands on the heroism of youngsters. It is far easier and it is better psychology to change the school in such a way that a normal child has at least a gambler's chance of liking it. A growing number of children go to truly fascinating schools. Problems of tardiness and truancy are largely matters of history, not of current concern. Great ingenuity should always be used to reduce essentially boring tasks to an absolute minimum. There is no virtue in the disagreeable *per se*, though rationalizations for it infest our literature.

(3) *The proper direction of attention.* The proper direction of at-

tention is essential to highest efficiency. When attention does not increase efficiency, it is improperly directed. The golfer who attends to the consequences of his shot instead of to the ball should not be surprised if he plays poorly. The conversationalist who attends to his words and his manner of speaking, instead of to the people about him and to what others are saying, is not an interesting companion. The business executive who is so anxious to talk that he cannot listen should not, but would, be surprised on failing as an executive. Just as the typist must cease attending to spelling and attend to typing, so managers and speakers should cease attending to manners and concentrate on directing their men or on influencing their audiences. To attempt to do consciously what should be done unconsciously is always inefficient. As Smith says, "The over-anxious person is always ineffective, and the harder he tries the worse it makes him." [6] If attention is to make us more efficient, we must attend to the right things.

In learning a complicated activity, we must shift our attention from one phase or part of the task to another. The child who is learning to write must first attend to making his letters legible; later he should try to write rapidly. In reading, the child must attend to one thing at a time. The beginner cannot attend to calling the words accurately, to expression, and to meaning at the same time. He must first learn the words; afterwards he should try to master expression and meaning. Similarly, in learning to play billiards, we must first learn to make our shot; after we have become somewhat proficient in doing that, our further progress depends on attending to the position of the balls for our next shot. In becoming a public speaker, we must first concentrate on what we are going to say, but later we may profitably attend to our audience and to the effect of what we are saying.

The value of instruction is to be found largely in the proper direction of attention. The person who is learning penmanship needs to have some one to direct his attention to his good strokes. The same is true in acquiring skill in sports and games, such as swimming and tennis. By undirected effort we may in time master these arts, but we do so at a great waste of time and labor. To have some one set for us a good example and call our attention to good form when we attain it reduces the labor of the learning process. This also applies to logical learning. To have some one help us with the organization of the facts we have learned and

point out what is significant will prevent us from wasting time with masses of unorganized and irrelevant facts. In reading a book, the student himself can do much to prevent waste, by first reading carefully the table of contents and the introduction; then he may hurriedly skim through the book so as to become acquainted with the essential position of the author and with the way he develops his subject. By so doing he gets a perspective which should enable him to pick out the essential and the important, and to see all facts in their relation to the whole.

THE MEASUREMENT OF ATTENTION

Measurements of the strength and vividness of attention often have to be made indirectly. Except in rare instances the measurements are affected by other aspects of mental life so that we are seldom sure that we are measuring attention and nothing else. Attention is not a mental process operating all by itself in such a way that it can be measured independently of other phases of the total personality. Approximate measures, however, of what is predominantly attention are of great practical use. Samples of such measurement follow.

(1) *Attention power of a stimulus.* Some stimuli attract attention more readily than others. Some magazine advertisements attract the attention of a reader more readily than others. It is important for an advertiser to know just how his advertisement compares in this respect with other competing advertisements in the same magazine. For example, suppose there are eight full-page advertisements in a certain magazine. How do these compare in their attention-drawing power? Measurements of the attention value of an advertisement may be obtained by means of an apparatus known as an eye-movement camera.[7] Figure 51 shows a subject sitting in front of such a camera. Before him is an easel upon which are placed two advertisements. The lights are turned out and the subject is asked to look at (fixate) a small point of light located exactly between the advertisements and halfway between the top and bottom of the page. An additional apparatus, known as a *tachistoscope*, then illuminates the material for a very brief interval, perhaps one second or less. When the advertisements are illuminated, a camera records whether the subject looks at the one on the left or the one on the right. An-

FIG. 51. MEASUREMENT OF "ATTENTION-DRAWING POWER"

Photographing eye movements determines which of two advertisements has the greater power of drawing and holding attention. Until recently the effectiveness of an advertisement could not be determined until after it had been *printed* and the magazine *sold.* It is now possible to measure the effectiveness of an advertisement *before* it is published. (From Purdue Psychological Laboratory.)

other pair of advertisements is then placed upon the easel and the process is repeated. This is continued until each advertisement has been compared with every other, each appearing an equal number of times on the right and on the left. Obviously, the advertisement which gets the "first look" in most trials, regardless of those with which it is paired, has more attention-drawing power than one which receives fewer "first looks."

Using this method, eight advertisements were measured for 37 college men and 44 college women. The results are shown in Table XVI. The maximum number of "first looks" was 14; that is, an advertisement would have received a score of 14 if every person looked at it first when it was paired with each of the other seven in both left and right positions. The actual values

TABLE XVI

THE RELATIVE "ATTENTION-DRAWING POWER" OF EIGHT ADVERTISEMENTS

Thirty-seven men		*Forty-four women*	
Advertisement	*Average number of "first looks"*	*Advertisement*	*Average number of "first looks"*
A (Camel)	12.4	A (Camel)	12.2
B (Listerine)	9.0	B (Listerine)	11.0
C	7.6	C	7.0
D	7.2	D	7.0
E	5.6	F	5.0
F	5.4	E	4.8
G	4.6	G	4.4
H	4.0	H	4.2

vary from 12.4 first looks (the Camel advertisement) to 4.0 first looks (Advertisement H, which, for obvious reasons, will not be identified).

It is interesting to observe in these results the agreement between men and women. For only two advertisements, E and F, is the order reversed by the sexes. It is also interesting to find that even after all of the advertisements had been shown (56 pairs) none of them could be accurately identified by the subjects. The exposure times were so short that the name of the advertiser could not be observed. It is important to note that the first-look power of an advertisement is unrelated to any knowledge concerning its content; one has to look before he knows what is there. To have people look first at one advertisement instead of another is presumably of great importance to the advertiser. It is similar to a great advantage in football — the ability to outcharge the opponents' line.

Another type of eye camera which is used to measure the power of advertisements to draw and hold attention under more normal reading conditions is shown in Figure 52. This apparatus reveals the time spent by a reader on different pages of a magazine and also the time spent on different parts of each page. The average results for 100 readers (48 men and 52 women) are shown in Figure 53. This chart shows that some advertisements have several times the holding-power of others.

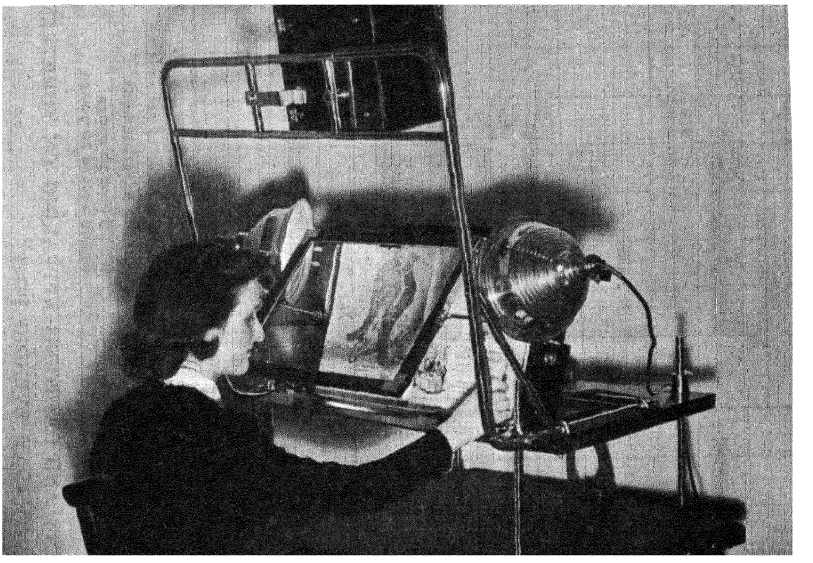


FIG. 52. EYE CAMERA WITH HALF-SILVERED MIRROR

A camera located above the head records where the reader looks as his eyes strike successive pages of a magazine. (Described by J. S. Karslake, "The Purdue Eye-Camera," *Journal of Applied Psychology*, XXIV (1940), 417–440.)

Figure 54 shows a "breakdown" of the results for one of the pages studied, namely, the Conoco advertisement. The figures superimposed on this illustration show that per cent of the total time spent by a typical reader of the advertisement which he gave to each part of it. Since the only part of the advertisement in which the name of Conoco Oil is mentioned is the lower right-hand corner and since the average reader looked at this part only seven per cent of the time spent on the whole page, the effectiveness of the page, as a Conoco advertisement, at least, might be seriously questioned.

(2) *The duration of attention.* It is obvious that the advertisements just considered could also be measured not only in their power to *attract* attention, but also in their ability to *hold* it. Here, as in other situations, the duration of freely given attention is important, since no one *has* to read advertisements.

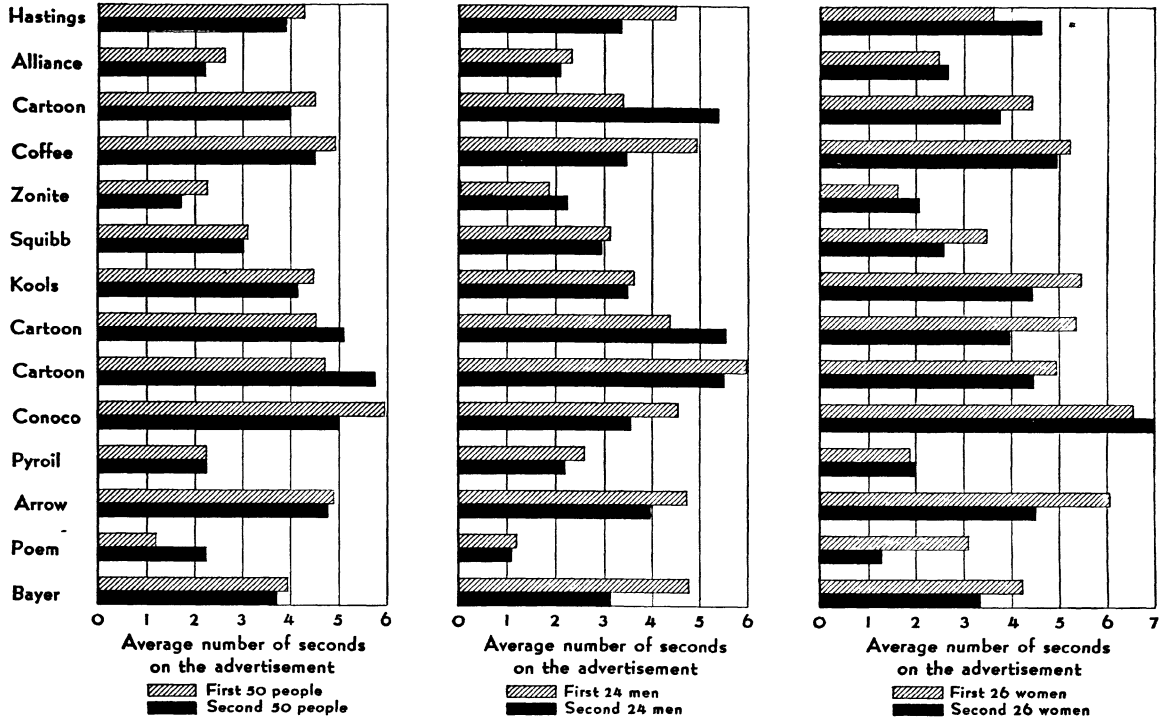


FIG. 53. AVERAGE TIME SPENT ON ADVERTISEMENTS AND CARTOONS APPEARING ON FOURTEEN CONSECUTIVE PAGES OF THE "SATURDAY EVENING POST"

Note the consistency of results between the first and second halves of each group studied.

FIG. 54. RESULT OF AN EYE-CAMERA STUDY

This shows that the average reader gives fifteen per cent of his time to the headline and distributes the remainder on the other parts as indicated. The product identification in the lower right-hand corner received only seven per cent. Advertisers are constantly increasing their demand for men and women capable of applying the technological methods of psychology to problems of advertising and business. (From J. S. Karslake, "A Simple and Direct Method for Investigation of Attention Value of Advertising Copy through Eye-Movement Photography." Ph.D. thesis, Purdue University, 1938. Reprinted by courtesy of Tracy-Locke-Dawson, Inc., Advertising, and Continental Oil Company.)

As yet, education has not been taken seriously enough, except in rare instances, to have forced exact studies to be made of the getting- and holding-power of textbook material. But in "educating" the buying public to use Gum X instead of Gum Y, to base its hope of future happiness on Soap A instead of Soap B, to buy Automobile M instead of Automobile N, the learning is so

important to the teacher (manufacturer) that every square inch of the textbook (advertisement) is constructed with utmost care.

The length of time one attends to a thing varies with the complexity of the object attended to and with one's own inner condition. Billings reports that the duration of attention to very simple things, such as dots on paper and small parts of a picture, is about two seconds. He also finds that the more complex the stimulating situation, the longer the duration of attention.[8] We can, therefore, attend to a scientific problem or to a book or to a picture for a long time. If, on the other hand, the object is very simple, such as a punctuation mark, we can attend to it for only a short time. If the reader will try to focus his consciousness on such a mark and hold it there, he will find that his attention wavers. It will come back to the object at very brief intervals, but he cannot keep it there. The mark becomes more like a basic point of operations. Attention centers upon it, but it is perpetually making excursions to other items.

What happens when we attend to a complex thing is quite different. We notice its various features one after another; we associate it first with one thing and then with another. The value of attention is greatly increased by its mobility. We need to attend in order to get a clear perception or understanding of the thing to which we attend. But if we were to continue to concentrate on an object or situation which no longer presented a problem, we should waste time and energy. In a world of great variety and constant flux we need to throw the spotlight of consciousness on various features one after another. To hold it on an object after our adjustment has been mapped out is a luxury of contemplation that we can seldom afford. A curious exception to the tendency to rove is the trance-like condition of the half-hypnotized crystal gazer, but this abnormality sets in clear relief the continuous restlessness of the attention of normal persons.

The length of time that a complex subject will be attended to varies also with the person attending. A manic person, distracted by every passing suggestion, can attend for only a very short time. A person of divided interests, torn with internal conflicts, cannot attend to anything long. A person who knows little about the object of attention cannot attend to it as long as one who knows a great deal about it. For example, a complicated problem of administration can be attended to for a long time by a trained

administrator who understands the complexity of the problem and who is able to foresee the various difficulties that may arise if any of the suggested solutions is followed. On the other hand, a person of little administrative experience is unable to anticipate the difficulties that may arise. He therefore can attend to the problem profitably for only a short time. Similarly, an artist can spend hours to advantage in studying a single picture. It would be a waste of time for the ordinary person to do so, since he lacks the experience, training, and knowledge of art necessary for a rational analysis of pictures. It is the same in every field; the more we know about anything, the longer we can attend to it.

Another factor which influences the duration of attention is continued stimulation. If one drives an automobile several hundred miles, he is likely to continue "attending to the road" for some time after the trip is finished. His dreams that night may be a continuation of this state of consciousness. It is as if the mind, once in action, finds difficulty in slowing down and finally stopping. If a card game is carried on into the small hours of the night, one may continue to pay attention to the cards long after he tries to sleep. Though attention shifts from one object to another, a long-continued state of attention cannot be quickly and permanently turned off as if by an electric switch. It takes a more exciting or important rival to crowd it out of our minds.

(3) *Span of attention.* How many things can be attended to at a time? This question really contains two questions: How many things can we perceive at a glance? And how many activities can we carry on attentively at one time? The answer to the first question depends upon what we mean by a single thing. If we mean by a single thing each letter of a word, we can attend to many things at a glance. If each grouping of letters into words is regarded as a single thing, then the number of things that can be taken in at a glance is much less. What is true of words is true in other fields. The architect, the business expert, the artist, and the physician can take in a great deal in their respective fields at a glance. They are able to do so because they have learned through experience that one thing implies another, and it is difficult for them to separate sharply the implications of things observed from what is actually seen.

We can see about five unorganized or ungrouped things at a time. This number, however, is not fixed. It varies, according

to Oberly, from about two and a half for complex things to eight for more simple things.[9] Investigations on the range of attention are usually made with a tachistoscope, the instrument mentioned on page 334. With a tachistoscope it is possible to expose to view for short periods, perhaps a small fraction of a second, a given number of unorganized things, such as letters, digits, or geometrical figures. As the number of objects presented is increased above five or six, the number perceived actually becomes smaller. This is shown both in laboratory experiments and in studies of the effect of magazine advertisement headlines of various sizes. If several cards, some containing four disconnected letters, others five, six, seven, and eight are presented tachistoscopically to a group of subjects, the number of letters recognized increases at first and then decreases after the optimum number for the range of attention is passed.

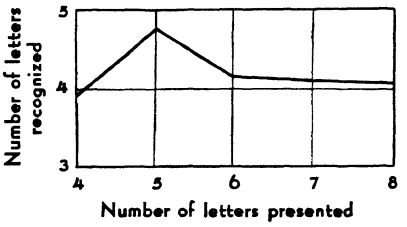


FIG. 55. RELATION BETWEEN NUMBER OF RANDOM LETTERS PRESENTED AND NUMBER IDENTIFIED

Five is best number for maximum identification.

This limitation of the range of attention is particularly important in advertising. As Starch has shown, one remembers a commodity advertised with a short headline better than one with a long headline. The results of one of his experiments are shown in Table XVII. Simpler experiments, in which unrelated letters are shown tachistoscopically in groups of from four to eight, show that five letters result in more correct judgments than a larger or smaller number. This is shown in Figure 55.

To the question of how many activities can be carried on attentively at one time, psychologists in general answer One. It is recognized, of course, that any complicated act is made up of simple elements. For example, in writing an essay we think of what we are going to say; we seek appropriate words; we spell the words; and we make the necessary movements of our arms and hands. All of these activities are really one activity, namely, writing the essay. Many parts of that activity are relegated to the level of habit.

TABLE XVII

SHOWING RELATION BETWEEN LENGTH OF HEADLINES OF FULL-PAGE ADVERTISEMENTS AND NUMBER OF TIMES ADVERTISEMENT IS MENTIONED[10]

	Headline	
	Five words or less	*Six words or more*
Number of advertisements	5	5
Number of mentions	33.6	13

There are, however, apparent exceptions to the statement that we can perform attentively only one act at a time. At times we carry on two unrelated activities at once, as when we talk while walking. In such cases, however, the conversation is the only object of attention; walking is performed automatically. When there are difficulties in our path, and walking requires attention, we find the carrying on of a conversation tiresome and difficult. Likewise, pianists may play familiar compositions and carry on a conversation, but they cannot do this when they are learning a difficult piece. Caesar is said to have been able to dictate several letters at a time; but, when we remember that his scribes wrote in longhand, we can readily understand that this feat may have been the result of an accurate memory and a rapid shift of attention, rather than of attending to several things at once. When the motion pictures show four or five telephones on the business man's desk, there is some reason to suspect either exhibitionism or an approaching nervous breakdown.

A more serious objection to the view that we can attend to only one thing at a time grows out of the performance of stage magicians who seem to collect all sorts of information and at the same time perform complicated mathematical problems which have been formulated with the help of the audience. They apparently attend to two or more things at the same time. This type of performer is really taking advantage of the inability of his audience to attend to many things at once. The experiment of Münsterberg, cited on page 317, shows that we do not observe numerous things which happen right before our eyes.

Equally remarkable appears to be the case of a typesetter of the old school who, according to Phillips, used one eye to read the copy and the other to set the type without head rotation.[11]

Likewise, some telegraphers apparently receive at great speed and at the same time keep in contact with what is going on about them. Ripley in his *Believe It or Not* claims that a certain William W. Lord of Philadelphia can write two long letters on unrelated subjects (one with each hand), conduct a conversation, and mentally solve a mathematical problem at the same time.

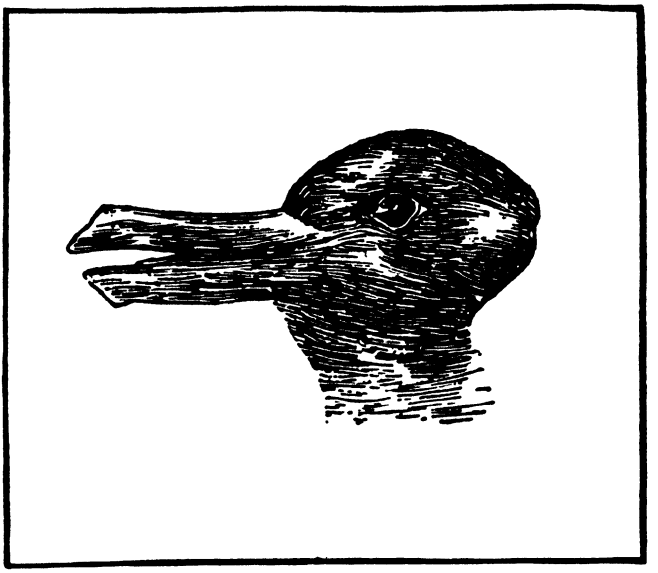


FIG. 56. WHEN IT'S A DUCK, IT'S A DUCK — WHEN IT'S A RABBIT, IT'S A RABBIT!

Normally we attend to only one thing at a time. (From J. Jastrow, *Fact and Fable in Psychology*, Houghton Mifflin, 1900, p. 295.)

Psychologists are, in general, skeptical of such claims and are inclined to believe that such performances are due to a rapid shift of attention from one thing to another, or to an abnormal condition, analogous to dissociation of personality, in which one activity goes on automatically. In either case, these feats cannot be developed by most persons and should not be considered as possible goals of achievement. That one may confuse *dual* attention with rapidly *shifting* attention is shown in Jastrow's famous illusion, illustrated in Figure 56. When asked for the first time whether

this picture is a rabbit or a duck, most students will immediately reply, "Both!" Upon closer examination, they will find that at one time they see it as a duck, then as a rabbit, but that however rapidly it shifts from one to the other, it is never seen as both at the same time. When it's a duck, it's a duck; when it's a rabbit, it's a rabbit! This illustrates a major trait of the attentive process and strongly suggests that normally we attend to only one thing at a time.

SUMMARY

Attention may be thought of as the "spotlight" of consciousness. We attend to a succession of things. Though a number of people may be in the same room, their attention is usually on different things. Attention increases efficiency in several ways. (1) It improves our sensory discrimination by isolating the parts of a complex whole, by making us aware of stimuli that would otherwise pass unnoticed, and by making our impressions clearer. (2) It involves a heightened state of motor readiness. (3) It helps us remember experiences more accurately and fully. (4) It makes us responsive to relevant matters. Attention may decrease our efficiency if we attend to skills or habits which are better relegated to an automatic or unconscious level of performance.

Attention is determined by objective and subjective laws. The objective conditions (or the factors in the stimulus) which favor attention are: (1) change, (2) intensity, (3) size, (4) repetitions, (5) novelty or uniqueness, (6) nearness to point of fixation, and (7) importance. The main subjective determinants of attention are: (1) native desires, (2) sentiments and complexes, (3) mood, (4) attitude, (5) education and training, (6) purpose of the moment, and (7) purpose of the future.

Involuntary attention occurs when we become "lost" in an activity without conscious effort; voluntary attention, when our minds "wander" and only with effort are kept upon a given task. Both types of attention are subject to the same laws. Involuntary attention is more efficient than voluntary because it does not involve so much wavering and fluctuation.

From their study of attention psychologists have evolved numerous valuable principles of controlling it. Some of these apply to the elimination of distraction, others to the direction of attention to things that are at first uninteresting, and others to the direction

of attention to the proper aspects of its object. (1) Distraction of attention may be reduced by eliminating or going away from the distracting influence, by incorporating the distraction in the major activity, by becoming negatively adapted to the distraction, by putting forth more effort, by being alert for wavering of attention, and by assuming a posture of attention. (2) Attention to uninteresting things may be stimulated by rewards and punishments, by a desire to excel others, by competition between groups, and by a desire to excel one's own record. (3) In learning any skill it is important to recognize what parts should be attended to and what parts should become habitual, automatic, and unconscious. One of the main values of instruction is to point out the proper direction of attention.

Some of the aspects of attention that have been measured are: (1) the attention-drawing power of competing stimuli, (2) the duration of attention, and (3) the span or range of attention.

QUESTIONS ON THE CHAPTER

1. Define in your own words the concept of attention as explained in this chapter.
2. How does attention increase the efficiency of our activities?
3. Under what conditions will attention decrease the efficiency of our responses?
4. List and discuss the objective determinants of attention.
5. List and discuss the subjective determinants of attention.
6. Distinguish between voluntary and involuntary attention.
7. What is the function of the physiological changes that occur when we attend?
8. What are the possible methods of overcoming or reducing distraction?
9. How may attention to uninteresting things be stimulated?
10. Describe how the attention-drawing power of advertisements may be measured.
11. What is meant by (a) the duration of attention, and (b) the span of attention?

QUESTIONS FOR DISCUSSION

1. Who pays more attention to driving an automobile, the beginner or the experienced driver? Cite similar instances.
2. Cite instances where you and a friend have attended to different things because of different backgrounds or interests.

3. Give examples where attention to the wrong thing has decreased your efficiency.

4. What situations have you been in where an effort was made to attract and hold your attention by objective conditions? Was it successful?

5. How might a teacher utilize the principles of attention in increasing his efficiency?

6. Suppose you were employed by an advertising agency to measure the attention value of advertisements before they were published. How should you go about it?

7. Cite cases where shifting attention has passed for dual attention.

8. What principles of attention are utilized by a magician?

SUGGESTED READINGS

J. J. B. Morgan, *Child Psychology* (third edition; Farrar and Rinehart, 1942), Chapter VII. Though this chapter is called "Motivation," it might have been called "How to Keep the Child's Attention on the Job." Interesting and helpful.

W. B. Pillsbury, *Essentials of Psychology* (The Macmillan Company, 1930), Chapter VII. A good discussion of the major facts about attention, though it does not include recent experimental work.

MORE ADVANCED READINGS

H. L. Hollingworth, *The Psychology of the Audience* (American Book Company, 1935). How a speaker may use the laws of attention to get and hold his audience.

W. B. Pillsbury, *Attention* (The Macmillan Company, 1908). A classic treatment of attention, though it needs revision to bring it up to date.

CHAPTER TEN

Learning: How We Change Our Behavior

THE chief industry of modern civilization is learning. In order to carry on any specialized work, we must first "learn how." Learning literally *makes a man into* a professional of one kind or another. Having learned his "trade," the ball-player, for example, responds to situations with special actions that are quite as quick, quite as vigorous, as any native reactions. In every aspect of his constitution the man *is* a ball-player, and he becomes so largely, if not entirely, by learning.

In the span of a few years the young human being must learn literally thousands and thousands of things and weave together into smooth working wholes scores of items which were learned in relative isolation. Thanks to man's complicated nervous system, he is by far the greatest learner the earth has yet seen. No other form of life learns anything like as much, as fast, or as well as man. Much of our learning goes on willy-nilly, other phases of it are more or less controlled, while still other learning victories would never take place except for deliberate intention and skillful guidance. There is no conscience and not very much judgment in a good deal of man's learning, and it is often difficult to give an account of the exact procedures which result in given specimens of learning. Yet the importance of learning is not lessened by the difficulty of explaining it. It is learning — perhaps more than any other single factor — which causes one man to be a skillful surgeon, another a blunderer; which causes one to be an expert mechanic, another a tinkerer; which causes one to be a respected citizen, another a hunted criminal.

Psychologists have indulged for years in famous quarrels over

the definition and nature of learning. Even today the simple fact that learning *does* take place cannot be explained to every one's satisfaction. Do not be surprised if you find in the psychological journals one explanation of the laws of learning devastatingly refuted by another. Fortunately, the beginning student need not concern himself with these confusions and disagreements amongst the doctors. Amid all the uncertainties over the ultimate nature of learning, we know for sure that man does learn; and we know a good many of the principles of learning well enough to make use of them in a practical way. But we do not know, and the authors will not pretend to know, exactly what takes place when we learn. The difficulties of the situation can be shown by a simple illustration which, though commonplace, brings the whole mysterious matter of learning directly before us.

John, in the first grade, is asked by his teacher on Monday morning: "Seven plus four equals what?" This question is a problem, or a situation, or a *stimulus* to which a proper response must be attached. But John does not know the correct answer; that is, he has not *learned* it. So to this stimulus he makes whatever response he has learned to make in the face of an embarrassing situation — a worried, downcast look; a wiggle or two; a whimper; a pretense that some one else was asked the question; or a very fine response which he has learned: namely, "I do not know."

On Friday of the same week the teacher again asks John: "Seven plus four equals what?" This time John replies, "Eleven," with promptness, assurance, and a general feeling of well-being. Somehow or other during the week John learned that seven plus four equals eleven. Should we ask ourselves just what happened in John's nervous system which will account for this connecting, we should ourselves have to give the very fine response, "I do not know." Neural adjustments of amazing complexity no doubt took place, but man has yet to invent a magic microscope which will reveal the differences between a nervous system that cannot respond with *eleven* to the stimulus *seven plus four* and one that always does. John's learning of a simple addition fact is a case of relatively simple learning, but it is the same kind of thing as the most complicated learning that we experience. It is no more difficult *in principle* to explain how one learns to conduct a symphony orchestra or pilot a transport plane than to give a satis-

factory explanation of how a child learns that seven and four are eleven.

No group of examples of learning can begin to indicate the importance which learning has for us, or the constant dependence we place upon it. Scarcely an hour passes that does not have some effect upon us, in which we do not learn something, either casually and accidentally or by intent and deliberation. From birth to death, most of what we do or can do depends upon what we have learned. When we need to perform an act for which we do not have the necessary skill, or when we desire additional information, we seek to learn by directed activity. At other times, learning results from spontaneous activities and observations, as when a child acquires muscular control by playing with his toys, or when we learn by listening to the conversation of well-informed people. The modifications of behavior that result from activity constitute what we mean by learning. If the learning results from conscious effort, it is called *intentional* or *deliberate;* if it occurs spontaneously, it is called *non-intentional* or *incidental* learning.

Activity that leads to learning may be mental or physical. When we perceive, or think, or daydream, we engage in an activity as truly as when we walk or skate; and such activities are as truly sources of learning. Learning that depends on motor activity and results in an increase of skill we shall call *motor learning;* learning that depends almost wholly on sensation and leads to greater understanding we shall call *verbal learning*, since it can usually, though not always, be embodied in words. Learning to skate is an example of the former; learning that candy is sweet, an example of the latter. Any modification of our behavior that results from activities and experiences is learning. We *learn* that we must exercise self-control, that keeping up with the Joneses is not worth the cost and worry, or that a quiet evening at home is preferable to dancing — improbable as this may seem to many students.

LEARNING AND ACTIVITY

All learning involves activity. Even the "receiving" of a sensory impression is an activity. Moreover, on receiving an impression, we frequently respond to the situation mentally by thinking what the overt response would be if we were to make one. Sometimes the mental response is unconsciously given overt

expression, as when the football or track fan moves in harmony with the motion of the team or of a player. Movements of this type are called empathic, and the word *empathy* is used to refer to our tendency to perceive or appreciate our environmental situation in terms of unconscious bodily movements. Examples are shown in the illustrations, Figures 57 and 58. In one, a spectator is "helping" an athlete with his hands, in the other with his foot. Both spectators were surprised when they were shown the pictures, for they were quite unconscious of their activities. What the fans do in an overt way many of us do, though in a less noticeable manner, as we follow the movements of players. Similarly, as we watch a dancer, we tend, to the extent that we appreciate her grace and enjoy the beauty of her movements, to make slight imitative movements. Auditory impressions influence us in the same way. When listening to a speaker, we unconsciously and silently imitate his manner of speaking; that is, we make certain movements that would be required if we were actually to imitate him.

The incidental acquisition of information also involves activity. The facts that we acquire in conversation or in listening to a speaker we assimilate by relating them to what is already known or believed. Otherwise, they would be meaningless. Obviously, thus relating them involves mental activity. We see them in their different relations or think of their different uses. As a result, they, with their meanings and implications, are learned.

To be impressionable is a necessary condition of learning. An organism uninfluenced by its activities obviously cannot learn. Much incidental learning results from being impressionable. A person reared in a good home where the social conventions are constantly observed learns these conventions as a matter of course. In the same way he picks up his accent. Every person learns much vice or virtue without seeking to do so. Much of our learning, especially that which forms the basis of our fundamental attitudes, such as our attitude toward work, civic responsibilities, and religion, comes in this way. The same is true of many fears. The child does not seek to learn to fear snakes; he becomes afraid of them from hearing those about him give expression to their fear. Similarly, a child does not seek to learn to imitate his mother in her neurotic escapes from unpleasant situations, but he is none the less likely to do so.

FIG. 57. EMPATHIC REACTION

FIG. 58. ANOTHER EMPATHIC REACTION

IMPORTANCE OF LEARNING IN MAN

To learn is an outstanding characteristic of man. Its importance may be seen by comparing him with other animals, by noting the poverty of man's repertory of unlearned activities, and by considering the nature of what he must learn. Of all animals, the human being has the longest period of immaturity. This means the longest period of helplessness and plasticity, and hence, the longest time for learning. Compare man with the mayfly, which lives only three or four days. Obviously, such an insect has little time for learning. Yet it must carry on certain activities to preserve itself and also to preserve the species. The guinea pig also impresses us with its rapid development. Within a few hours after birth, it can sit, run, scratch, and paw. The human infant, on the other hand, remains in a helpless condition for months, and not for years is it able to shift for itself.

A consideration of what we learn also shows how important learning is for us. By nature we respond to relations, and attempt to organize our experience into a system. But the actual relations must be learned. To be more specific, by nature we experience things as coming before or after, but we have to learn that the bell rings before dinner. Similarly, by nature we perceive that things are causally related. But we have to learn that poverty is a cause of mental retardation. The child learns the principle of inflection before it learns such irregular forms as *good, better, best.* Before he learns them, he is apt to say the "very goodest." Only from experience can we obtain the many things we must learn; and it is from this experience that we learn facts of all sorts, and acquire beliefs in religion, politics, and philosophy.

UNLEARNED ADJUSTMENTS

In emphasizing the importance of learning, we should not forget that we perform a number of acts without learning. If it were otherwise we could not learn; for learning depends on activity. Even prematurely born infants are able to carry on the various vital processes. The emptiness and periodic contractions of the stomach give rise to an expression of dissatisfaction. When a nipple is inserted in the mouth of a full-term infant, it closes its mouth tightly around it so as to exclude the air, and sucks so

as to get the milk, at the same time swallowing and breathing rhythmically. It is also able to sneeze and cough. It soon responds with signs of pleasure to caresses. It shows fear when dropped or when loud noises occur near it. It becomes angry when denied the freedom of moving its arms and legs. It responds reflexly to many stimuli. Before long, usually after about thirty-four hours, it can follow a light with its eyes without any previous practice. It can discriminate various tastes. It can remember its past — at least, its behavior shows the influence of its past.

(1) *Maturation.* Other unlearned activities wait upon the development of the body, particularly of the nervous system. For example, before it can walk, the infant must wait until its muscles, bones, and nervous system are sufficiently developed. Its kicking and crawling doubtless stimulate this development somewhat, but the important factor is time. The fact that a baby apparently *learns* to walk is due to its making an effort, usually encouraged by adults, to do so before its nervous and muscular systems have developed enough to make walking an easy and steady movement. Likewise, the increasing range and refinement of sensations wait upon the development of the nervous system. As we have seen above (page 294), many emotional responses do not have to be learned. They occur when the individual has reached the necessary stage of development and is subjected to proper conditions. An infant does not *learn* how to show jealousy. All that is needed is sufficient maturity and the lavishing upon another of attention which has formerly been lavished on him.

(2) *Bird's and Carmichael's experiments.* Development of the kind just described is due to the maturing of the organism, or to inner growth, over which the organism has little, if any, control. Several investigations, dealing with both animals and human beings, show the importance of this source of development. At the animal level, Bird has studied the pecking of newly hatched chicks. He divided chicks into groups, allowing some to try their skill at pecking immediately after hatching, while others were kept in the dark and fed artificially for varying intervals of time before being allowed to peck. He found that a chick kept in the dark for hours before being allowed to peck will learn the skill in a fraction of the time required by a chick just out of the shell.[1] The curve of maturation (without learning) for chicks is shown in Figure 59. Bird also reports that certain errors, such

as missing the grain completely, seem to be practically eliminated by general physiological development, even in the absence of any practice.[2]

Carmichael reports work on frogs pointing in the same direction. He allowed a number of frog's eggs to hatch in water containing an anaesthetic, which prevented the developing organisms from moving, though it in no way affected their physical development. At the same time, he allowed a number to hatch in plain water. After the latter group had turned into tadpoles and were swimming well, he placed the anaesthetized tadpoles in water containing no drug.[3] In a few minutes these swam as well as those that had practiced swimming for some time. Evidently tadpoles do not learn to swim. They need only sufficient maturity.

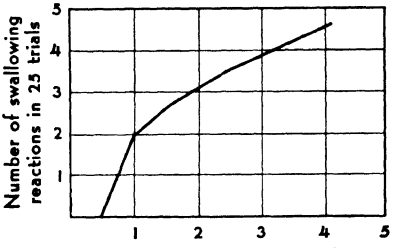


FIG. 59. A TYPICAL CURVE OF MATURATION

This shows how ability to peck more accurately increases with age even without practice. (From Charles Bird, "The Relative Importance of Maturation and Instinct in the Development of a Habit," *Ped. Sem.*, XXXII, 1925, 68–91.)

(3) *Gesell and Thompson's experiment.* Studies of a similar nature have also been conducted with children. Gesell and Thompson separated a pair of identical twins when they were about a year old. Identical twins are twins which develop from a single fertilized ovum and which therefore have the same heredity. One twin was regularly given ten minutes' practice playing with small blocks and ten minutes' practice climbing a short flight of stairs. The other twin was kept away from stairs and articles of furniture which could be used to climb upon, and was denied small blocks to play with. At the end of six weeks the performances of the infants were compared. There was no difference in their ability to play with blocks. The infant who had practiced climbing stairs, however, was decidedly superior in climbing. This superiority, however, was overcome by her sister in two weeks of practice. From the experiment Gesell and Thompson conclude that the child who had six weeks of practice

was no further ahead at the end of eight weeks than she would have been without her preliminary practice.[4] This conclusion has been substantiated by Hilgard's experiments involving groups of preschool children.[5] In the acquisition of skill in later childhood, practice plays a more important part.

(4) *Maturation in mental activities.* In more purely mental activities, the rôle of maturation is equally clear. No one tries to teach an infant a few weeks old to talk, a child of three years to read, nor a child of five to remember the multiplication table. Nor do we expect young children to be able to reason logically, or to show depth, richness, or control in their emotional states. For these things there must be a sufficient degree of maturation, as truly as there must be to walk or to suckle. The proper "grade-placement" of curricular materials is an important psychological problem. To recognize maturation as a necessary condition of learning is vitally important for teachers, parents, and all others directing the development of children. Learning, at each level, must wait for maturation. Attempting to instruct a child before he has achieved the necessary maturation is not only fruitless; it is likely to awaken feelings of defeat and despair which will persist and render the task difficult even after sufficient maturation has taken place. What is more, if one waits for maturation, a great deal of learning will not have to take place at all.

THE CHANGES THAT OCCUR WHEN WE LEARN

(1) *Conditioning.* One kind of change that occurs when learning takes place is the attachment of a response to a new stimulus. This is illustrated when one's mouth "waters" at the sight of food or when a horse stops in response to the word "whoa." The originally effective stimulus for the reflex action of the salivary glands is food in the mouth. Eventually, this response becomes attached to new stimuli such as the sight of food, the smell of food, and even the thought of food. In a similar way the horse learns to make the response to "whoa" that he originally made to a pull on the bit. This kind of learning is called *conditioning.*

The procedure of conditioning is illustrated in the classic experiment of the Russian physiologist Pavlov on the conditioned salivary reflex in the dog. In this experiment a dog was trained to stand quietly in an experimental set-up which permitted an

experimenter to measure the number of drops of saliva secreted and to control the stimuli used in conditioning the animal. The *unconditioned* or naturally effective stimulus for the salivary response was food. The new stimulus — new only in the sense that it did not at the outset of the experiment arouse a salivary secretion — was the sound of a bell. The bell did arouse other such responses as pricking up the ears or tension in the neck and leg muscles. With the dog in position and awaiting food, the bell was sounded slightly before the food appeared. The bell and food were presented in this way a number of times, after which it was discovered that the sound of the bell alone produced the salivary secretion.[6] The stimulus-response connections present before and after the conditioning are represented as follows:

Before conditioning

Stimulus	Response
bell	pricking up ears, etc.
food	salivary secretion

After conditioning

bell . . . . . salivary secretion

It will be noted that whereas before conditioning there was no connection between bell and salivary secretion, after conditioning there was a sufficient connection for the bell to arouse the salivary response without the appearance of food. The bell is now called a *conditioned stimulus*, and the response to it is a *conditioned response*. Thus a conditioned response is one which is now aroused by a stimulus which was originally inadequate to produce it.

The conditioning of a very wide variety of human and animal responses has been demonstrated in psychological experiments. An experimental set-up for conditioning the foot-withdrawal response in a dog to the sound of a tone is shown in Figure 60. A similar set-up was used by Liddell in studying certain characteristics of a conditioned leg-withdrawal response in sheep.[7] Human responses which have been conditioned experimentally include the wink reflex, the salivary reflex, finger-withdrawal to

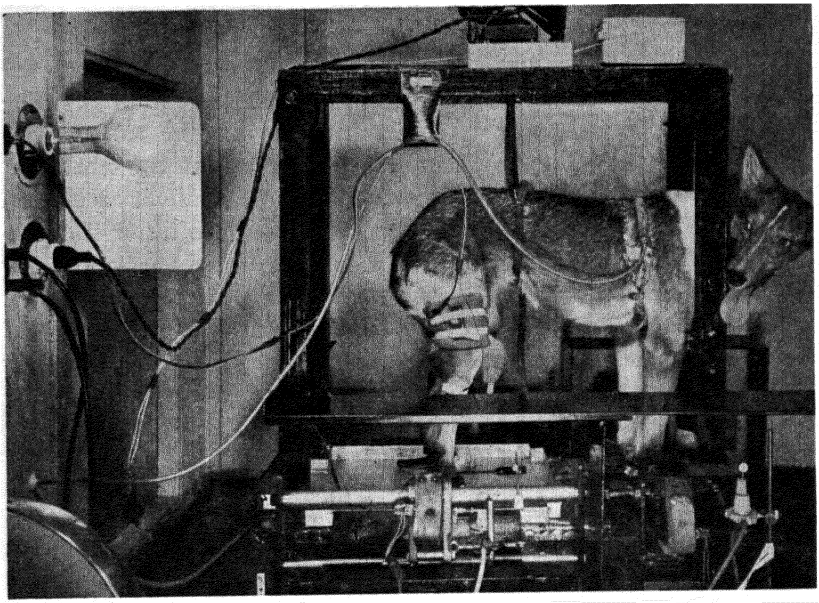


FIG. 60. EXPERIMENTAL SETUP FOR CONDITIONING THE FOOT-WITHDRAWAL REFLEX IN A DOG TO THE SOUND OF A TONE

(From W. N. Kellogg, R. C. Davis, and V. B. Scott, "Refinements in Technique for the Conditioning of Motor Reflexes in Dogs," *Journal of Experimental Psychology*, XXIV, 1939, 318–31.)

pain, breathing reactions, psychogalvanic reflex, sucking response in infants, and emotional reactions. These responses have been conditioned to a wide variety of extraneous stimuli.

Many examples of conditioning can be found in everyday life. A youngster learns to dislike orange juice after a few doses of a mixture of castor oil and orange juice. In one case the emotional shock of a severe arm burn from hot coffee became attached to water and other liquids. One three-year-old boy displayed intense fear of his barber after a very painful session in a physician's office with a man dressed in white and wielding shiny instruments. If a child hears some one say "no-no" just as he touches something hot, he may become conditioned by that one presentation of the unconditioned stimulus (pain) and the conditioned stimulus ("no-no") to make a withdrawing response to the sound "no-no." And what a useful conditioned response this would be in dealing with small children! A teacher displays a card with the word "boy" printed on it and says to her first-grade pupils, "Say boy." Obediently, the children say "boy." After a number of repetitions, the children (the brighter ones, at least) will say "boy" at the sight of the card alone.

In order to establish a conditioned response it is necessary (1) that the conditioned and unconditioned stimuli be presented together or in close succession, (2) that the stimuli be repeated a number of times (in rare instances a single presentation may be sufficient), (3) that the subject be alert and attentive, and (4) that the conditioning situation be free of distractions. Learning occurs if the conditioned and unconditioned stimuli are presented simultaneously, but it appears that the best learning occurs if the conditioned stimulus precedes the unconditioned by a short interval. In one experiment the optimal interval was .5 of a second.[8] The number of repetitions of the conditioned and unconditioned stimuli necessary for learning depends upon the age and intelligence of the subject, the nature of the response, and the degree of freedom from distracting influences. Mateer found in conditioning children to make a swallowing response to a blindfold that some children required as many as eighteen and some as few as three trials. The younger children and the mentally defective children in the group required more trials on the average than the older and normal children.[9]

Some of the experiments on conditioning have revealed that

the continued application of the conditioned stimulus without the unconditioned stimulus (bell without food) after the conditioned response has been established, results in the disappearance of the conditioned response (salivary response to the bell). The animal learns not to salivate to the sound of the bell, and he does so as a consequence of hearing the bell over and over when no food is present. This phenomenon in conditioning is known as *experimental extinction.* The conditioned response is eliminated in the experimental set-up by presenting the conditioned stimulus without the unconditioned. This extinction is apparently a case of active learning. In the beginning the animal learned that the sound of the bell meant eating. He now learns that the bell means no food and no eating.[10]

Other experimenters have shown that an established conditioned response can be eliminated by conditioning the organism to make a new or substitute response to the conditioned stimulus. The use of this procedure by Jones in eliminating a child's previously learned fear of a rabbit was described in Chapter VIII.

The technique of conditioning is a valuable method for investigating certain kinds of behavior in young children and animals. For example, it is possible by this method to determine an animal's or a child's ability to discriminate between two closely similar stimuli, such as tones, colors, or other visual objects. In such experiments an animal is conditioned to make a response (salivary secretion) to a tone of a certain pitch. A different tone is then introduced. If the animal does not make a salivary response, it is assumed that he perceived the new tone to be different from the first one.[11]

(2) *Coördination and integration.* Many of the changes that occur when learning takes place are easily observable. A person does not need to be an especially keen observer to note the modifications apparent when a person becomes a skillful skater. These stand out clearly when we compare a poor and an expert skater. Conspicuous are the superior coördination and integration of movements of the expert. In addition to knowing, as perhaps does the novice, what is the correct position, the expert also knows how to assume it. His legs work coördinately with his arms and body; and his superior integration is seen in the smoothness of his movements, one movement fading into the next as he moves over the ice. There is little unnecessary activity, whereas

the beginner makes not only many unnecessary movements, but, much worse, many that conflict with the necessary ones. As a result, he is quickly exhausted. The experienced person also shows his mastery of an art by setting a pace he can maintain, whereas the novice at any task is apt to set too rapid a pace for himself.

(3) *Organization of material into wholes.* Similar changes occur at a somewhat higher level of learning, as in typing and telegraphy. The inexpert typist or telegrapher responds to each letter or click, as the case may be, whereas the expert responds to larger groups of elementary units. The expert typist reads her material and organizes it into larger units, thus insuring smooth and highly coördinated movements. Most of us who have had practice chiefly in writing letters on a typewriter approximate this level of expertness only when we write "yours very truly." Even more remarkable is the performance of the expert telegrapher, who keeps in mind a great number of sounds so as to perceive their structural pattern and, at the same time, writes rapidly on his machine. If this were not so, improvement to the point shown in Figure 61 would not be possible. Figure 61 has historical as well as practical significance. Though it comes from one of the earliest quantitative studies of learning, it is still considered an example of the best type of scientific study in this field.[12] Skill in telegraphy involves not only highly skilled muscular responses but also much training of auditory perception. The telegrapher learns to respond with his ears to large units of meaningful material in much the same way as we respond with our eyes in reading.

(4) *Negative adaptation.* Improved coördination and integration, with the consequent elimination of unnecessary and antagonistic movements, constitute the basis of all motor skills. Many skills, however, require more than this. They demand that we become negatively adapted to unimportant features of the situation and that we learn what is important. We speak of the skill of a woodsman or of a hunter. By this we mean more than ease in walking, or ability to withstand exposure, or expertness in shooting. We mean that these experts have learned to ignore many things that would be attended to by the novice and have learned to respond to many things that the novice would ignore. Furthermore, they have learned to respond in a more satisfactory

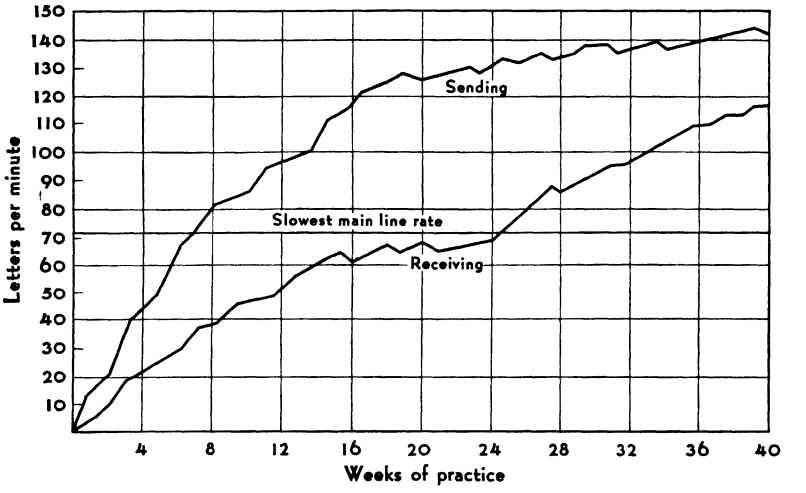


FIG. 61. LEARNING CURVES IN TELEGRAPHY

This graph is the product of one of the earliest and most influential experiments in learning. (From W. L. Bryan and N. Harter, "Studies in the Physiology and Psychology of the Telegraphic Language," *Psychol. Rev.*, IV, 1897, 27–53.)

way to those features of the situation to which they do pay attention.

These characteristics of learning extend to the lowest animals. If water is dropped upon an amoeba, it will, for a short time, make withdrawal movements. In time, however, it will cease to do so. It becomes negatively adapted to the harmless stimulation. In the same way, spiders will make a protective reaction when a tuning fork is sounded; but after the stimulation has been experienced a few times and nothing of consequence has followed, they become indifferent, or negatively adapted, to it.

Animals also learn to single out and respond to the important features of a situation. Thus, a cat placed in a cage may at first make random movements, strongly motivated by an impulse to get out. But after a number of trials, it ceases to act at random and concentrates its efforts on those parts of the cage that offer a real possibility of escape. Or a rat may be taught to respond positively to yellow and negatively to blue by rewards and punishment. In a similar manner, fish can be taught to react to the

brightest of three lamps, or to the least bright, or to the one of intermediate brightness.[13]

Some of the higher animals, such as chimpanzees, show considerable ability in eliminating irrelevant and useless action and in discovering the solution of a problem. They quickly learn that it is futile to attempt to squeeze through the bars of their cage, and they notice sticks or other things which they can use to attain their objective. Moreover, this last response, far from being a random act, apparently involves *insight* or the perception of the relation of means to end. According to Köhler, apes, when fruit is placed beyond their reach, give every sign of thinking; they sit down, scratch their heads, and look at the fruit from time to time. Then suddenly they may get up, reach for a stick, and use it as a tool to get the fruit.[14]

The changes that occur when we master intellectual subject matter, such as economics or psychology, are also readily observable. These correspond in general to those involved in becoming skillful. The beginning student of a science is apt to flounder. He gets, at first, only vague and unorganized meanings regarding the subject. As he progresses, however, bewilderment gives place to definite organization of facts, and he is able to present what he knows in a clear manner, neglecting many irrelevant bypaths that once attracted him.

Learning frequently leads to a closed mind — closed not only to irrelevant bypaths, but to important possibilities in one's field of study. This occurs even among well-trained scientists. For example, when Einstein first presented his theory of relativity, only a few physicists gave it serious consideration. Similarly, classical economists are apt to become negatively adapted to arguments for state control of economic activities. Financiers learn that certain types of investment are unsafe and, accordingly, avoid them, as the rat avoids the door which he has learned means punishment. The tendency to develop a closed mind should be recognized and guarded against. In mastering a subject, one should seek to maintain a balance between wasting one's time on irrelevancies and closing the mind to possibilities not congenial to one's initial assumptions.

The subjective changes that occur as a person learns are also easily observable. The feeling of uncertainty and bewilderment gives place to one of confidence and assurance. There is no

longer the strained attention involved in looking for meaning and clues to action. The significant elements and their implications have been discovered and are dealt with easily and efficiently. Confidence born of insight takes the place of uncertainty and of exploratory trial-and-error procedures.

(5) *Physiological changes in learning.* The physiological changes that occur when we learn can be described with less certainty. We may take for granted that any modification of our behavior, including that involved in learning, makes some impression on our bodies. But what these changes are we cannot say with any assurance. A theory that has been widely held is that all activity involves definite nervous arcs, which function more readily as a result of use. According to this view, there is a lessening of resistance between the neurones constituting a nervous arc. Two explanations of this supposed change have been advanced. One holds that the neurones constituting the nervous arc act something like an amoeba when it sends out its protuberances, and that the action takes place more readily the second time than the first. The other holds that the membrane encasing the vital nervous substance becomes more permeable with use and that this makes it easier for nervous energy to take one path rather than any other.

This theory is now being subjected to widespread criticism. It is attacked by anatomists and physiologists on the ground that no definite part of the brain seems necessary to the performance of any task. For example, Lashley has found that rats with any third of their occipital cortex destroyed will learn, in this state, to discriminate the brightness of lights as readily as they do when the cortex is intact. When a larger area is destroyed, he finds an impairment of the ability to discriminate. By experimenting with all parts of the brain, destroying some parts in some rats and other parts in others, he has shown conclusively that no particular nerve pattern is essential. More striking yet are his experiments regarding the acquisition of motor skill. Rats having, on the average, one third of their cortex destroyed are found to learn a complicated motor act even more readily than normal rats.[15]

Both Lashley and Franz have found that the frontal areas of the cortex are involved in learning but that other areas of the brain take over the task of performing the act after it has been

learned. In other words, the nervous arcs which are first involved, instead of performing the act more and more automatically, become less and less necessary for its performance. This is in direct opposition to the view that learning is due to nerve paths becoming increasingly permeable with use.[16]

Neither do serious disturbances in the lower centers of the nervous system make learning impossible. Ingebritsen reports that maze learning in rats occurs without retardation in spite of severe and distributed lesions in the spinal cord.[17] An experiment of Wheeler and Perkins casts further doubt on the theory that learning involves the strengthening of specific nervous arcs. They found that the goldfish readily learns to choose from among three lights the one of medium intensity. If the lights in an experiment are all increased or decreased in brightness, the fish will still swim to the one of medium intensity, although this one is of a certain brightness which it has previously been taught to avoid.[18]

Studies such as those just reported support our general point of view that an individual behaves and learns as a total organism. Common-sense observations indicate the same. A person who for years has been a constant smoker may quickly break the habit when told by his physician that he has a bad heart. Clearly, such behavior must be accounted for in terms of the personality as a whole, not in terms of individual nervous arcs. That we learn as a whole and not as an assemblage of parts may be inferred also from the fact that, having learned to write with one hand, we can then write, at least after a fashion, with the other. Or, having learned to recognize a picture with one eye, we can recognize it with the other. Finally, the fact that many organisms do not have nervous systems and yet are capable of learning should warn us against assuming that the physiological changes involved in learning consist wholly of changes in the nervous system. Blood cells, as a result of conflict with enemies of the body, become more efficient in dealing with them. Muscles, too, are modifiable, and the changes that occur in them from exercise may well be regarded as constituting important physiological bases of learning. In brief, we must say that we do not know just what the physiological changes are which occur when we learn, though the more we discover about the changes, the more apparent it becomes that we learn as a whole rather than as an assemblage of parts.

HABITS

Acquired ways of thinking, feeling, or acting are habits. A person may acquire the habit of thinking before acting. In the realm of feeling, one person may habitually look on the bright side of things, and his affective states may be constantly pleasant; while another may acquire the habit of looking on the gloomy side of life. In our motor activity we assume certain ways of walking and dressing, certain gestures and peculiarities of carriage. We cultivate habits of politeness, of eating at certain times, and of speaking with a certain accent.

Usually we think of habits as specific and stereotyped responses, but these characteristics are not necessary. For example, a person who constantly meets the suggestions of his friends with countersuggestions acts in accordance with a habit, though his countersuggestions, in the very nature of the case, cannot be stereotyped. Another person may have the habit of thinking over carefully suggestions made to him. Obviously, this again cannot be a stereotyped response except in a most abstract sense.

The importance of habits is hard to overestimate. The Duke of Wellington is reported to have said, "Habit is ten times nature." When we think of the effect of discipline on soldiers under fire, we are inclined to agree, though we must take exception to the Duke's statement in so far as it implies that habits and nature are opposed. They are really partners, each relying on the other. Habits are the ways we have found to satisfy our needs. Through them we simplify our lives and gain time for thinking about new problems. The business man who has acquired the habit of not considering investments that offer too large a return has a habit which saves valuable time for the consideration of safer investments. The writer who has reduced typing to a habit is free to give all attention to thinking about what he is to write. So with more specific acts. We do not have to consider whether we shall go to our work or not. Such decisions we have reduced to habits. Nor do we have to think how to put on our clothes, tie our shoes, or button our shirts. If we did not relegate such activities to a more or less automatic level, we should be so lost in the details of living that there would be little opportunity for further growth and development.

Popular thought — and many psychologists too — has overemphasized the importance of repetition in habit formation. Repetition is only one factor, and usually a minor one, in the formation of habits. Unless some satisfaction is found in acting in a certain way, repetition will not make a habit. On the contrary, repetition may cause a counterhabit. Some adults, for example, dislike music because as children they were forced to practice on the piano. A little girl does not necessarily develop a habit of keeping her playthings neatly arranged, even though her mother requires her day after day to set them in order. But she is very likely to develop a habit of asking for candy when her father comes into the room after she has been given candy by him only once. To develop the habit of keeping her playthings in order, the child must get some satisfaction in so doing. Perhaps parental approval will give her this satisfaction; perhaps a love of order may be awakened in her. With proper motivation the habit is acquired quickly, but not without.

Though formed as a means of gaining satisfaction, habits become so automatic that they are performed without conscious direction. To act in the habitual way is to act in the easiest way. A person who carries a watch in his left pocket finds it hard to look for it in his right. Other habits are hard to break because they are satisfying. A person who ordinarily leaves his room in order finds it hard not to do so because that habit is satisfying to him and because he would be uncomfortable if the room were untidy. A person may find it hard to stop smoking or drinking because these habits are so satisfying to him.

Some people habitually jerk their heads, pucker their foreheads, make their nostrils tremble, or pull their mouths sideways. Such activities are called *tics*. When they are not caused by structural defects, they may properly be called habits. They are ways the individual has found of relieving some tension. If such spasmodic movements are prevented by bandages, similar twitchings are apt to break out in other muscles — which, incidentally, is additional proof that behavior cannot be explained in terms of the specific nervous arcs involved. Though these twitchings occur without conscious direction, they are of mental origin. Usually they are brought about by some repression or anxiety; they are ways of escaping from something disagreeable. Psychopathologists, in dealing with such cases, seek to unearth the repression

and thereby help the sufferer to find a more satisfactory way of relieving the tension.

Sometimes tics and nervous habits may persist after the tension that gave rise to them has been relieved. This has been demonstrated in the case of rabbits. The ear of a rabbit was blistered by means of a chemical, and the rabbit began to scratch the sore ear. The rabbit continued to scratch the ear, however, after the sore had completely healed.[19] A similar sequence has been observed in children. They may develop the habit of moistening chapped lips with the tongue and continue the practice after the lips are well.

It is common knowledge that some habits are desirable and some undesirable. Some make for development; some stunt development. For this reason great importance is attached to the formation of desirable habits and the elimination of undesirable ones. If you feel that a certain habit should be eliminated, one of the best ways to accomplish this is to substitute another habit for the one to be broken. If you wish to break a baby of the habit of going to sleep with its bottle, take the bottle away and substitute soothing music. If you wish to break yourself of the habit of smoking, have a package of Life Savers handy. Whenever possible, learn what satisfaction is derived from the old habit and discover a more desirable way of fulfilling this desire. The motive back of grouchiness may be a wish for social attention; if so, the attention could be gained better by being cheerful and kind. If a desirable outlet for the interest in question cannot be found, cultivate another interest in order that the old one may fade.[20]

MOTIVATION AND LEARNING

Uneducated people and children sometimes say, "She learned me all I know about reading." If learning were a passive process, we could perhaps "learn" another. Since learning, however, is an active process, we can only teach another; and our problem is to get the person we are trying to teach sufficiently interested to perform the acts necessary for learning.

That the person who is motivated works at a higher level of intensity and learns more rapidly than the indifferent one has been well shown by Book and Norvell. They directed two

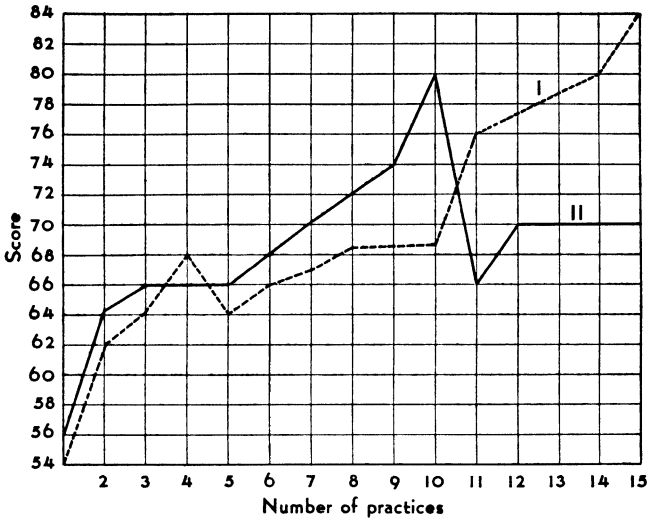


FIG. 62. HOW KNOWLEDGE OF RESULTS AFFECTS PERFORMANCE IN MENTAL MULTIPLICATION

Until the tenth practice the group represented by the solid line was kept informed of results, the dotted-line group working "in the dark." On the eleventh practice the conditions were reversed. Note the immediate change in accomplishment. (From W. F. Book and L. Norvell, "The Will to Learn," *Ped. Sem.*, XXIX, 1922, 305–62.)

groups, one experimental and one control, to learn a code, to multiply figures mentally, and to perform other simple tasks. The members of the experimental group were asked to watch the records of their progress and to attempt, at each practice period, to make a high score. The members of the control group, on the other hand, were not informed of their progress. According to the results of the study, the experimental group showed greater improvement than the control group in accuracy and speed. When the conditions were reversed, however, the control group being given the incentive and the experimental group deprived of it, the former suddenly spurted ahead, while the latter's gain declined rapidly.[21] The results of this study are shown graphically in Figure 62.

Similar results were reported by Panlasigui and Knight, who found that sixth-grade children studying arithmetic over a period of weeks showed definitely greater progress when told of their

achievement than when not so informed. It was also observed that knowledge of results was a more powerful motivating factor with good than with poor pupils.[22] The maxim, "Nothing succeeds like success," is sound pedagogy. Adults also improve when they are stimulated to put forth more effort, as when given a bonus for excellent or rapid work.[23]

Experiments on animals show similar results. A motivated rat or dog learns faster than one not motivated. The hungry rat learns, as we have already seen, faster than the well-fed one. When punished for false moves and rewarded for successful ones, rats learn faster than when one motive only is used.

Motives may be divided into two classes: intrinsic and extrinsic. Intrinsic motives are those that arise from interest in an activity itself. Extrinsic motives are those that come from interest in the effects of an activity. Intrinsic motives grow more or less directly out of our instinctive or innate purposes. Illustrations of these are our desire for food, our interest in the opposite sex, in being appreciated and understood, and in overcoming rivals. An illustration of an extrinsic motive is the interest we take in our work not because it is interesting in itself, but because it provides us with food and social approval. Another example is the desire of a student to obtain high grades because his father has promised him a car if he does well in his college work. Extrinsic motives are common and powerful. The interest of students in their school work frequently arises from the fact that they hope it will help them to gain things they really desire, such as wealth and power.

Much of our motivation is of the extrinsic sort. In the old type of school this was the chief kind of motivation. The child was made to study in order to avoid punishment. Today more reliance is placed on the child's desire to win the approval of his teachers and parents, and to have his name on the honor roll. But for such motivation our best teachers are substituting, whenever possible, incentives of a more intrinsic nature. This is done by creating problems in the mind of the child and by appealing to his curiosity and his desire for mastery. Motivation of this sort is far more efficient for learning than that based on extrinsic considerations; for such motivation is, as we have already pointed out, the basis of effortless attention. Moreover, appeals to intrinsic motives are less likely to discourage a child if he does not

do as well as another, and less likely to inflate unduly the ego of others if they easily surpass their classmates. These incentives are, therefore, more conducive to emotional health and desirable social attitudes.

Good use has been made of biographies and other forms of literature in motivating the child. A few years ago the wholesale advertising of the exploits of Lindbergh and Byrd aroused in many boys a real interest in aviation. Much use has also been made of group loyalty in stimulating interest in various things. This has been especially true of intercollegiate athletic contests, and, to a lesser degree, of intercollegiate speaking and journalistic contests. In all such cases the psychological situation is so arranged that the desired interest emerges from it.

Advertisers use the same principle in their attempts to teach people to ask for their particular products. Every effort is made by suggestion and repeated claims to create a demand for a commodity. Cigarettes are associated with sex charm and assured social position. Any young woman can win social prominence by smoking Old Golds. An easy way to possess a perfect figure is to wear a Jantzen bathing suit. Listerine, as the eliminator of halitosis, has been presented as the key to social popularity. The advertisers of soap find in B.O. (body odor), and the advertisers of clothes in P.A. (personal appearance), the determiners of success and social standing. By associating their wares with deep-seated desires and by presenting them in pleasant situations, manufacturers have made it easy for people to learn the name of their brands and to ask for them.

ECONOMICAL LEARNING

How can skills, like dancing or tennis, or an understanding of a subject, like a knowledge of economics, be acquired with the least expenditure of time and energy? Though the methods of acquiring a skill are, in some respects, different for those employed in acquiring mastery of a subject, they have much in common. In considering the methods of economical learning, we shall consider first the principles that are common to both kinds of learning.

(1) *Strong motivation*, as explained in the preceding section, makes for efficiency in learning.

(2) *Proper direction of attention*, as stated in the preceding chapter, makes for economical learning.

(3) *Sufficient maturation* is a favorable condition for learning. A baby, if encouraged by its parents, may learn to walk a little earlier than otherwise; but were the parents to wait a week, the baby would walk by itself. Similarly, a child of seven may memorize the multiplication table, but it will be easier for him at eight. We mature gradually, and not until we are in our late teens do we attain full capacity to learn.

(4) *An appropriate physical condition* facilitates learning. It is a mistake to make oneself too comfortable when studying, for complete physical relaxation is more favorable for sleeping than for learning. This is shown by the experiment of Elliott and Treat, proving that hungry rats learn more readily than those that are not hungry, and the experiment of Wada, indicating that human subjects when hungry do better on intelligence tests than when not hungry. (See page 41.) Further evidence of this fact is provided by an investigation of Bills, who found that subjects who toned up their muscles by mildly squeezing some object learned more rapidly than those who did not. Too much pressure was, of course, found undesirable.[24] In general, a certain amount of physical tension rather than complete bodily relaxation is recommended for efficient learning.

(5) *Spaced periods of practice* are more economical than unspaced periods. This means that if you have to learn an assignment, it will be better to study it a short time on several days than to attempt to learn it at one sitting. The advantage of distributed periods of study is shown in Figure 63. Though the children in this experiment had the same actual amounts of practice, those who distributed their learning surpassed in achievement the ones whose learning was more concentrated.

The explanation of the advantage of distributed periods of study over undistributed periods is that a mental process, once started, continues even though our attention is directed to other things. This is especially true if the final goal has not been attained. This has been made clear by an experiment of Lewin. Lewin gave a group of learners various tasks. Some he interrupted before they had finished; others were permitted to complete the work. Those who were interrupted remembered a great deal more than those who were permitted to finish.[25] These re-

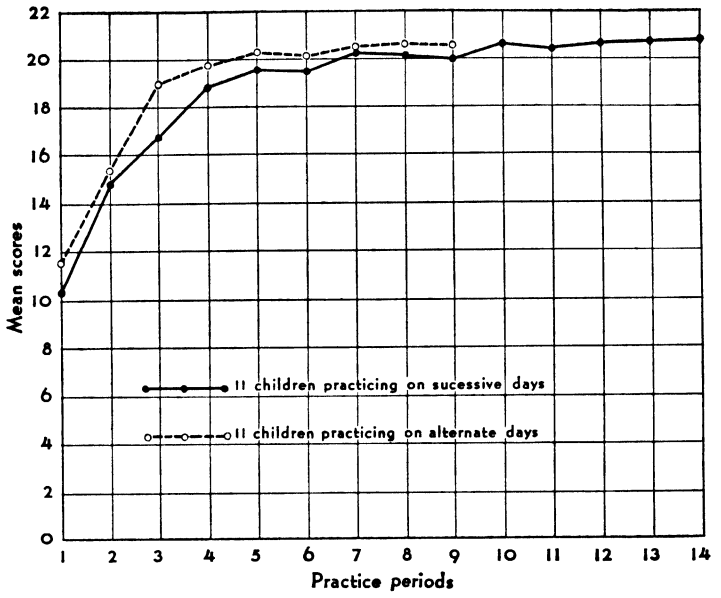


FIG. 63. THE EFFECT UPON LEARNING OF SPACED PRACTICE PERIODS

Spaced practices are in general more economical than unspaced practices. (After Kirkwood, from Joseph Peterson, "Learning in Children" in *Handbook of Child Psychology*, ed. C. Murchison, Clark University Press, 1931, p. 351.)

sults show that once we accept a task, there persists a state of mental tension until it is finished; whereas when a task is finished, we mark it "finished" and proceed to forget it. (For this reason, some universities give students comprehensive examinations before they graduate.) When periods of study are distributed, mental tension persists between them; we learn not only during the periods of study, but also during the intervals. Moreover, the interval between study periods gives an opportunity for growth. By approaching a task after an interval, we approach it with a new mental background and thus can increase the number of associations we make between the new and what we already know. In this way, the process of assimilation is hastened. Finally, a period of rest between periods of learning prevents fatigue.

Though it is well known that short study or practice periods are more efficient than long periods, there is a period for optimum efficiency, and there is just as much danger in making study periods too short as in making them too long. The student who puts aside his studies when the first discomfort or fatigue appears does little to develop mental stamina, or even to get his second wind. Experiments show that we learn more readily by distributing our periods of study; they do not show that a person interested in improving his efficiency should never work when fatigued.

As might be expected, different skills have different optimum periods of practice. In general, the less fatiguing the task and the greater the interest in it, the longer may be the period of practice or learning without loss of efficiency. For drill in adding numbers, Reed states that for average subjects the optimum period is from ten to twenty minutes, and that either of these periods gives more efficient results than work periods of one hour.[26] Obviously, however, it would not be wise to study assignments in history for such short periods.

(6) *Proper duration of rest periods.* The optimum duration for the rest between work periods has also been studied experimentally. McClatchy found that the optimum varies with the amount of learning which has already taken place. Shorter rest periods are advised early in the learning process and longer periods later.[27]

A common experience in learning is that after a period of satisfactory progress there comes an interval of little apparent improvement. Such periods of no progress are called *plateaus;* for if the progress of learning is represented graphically by a line, the period of no progress will be level. Many theories have been advanced to explain the plateau and to eliminate it. When the plateau appears, it causes still further retardation; for whatever may have been its original cause, its effect is to discourage the learner by necessitating humdrum repetition and preventing steady advance. Thus it stimulates factors which prolong it.

One important characteristic of the plateau is that it is found much more frequently in complex than in simple skills. Batson has reported experiments which tend to show that in a complex skill, where improvement cannot be observed until *several* specific skills are mastered, the plateau appears while these component skills are being mastered.[28] Thus in telegraphy, one will

show improvement while he is learning the individual letters; but having learned them, he must practice a long time without apparent improvement, while he masters the word and phrase units. If one is aware of this fact, he is not so likely to "let down" when a plateau in his learning is reached; for he will realize that improvement is still taking place, even though it does not show in the objective performance.

It has also been found that plateaus can be greatly reduced by a proper distribution of work and rest periods. The chief value of the rest periods, according to Wheeler, is that they give the subject time to assimilate thoroughly what has been learned. They also prevent fatigue and lack of interest.[29] An important part of the science of teaching is to determine the optimum work period for various subjects and various pupils, so as to have all work done under the conditions of greatest efficiency.

The foregoing methods of economical learning apply to acquiring both skill and understanding; the two following methods are especially applicable to acquiring understanding and information.

(7) *Organize the material* to be learned into large units and study it as a whole. By so doing you reduce the material to a few meaningful units, each one of which is as easily learned as its component parts would be if taken separately. For instance, it is as easy to learn the names of half a dozen familiar cities as it is six letters taken at random, though each of the names may contain six or more letters.

The reader may readily discover for himself the value of grouping material into meaningful wholes by memorizing the following lists of words:

niv	fox	sun
feb	book	warm
paz	sour	sand
yoz	kin	wave
lak	hat	boy
zig	glove	call

The first list of words (nonsense syllables) cannot be grasped as a meaningful whole. The second has much more meaning. The third creates a meaningful picture which can be comprehended as a whole and is, therefore, still more readily memorized.

By learning things as wholes, we better understand the meaning

of the material and, in consequence, see how the different parts fit into a general plan. We also avoid the labor of fitting together, in a separate operation, parts which have been learned independently of one another.

A disturbing factor in learning an assignment as a whole is the possible loss of confidence. This can be guarded against, however, if the learner realizes that he should not expect to recall the material perfectly with the first few readings. In practice, a modification of this method is usually advisable. No long assignment is equally difficult throughout for every one. Since some parts are easier than others, it is a waste of time to study all parts equally. The sections which are most difficult should be given extra study with each reading. Moreover, the student should keep in mind that by wholes we mean logical wholes. A whole is not necessarily a whole assignment. There may be in one lesson two or more logically complete systems of ideas. Each of these constitutes a whole. Also, in applying this method, the student should recognize that what one person may grasp as a whole, or comprehend as a meaningful unit, may be beyond the comprehension of another. The size of the wholes that can be grasped varies with intelligence and experience. Our principle therefore should be: Organize as much material as possible into a logical whole.

(8) *Active recitation* makes for economical learning. This means that more can be learned in a given study period if part of the time is spent in reciting or in trying to recite, than if all the time is used in reading. The amount of time that should be devoted to reciting varies with the material. If it is easy and meaningful, little time need be so spent; but if the material is difficult and has little meaning, more time should be given to recitation. This has been demonstrated by Gates, who gave to a group of subjects some easy biographical material and a list of nonsense syllables to study for nine minutes. Table XVIII gives the results.

The greater efficiency of active recitation over more or less passive reading is probably due, in part, to making the study more stimulating and strenuous. To know that one is going to recite does much to prevent passive reading. We are apt to acquire the habit of holding our books before our eyes as if our minds were photographic plates. Anything that can prevent such an attitude is helpful. Furthermore, active recitation makes the study more satisfying. We like to see what we have accomplished. As we

TABLE XVIII

HOW LEARNING IS IMPROVED BY DEVOTING PART OF STUDY TIME TO RECITATION [30]

Division of study time	*Sixteen nonsense syllables*		*Five short biographies (totaling about 170 words)*	
	Per cent remembered		*Per cent remembered*	
	Immediately	*After four hours*	*Immediately*	*After four hours*
All time devoted to reading	35	15	35	16
⅛ of time devoted to recitation	50	26	37	19
⅜ of time devoted to recitation	54	28	41	25
½ of time devoted to recitation	57	37	42	26
⅝ of time devoted to recitation	74	48	42	26

discover that we are mastering the assignment, our interest grows; with each sign of progress, we experience a feeling of satisfaction. In this private active recitation we also are practicing what we are preparing to do, since we study our lessons with the idea of eventually reciting them. Finally, active recitation encourages us to look at the material from various angles, and hence we make many associations which will help us to recall the material when it is asked for. Many students after practically committing an assignment to memory have failed to recite well because they did not make the right associations between the material and the questions of the instructor.

The importance of sound habits and methods of studying has been clearly shown by Wrenn and McKeown. At Stanford University these men found that of 220 students who were equal on intelligence tests and who were paired in their major studies, 110 were in the highest 10 per cent of the university with respect to scholarship and 110 were in the lowest 20 per cent. Since the difference in scholastic standing was not caused by differences in intelligence or in major subjects, the elimination of these two determinants of scholastic grades suggests that the two groups em-

ployed different methods of studying. When questionnaires were submitted to them, it was found, as expected, that their habits of studying, their methods of taking notes, and their attitudes on examinations differed significantly. The results of this investigation have been embodied in a convenient test which makes it possible for a student to learn whether he is studying as the best or as the poorest students do.[31]

DRILL

Much emphasis has been placed in recent years upon the deadening effect of drill and upon the importance of looking for logical relations. Yet it is doubtful whether great skill can be acquired without drill. Think for a moment of the great football or baseball heroes or of golf champions. Bennie Freedman, a former Michigan star, is said to have practiced throwing the forward pass all summer. Sam White of Princeton is said to have practiced bouncing the ball for years. It is said of one of our good golf players that when he began the game, he was taught by a professional who saw to it that he spent many hours drilling alternately with his right arm and with his left. He was more than once tempted to give up, but he stuck; and, as a result, he is now able to drive 250 yards time after time.

Drill is helpful in attaining mastery of any task that requires repeated performance, whether mental or motor. Proficiency in mathematics depends on being able to add and multiply rapidly. No one would expect children to acquire these fundamental processes without much practice and drill. Similarly, in grammar and English composition, the student profits by being drilled in the fundamentals until they become second nature. Teachers of foreign languages recognize this principle and make greater use of it than English teachers do. No matter how efficiently we may distribute our periods of practice or study or how strongly motivated we may be, the backbone of much learning is drill. The student who refuses to master fundamental tools through long-continued drill lays up for himself a lifelong handicap. It is well to make use of every short cut and easy method of learning, and we should not forget that humdrum drill may do as much harm as good. At the same time, for many purposes nothing can remove the necessity for thoughtful, intelligent drill.

CRAMMING

By cramming is meant brief periods of intensive study, such as a debater may give to his subject before a debate, or a student to his courses immediately before an examination. Such periods of study are of greatest value to the good student who has studied the assignments regularly. They give him another review, and therefore make for overlearning which, in turn, causes better retention of the material. When material has been studied until mastery is just reached, further effort seems, at the time, to be unnecessary. Yet we know that forgetting begins immediately and that if we wish to retain material for any period of time, it is necessary to overlearn it. *Overlearning* may be defined as learning which is over and above the amount necessary for mastery. It is absolutely essential if we wish to retain material for any length of time. Cramming is an excellent means of overlearning, assuming of course that the material has been already learned before it is crammed. Cramming also gives the student a bird's-eye view of a course, and hence a better understanding of its organization. Perhaps the poor student derives some of these advantages also, though there is a danger that he will be confused by the mass of material.

Though cramming offers the greatest benefit to the good student, it may also do him the greatest harm. Good students, that is, quick learners, can learn enough to pass most courses given in colleges and universities by attending the classes and by cramming in the last few days before the examination. Some are tempted to do so. They get their credit, but they fail to learn what they should, and even the knowledge they display on the examination does not remain with them. The laws of the economy of learning apply not merely to acquiring a mastery which will make immediate recall possible; they apply also to the permanent retention of what is learned. Material is retained best if it is learned in accordance with these laws. Recitation, distributed periods of work, and attack on logical wholes will give long-term results. In cramming, full advantage cannot be taken of these methods. Consequently, material gained from periods of cramming is not retained as well as material reflected upon and viewed, as the course develops, from various points of view.

In spite of all that has been said, however, the ability to cram

is one that should be cultivated. A debater needs to work up his subject quickly. So does a lawyer. A patent attorney must learn much about related inventions as well as about the one for which he seeks patents, in order to show that a patent should be granted. Obviously this must be done quickly, and, on the other hand, there is no need of retaining the knowledge thus hurriedly obtained. Cramming, in such cases, fits the need in every respect. Moreover, cramming, by requiring full use of one's mental powers, reveals what one can do.

THE TRANSFER OF TRAINING

Does acquiring one skill make it easier to learn another? Does knowing how to swim help one in learning to shoot baskets? Or does a knowledge of Latin help in learning bookkeeping? Forty years ago, the theory of transfer of training from one skill or mental operation to another was widely accepted. Students were universally required to study Latin, Greek, and mathematics on the ground that training in these subjects improved memory and reasoning. The practice was called formal discipline. It was believed that if a student of Latin later became an insurance salesman, he would be able to memorize premium rates and scales more easily because of his training in memorizing conjugations and declensions, and that in business generally he would be able to exercise better commercial judgment because his "power of reasoning" had been improved by higher mathematics.

(1) *Thorndike's experiments.* It is now known that little, if any, of this kind of transfer occurs. The first doubt arose from an extended and important series of experiments conducted by Thorndike and Woodworth about thirty-five years ago. They trained subjects in a number of simple mental tasks, such as estimating areas and lengths, and they measured the improvement caused by such training, in performing other simple tasks which had not been practiced. Their experiments showed little, if any, improvement in the unpracticed tasks. Thorndike later investigated, in another series of experiments, the effect of subjects actually studied in school. In this work he measured the general transfer effect of a number of studies. He considered not only those which were traditionally supposed to have great transfer effects, such as Latin and mathematics, but also those which were commonly thought

to have little general value, such as typewriting and bookkeeping. These experiments were epoch-making. Quoting from Garrett's summary of this work: "Mathematics, including bookkeeping and arithmetic, proved to have the greatest training effect, with general science, physics, and chemistry close seconds. Latin was inferior to mathematics and science, about equal to French, and superior to economics, sewing, stenography, manual training, and dramatic art. In general, these last-named subjects showed negative transfer — a loss in final score rather than a gain. The traditional view that Latin is the subject *par excellence* for training one to reason or think is hardly borne out by these findings." [32] Thorndike writes as follows in summary of his own work: "The expectation of any large difference in general improvement of the mind from one study rather than another seems doomed to disappointment. The chief reason why good thinkers seem superficially to have been made such by having taken certain school studies is that good thinkers have taken such studies, becoming better by the inherent tendency of the good to gain more than the poor from any study. When the good thinkers studied Greek and Latin, these studies seemed to make good thinking. . . . If the abler pupils should all study Physical Education and Dramatic Art, these subjects would seem to make good thinkers." [33]

Scores of experimental studies have been carried on in this field since the pioneer work of Thorndike. Examples which may be cited are the studies of Van Alstyne, which showed that there is little transfer from one type of reading to another; [34] and of Rice, which showed practically no transfer in eye-hand coördination from one task to another.[35] A conclusion somewhat opposed to the view of Thorndike is that of Brooks, who found only a slight relation between amount of transfer and general intelligence.[36]

(2) *The concept of identical elements.* These studies, although largely negative in their results, nevertheless indicate that in some cases there is a real, though usually a small, transfer of training from one subject to another. The explanation of such transfer, when it exists, may be found in the elements or methods of study which are common to both subjects. If one acquires certain multiplication facts while learning long division, these facts will be available when needed later in the study of square roots. A transfer of ability from long division to finding square roots will

take place because of the element common to both subjects. We speak of this type of transfer as due to *identical elements*. In a similar manner, if while studying Latin one learns certain methods of committing conjugations to memory, he will no doubt find the same methods helpful in learning French and Spanish. Methods of study often have transfer value, particularly in relation to subjects of a similar nature, such as the various foreign languages. We conclude from these studies that transfer between two subjects takes place to the extent that the subjects either contain identical elements or are susceptible of efficient learning by common methods of study.

These two general principles — identical elements and identical methods — account for the cumulative effect of learning, for the fact that the more we know, the easier it is to learn related things.[37] Knowing how to play five hundred is a help in learning to play contract bridge. The knowledge of mathematics makes easier the mastery of chemistry and physics. After a person has taken a few courses in a subject, he finds others in the same subject easier. The information and understanding already acquired serve as grappling hooks to seize the new and to make it intelligible. Similarly, in motor skills, the muscular control acquired in one field is extended to new ones.

Since what we know aids us in acquiring additional knowledge, it should be possible to control the order of one's experience so that learning can proceed with the minimum of effort. To do this should be a guiding principle in arranging the school curriculum. Presenting a subject so that one division of its study paves the way for another has been called *pacing*. The value of such pacing rests upon the transfer of identical elements in what is learned as well as upon the maturation of the individual. Pacing is described by Wheeler as follows:

> We shall think of pacing as gradually giving the child more and more complex tasks to perform as he grows and matures. The increase in difficulty of problems should not at any time be faster than the child's rate of maturation, otherwise repeated failures lead the child to develop undesirable habits of work and unhealthy emotional attitudes. Once he masters a task of a given difficulty he should not be presented with another and more difficult task until a recess period has elapsed during which he may have a time to grow to the more difficult situation.[38]

Another type of transfer of training that is found in certain cases is *negative transfer.* This occurs when practice in one skill diminishes one's ability in another. After extensive practice in crossing out each letter *e* which appears on a printed page, one will be less skillful in crossing out some other letter than if he had had no practice at all. In general, skills which may interfere with each other involve negative transfer.

LEARNING BY TRIAL AND ERROR AND BY INSIGHT

Sometimes we seem to learn by random and blind efforts and sometimes by insight, or a knowledge of relations. The former occurs when we cannot associate the correct response with the problem situation. A rat in a new maze will go down the right and wrong alleys indiscriminately. All alleys look alike until the animal has run the maze enough times to associate certain turns with obtaining food. In such a situation, we say, learning takes place by trial and error. Nor is this type of learning limited to rats in a maze. One has only to observe himself looking several times in the same drawer for a mislaid article to realize that trial-and-error behavior characterizes human beings as well as animals. On the other hand, if one has sufficient knowledge of the factors involved, trial-and-error behavior is frequently unnecessary and learning proceeds by the more efficient process of trying those methods which are seen to have a relation to the solution. Such learning, we say, proceeds by insight. Insight may be defined as awareness of the consequences of performing an act.

Insight depends upon past experiences of a similar nature, upon the presentation of the factors of the problem in a manner clear enough for the individual to grasp, and upon the capacity of the individual to perceive the causal relations which he experiences. A rat running a maze for the first time has no past experience which tells him that the alley to the right will take him to food and the one to the left into a *cul de sac.* Both alleys look alike. His only option is to try one alley, and, if that is unsuccessful, to try the other. A human being in a similar maze would do exactly the same. Without past experience or a sufficient view of the maze to see the end of the *cul de sac* before entering it, there can be no possibility of "insightful" behavior. But in a maze where the end of the *cul de sac* is plainly visible, a rat will still take the

wrong pathway in many of the trials, while the human being will avoid it from the outset. Here we have an example of difference in ability to comprehend the factors of a problem when they are presented.

There may, of course, be *achievement* without any learning at all, as when a person tinkers with a mechanical puzzle until he solves it, only to find that as much time is required for a second solution as for the first. Mere trial and error is more likely to result in achievement than in learning or increased proficiency. So true is this that some psychologists claim that there is no learning without some insight.[39] We are not prepared to make this claim; for, though insight clearly facilitates learning, yet a number of situations have been observed where a person has apparently learned something and yet has not been able to state the relationships he has consciously experienced. This is illustrated in learning by the conditioned response. When one becomes conditioned so that he gives the psychogalvanic response to a click, learning has certainly taken place, though the subject is unaware of the significance of the click and does not even suspect a change in the electrical resistance of his skin.[40] At a higher level, learning without insight has been demonstrated by an ingenious experiment of Thorndike and Rock. They showed that subjects taking a free-association test and stimulated by a money bonus will learn to give responses which follow a certain principle of selection, even though the subjects do not try to learn the principle in question and are unaware of its existence after it has been acted upon.[41]

A plausible interpretation of nervous habits and of even more serious mental disorders has also been given in terms of blind trial and error.[42] Let us suppose that an individual has been made tense by failure to make a satisfactory adjustment. Perhaps he is failing in his school work and is afraid that he will be punished by his father. Being unable to resolve the tension in a constructive way, he may find an outlet to his nervousness in biting his nails or in some other equally senseless act. The activity, however, provides some relief and is continued. Yet the boy need have no insight into his activity. When the state of nervous tension is removed, the habit tends to disappear. It may continue, however, as a mere habit; and if it does, insight into its cause will be helpful to the sufferer.

We may conclude from these experiments that learning may

take place without conscious insight on the part of the learner. At the same time, the importance of insight should not be minimized. While learning *may* take place without a knowledge of the factors and relations involved, it proceeds far more readily when these factors are known to the learner. In the free-association experiment of Thorndike and Rock, the learning would undoubtedly have been more rapid had the principle been pointed out to the subjects. Here lies the function of the teacher, the athletic coach, and the play director. Their job is to help the learner obtain greater insight into the process that is to be learned.

SUMMARY

Learning is any modification of behavior that results from bodily or mental activity. One of the chief distinguishing characteristics of man, as compared with lower forms of life, is an outstanding ability to learn and a greater dependence upon learned activities. Many simple types of activity, such as reflexes, are present before learning takes place, and part of the job of learning consists in modifying and elaborating these simple responses. A number of activities are made possible by the ordinary growth of the organism. These activities are due to maturation or organic growth, and are not dependent upon exercise.

The exact physiological changes that occur when we learn are not definitely known, but we do know that the process is more complex than the strengthening and weakening of specific nerve pathways. Learning involves the selection of certain aspects of a stimulus situation and a response of the organism to these significant features. Habits are learned ways of acting which satisfy the organism. Habits which are momentarily satisfying but unsatisfying in the long run are spoken of as "bad habits." Several aids in "unlearning" or "breaking" such habits can be suggested: substitute another habit for the one to be broken; find, if possible, a more desirable way of expressing the drive behind a habit; and cultivate new interests to supplant the one for which no satisfactory outlet can be found.

Learning takes place slowly, if at all, unless a satisfying state of affairs is attached to the new response. We speak of this process as motivation. Motivation may be extrinsic or intrinsic. In extrinsic motivation, an external reward is attached to an activity,

as the reward of grades, prizes, or honors to the activity of study. In intrinsic motivation, satisfaction is gained from the activity itself, as the pleasure which comes from a job well done. The latter type is more enduring and usually more efficient. Moreover, it does not produce the undesirable tension so frequently caused by such extrinsic motives as rivalry and working for approval.

There are numerous ways of increasing the efficiency of learning — for learning in general, the following: (1) strong motivation; (2) direction of attention to significant aspects of things to be learned; (3) time enough for sufficient maturation before learning begins; (4) a mildly tense physical condition; (5) spaced periods of practice; and (6) proper length of rest pauses — for understanding and acquiring information, in particular, two more: (7) organization of material in large units; and (8) recitation while learning.

Plateaus in the learning curve are periods when continued practice does not result in any apparent improvement. The presence of a plateau accentuates fatigue and lack of interest so that a circular process is set up, which, once under way, is difficult to stop. Plateaus may frequently be shortened and motivation maintained during their presence if the learner appreciates that improvement is taking place even though it is not apparent. Proper spacing of practice periods is also effective in this respect.

Although drill of a blind and repetitive kind will not produce much learning, nevertheless the rôle of drill should not be minimized. The development of a skill by practice reduces many elements of the final skill to a semi-reflex level and thus frees resources of the organism for further improvement. Cramming is an excellent way to review, but a poor way to learn originally. The transfer of training from one skill or field of knowledge to another takes place to the extent that the two skills or fields of knowledge contain identical elements or methods.

Learning may proceed either by trial and error or through a conscious perception of the relations which a problem involves. Learning by the latter method is more efficient. It is present when the learner (1) applies his past experience to a problem, (2) perceives the significant aspects of a problem, and (3) has the capacity to associate the right response with the solution. Learning by trial and error may take place when these conditions are lacking.

Such learning seems to be responsible for many nervous habits and even for more serious forms of maladjustment.

QUESTIONS ON THE CHAPTER

1. What is empathy? How is it related to learning?
2. How does learning differ from maturation?
3. Summarize the experiments of Carmichael and Bird on maturation.
4. What are some of the main changes that occur when we learn?
5. What is a habit? How does it differ from a reflex?
6. What aids may we use in changing or breaking a habit?
7. Define and give instances of extrinsic and intrinsic motivation.
8. List and describe the means of making learning more efficient.
9. What is a plateau? What is its cause and its effect?
10. In learning information and gaining understanding, what principles are helpful?
11. What are the values and dangers of drill?
12. What are the values and dangers of cramming?
13. What is meant by the "transfer of training"? What is shown by the experiments on this subject?
14. Compare trial and error with insightful learning. What are the main differences?
15. Does achievement always mean learning? Explain your answer.

QUESTIONS FOR DISCUSSION

1. What part do maturation and learning play in the following activities: (a) the first walking of an infant, (b) an adolescent's first love, (c) your own work on a problem in algebra?
2. What is conditioning? Reconditioning? Give an example of each.
3. Can you cite an instance of some one's "breaking a habit over night"? What light does your answer throw on the nature of habit?
4. What makes a habit good or bad?
5. What light do the experiments of Franz and Lashley shed on the notions of phrenology discussed in Chapter V?
6. Give some cases where the ability to cram may be of great value.
7. How are present elementary and high schools influenced by the doctrine of transfer of training, or formal discipline?
8. Do you see any relation between "insight" and the "transfer of training"?
9. Can you cite instances of trial-and-error behavior in yourself?

SUGGESTED READINGS

J. F. Dashiell, *Fundamentals of General Psychology* (Houghton Mifflin Company, 1937), Chapter XIV. A good discussion of motivation and the general principles of learning.

H. E. Garrett, *Great Experiments in Psychology* (revised and enlarged; D. Appleton-Century Company, 1941), Chapter V. A very readable account of Pavlov's experiments on the conditioned reflex. Chapter VII gives an excellent account of Thorndike's experiments on learning in animals and how they resulted in the "laws of learning."

R. S. Woodworth, *Psychology* (4th edition; Henry Holt and Company, 1940), Chapter IX. Another interesting discussion of human and animal learning.

MORE ADVANCED READINGS

E. R. Hilgard and D. G. Marquis, *Conditioning and Learning* (D. Appleton-Century Company, 1940).

W. Köhler, *The Mentality of Apes* (Harcourt, Brace and Company, 1926). An interesting account of learning and problem-solving in apes.

E. L. Thorndike, *Human Learning* (The Century Company, 1931). A penetrating account of learning by a recognized authority on the subject.

CHAPTER ELEVEN

Memory: How We Retain the Past and Are Influenced by It

MUCH of our life is spent in the past — in reliving experiences we had an hour ago, or last year, or during childhood. Still larger parts of our life are indirectly influenced by the past. Habits, skills, knowledge, information, personality — all these could not be as they are if the past had no effect upon us. To be affected by the past, to learn and to remember, are characteristic of all living organisms, but they are particularly important characteristics of man.

Memory and learning are closely akin. There can be no learning without memory, and learning is the first step of memory. In learning, emphasis is placed on mastering new situations and assimilating experience; in memory, emphasis is placed on the retention of experience. Common sense thinks of memory as the recalling of past experience. To recall or to recognize the past is evidence of memory, but neither is essential to it. Memory in its most general form means merely the retention of experience.

Memory in the broad sense here used is a characteristic of all animal life and is an important source of mental development. When the past is retained in habit and in likes and dislikes, without any consciousness of the original experience, it is called *organic memory*. When the retention leads to the recalling of the past events, it is called *conscious memory* or *recall*. When something is "placed" in one's past as having been previously experienced, it is said to be *recognized*.

THE STEPS INVOLVED IN MEMORY

Two steps are essential to memory: namely, an experience and the retention of its effects. One of two other steps, recall or recognition, is essential to conscious memory. Either of these may be present without the other, since it is possible to recall an experience without recognizing it, and to recognize an object without being able to recall it. For example, a person in writing an article may advance a theory which he believes to be the product of his own creative thinking, only to discover later that he had read of the theory long before, and that he was guilty of unconscious plagiarism. This would be a case of recall without recognition. On the other hand, all of us have been embarrassed when we could not recall the name of a person which we should have recognized immediately if some one had spoken it. All students know that they frequently are able to recognize the correct answer to a question without being able to recall it.

The experience which is the object of memory may be perceptual, that is, based upon a sensory stimulation, such as witnessing a crime or hearing a lecture or going on a picnic, or it may consist of mental images such as we experience in dreams and imagination. In some experiences, both sensory and imaginal processes play an important part, as when we attempt to solve a mechanical puzzle or when we listen to stories. Many errors of recall and of recognition result from confusing imaginal experiences with perceptual ones, and from confusing what we have heard with what we have actually experienced. We shall refer again to this source of error when we discuss the errors and disorders of memory.

THE FORMS OF RETENTION

(1) *The conscious present.* The past is retained in all perceptions, no matter how brief they may be. The present moment regarded logically is only a point that separates the past and the future. It has no length or duration. In contrast to the *logical* present, the *conscious* present involves duration: we bring into what we call the present moment of consciousness an indefinite number of events that may be regarded logically as belonging to the past. The significance of this will be indicated in the chapter on perception.

(2) *After-images.* Another simple form of retention is the con-

tinuation of activity in a sensory organ after a stimulus has been removed. Look at a bright light and then look away, and you will continue for a short time to see the light. We shall describe this phenomenon also more fully in our account of perception.

(3) *Memory after-images.* After hearing a catchy tune or witnessing an accident, we may be unable to free ourselves of the experience. The continued persistence of imagery of this sort gives rise to what are called *memory after-images.* The difference between an after-image and a memory after-image is that the physiological basis of the former is thought to be continued activity in the sensory organs, while the basis of the latter is generally held to be continued activity in the cortex.

(4) *Memory images.* When experiences that have faded out of consciousness completely are revived, we have instances of true memory images. Recalling what you ate for breakfast or the events of your last summer's vacation are instances of memory images.

(5) *Imagination.* Nearly every one is able to see in his "mind's eye" things or experiences which have never been encountered. Though such experiences are made up of new combinations of experiences which have already taken place, they are sufficiently different from other memory experiences to warrant a separate classification. The inventor who mentally makes one attempt after another to construct a new machine, each time "seeing" the completed model in his mind, is utilizing imagination. Perhaps more than any other mental capacity, the power to imagine, to experience the new before it exists, is a mark of the essential genius of man.

(6) *Dreams.* Few aspects of our mental life are so difficult to explain or to relate to other conscious processes as our dreams. The ancients explained dreams by the belief that during sleep one's soul or spirit left the body and roamed the world unhampered by physical limitations. Whatever may be one's belief as to the essential nature of the soul, it is easy to disprove this belief by later examination, which always reveals that the activities which seemed very real during the dream actually did not happen at all. The most widely accepted current explanation of dream life is based largely upon the work of Freud. Freud contends that the dream is essentially a "wish fulfillment." The wishes fulfilled in dreams, however, are supposed to be for things

which the dreamer is unwilling to admit he desires, things which are not approved by his moral standards of conduct and behavior. Hence dreams present bizarre and apparently nonsensical content in order to disguise both the wishes and their fulfillment. This topic is one of the most interesting in modern psychology and, in many respects, it is one of the least understood. Though somewhat more consideration is given to dreams on page 473, an extended treatment of this subject is far beyond the scope of this book.

(7) *Habits and skills.* The past is retained in our skilled movements. The skater, the golfer, the trained speaker — all are greatly influenced by their past, though it need not be consciously recalled. The influence of the past upon our habits and skills is one of the most universal forms of memory.

(8) *Likes and dislikes.* Finally, the effects of past experiences may persist in the form of emotional disturbances, of likes and dislikes. These, like skills, often become so habitual a part of our behavior that we have no conscious memory of the experiences in which they originated.

DO WE COMPLETELY FORGET ANYTHING?

It is well known that we retain much that we cannot recall. Frequently students are able to recognize but not to recall answers to questions. This shows that something has been retained. The rate of forgetting indicates the same thing. A poem memorized is forgotten rapidly at first, then more and more slowly. But that it is not completely forgotten is indicated by the fact that it can be relearned more readily than it was learned originally. This provides us with a method of measuring memory known as the saving, or relearning, method. We determine the ratio between the time required to relearn material and the time required for the original learning. For example, if, after a period of time, certain material can be relearned in only ninety per cent as much time as was necessary at first, it is assumed that ten per cent of the original impression has been retained or remembered, even though one could not consciously recall any of the material before the relearning period. This method of measuring memory was originally proposed by Ebbinghaus.[1] A typical curve of forgetting based on the amount of time saved in relearning is represented in Figure 64.

It should not be inferred from this graph that the curve of forgetting always follows this form. Many elements influence and determine the rapidity with which we forget anything. Bean has listed five important factors as follows:

(a) Degree of learning.
(b) Distribution and concentration in learning.
(c) Material learned. (Forgetting is slower for meaningful material.)
(d) Method of measuring the amount forgotten.
(e) Individual differences in retentiveness.[2]

The first point calls for little comment. Few of us would forget that two and two are four, even though we were to go a year without recalling it. The fact has been learned so well that we shall never forget it. The second point is amply proved by several experimental investigations. English and Jones found little relationship between memory for meaningful and for nonsense material, the former remaining with the learner much longer than the latter.[3] Holaday and Stoddard found memory for many things seen in the motion pictures to be retained by children for long periods of time with little if any forgetting.[4] In general, as Johannsen, Levine, and Stirling have indicated, memory ability is specific to the material, rather than general.[5]

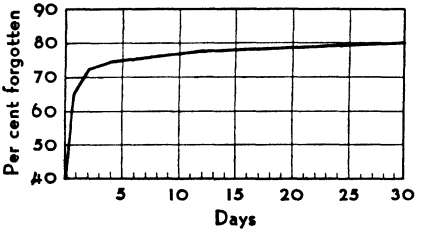


FIG. 64. A TYPICAL CURVE OF FORGETTING, SHOWING THE GENERAL PRINCIPLE THAT WE FORGET MOST RAPIDLY IMMEDIATELY AFTER LEARNING

(From data in H. Ebbinghaus, *Memory: a Contribution to Experimental Psychology*, translated by H. A. Ruger and C. E. Bussenius, Teachers College, Columbia Univ., 1913, p. 76.)

Many of our irrational acts and likes and dislikes are made intelligible in the light of experiences that are retained but that cannot be consciously recalled. For example, a person may have a phobia (fear) of running water because of some painful childhood experience that he cannot recall, or a dislike of a given food because of unpleasant associations that have been forgotten. Though the reason for the fear or the dislike may be forgotten,

the fear or dislike may remain none the less. In the vivid language of General Smuts, "Even the unremembered past is not dead, but alive and active below the level of consciousness. In the debating chambers of the present it may not speak, but it votes, and its silent vote is often decisive." [6]

Because we retain much that we cannot recall in ordinary circumstances, it has been held by some psychologists, notably the psychoanalysts, that we do not completely forget anything. In support of this view, they point to the fact that supposedly forgotten incidents may be recalled in exceptional circumstances: in dreams, in the delirium of fever, in somnambulism, in crystal gazing, in automatic writing, and in psychoanalysis.

In *automatic writing* a subject is given a pencil and paper. He is then placed so that he can write with ease, but is distracted from the writing when he has once begun. The subject continues, however, unconsciously; and he may write accounts of forgotten experiences, as well as answers to questions which are put to him.[7] As an illustration of the use of this method to regain lost memories, we cite the case of a woman who had a great fear of cats, which she was unable to explain. When automatic writing was resorted to, the hand wrote, according to Prince:

I think I know about cats — I can remember myself, a little child, playing on the floor with a kitten, and it began to run about the room and had a fit, I think, and it jumped on me and I was alone, and I screamed and cried and called my mother, but no one came, and I was very much frightened. I do not believe I ever told anyone. It was a white kitten. It ran out of the room and after a bit I went on playing.

There were two windows on the side of the room. The shades were gray, I think, with a border of grapes, or something of that color. The carpet was green or gray, with green figures. There was an old-fashioned sofa between one window and the door which led into the dining-room. A book-case and desk combination, you know. There was a mantle, I think, between the windows. It was the ground floor.[8]

Crystal gazing is another technique used for bringing to mind forgotten experiences. In this method, the subject gazes at a crystal until he objectifies his own mental processes and reports seeing events in the crystal which are really dreamlike occurrences in his own mind. In one case of recall through crystal gazing, also reported by Prince, a young woman was surprised and shocked to

see herself smoking a cigarette. The smoking had occurred at a former time, and she had no conscious memory of it.[9] This same patient on another occasion lost some money which she was able to find by gazing into the crystal.[10]

Hypnosis, a trance-like condition produced by suggestion, has been employed in two ways to induce the recall of apparently forgotten experiences. Hypnosis is sometimes spoken of as a form of sleep, and the hypnotizer may so speak of it to his subject. It is, however, very different from normal sleep. For one thing, the physiological changes, as detected by the methods discussed in the chapter on emotion, indicate increased tension, the very opposite of normal sleep. Moreover, during hypnosis the patient is extremely suggestible to whatever the hypnotizer may say. If the hypnotizer tells the subject that a cap he is holding is a cat, he will treat it as a cat. If the subject is told that a boil is developing where a piece of paper has been stuck, inflammation may be produced at that spot. Anaesthetic conditions have been produced by hypnosis. Before the discovery of drugs to produce anaesthesia, surgeons were looking forward to hypnosis as a means of saving their subjects pain. It may be suggested to a hypnotized person that when he awakes he will be able to recall events that occurred during a certain period. Or a person, while hypnotized, may be asked to live over certain experiences. The latter method is used when the physician does not wish the patient to remember the forgotten experiences after returning to his normal state.

An illustration of the second method is found in Morgan's account of a young woman suffering severe depression. Morgan describes as follows what happened when the young woman was hypnotized:

> We suggested to her that she was a girl again, just beginning school, then going through later and later stages. In all these periods she lived over varying incidents, one after another. Finally she came to the scene when she was about eleven over which she became very much disturbed. She was on her way home alone one dark night when she was attacked by a burly man. She went through the whole scene of fighting off this ruffian, calling wildly for help and finally dropped down on the floor in a stupor. When she recovered from this stupor she awoke from the hypnosis and had absolutely no memory of having portrayed this scene. It took much painful endeavor to get her to recall this scene consciously even after we knew of its existence.[11]

Psychoanalysis is one of the best methods of bringing into consciousness forgotten experiences. This method consists essentially in getting the patient to throw off all moral, practical, and rational inhibitions, and then to talk perfectly freely. It assumes that just as a man in ordinary conversation will talk of his favorite interests if he is given a chance, so the patient, when encouraged, will talk of such matters of vital interest to him as his fear of a painful event that he has driven from consciousness. The probable explanation of such revelation is that our mental processes are ordinarily brought to a focus by the requirements of action, and that only relevant elements are admitted into consciousness. When, however, we free ourselves of all logical, utilitarian, and moral considerations and assume a generally uncritical attitude, many forgotten memories are permitted to come into consciousness. Psychoanalysis requires much time and patience. Often one must talk to the analyst daily for weeks or even months before the "censor" is escaped and forgotten memories come into consciousness. We shall discuss these matters further in our section on dreams (see page 473).

The theory that freeing ourselves of practical considerations enables us to tap forgotten memories applies to automatic writing, crystal gazing, and hypnotism as well as to psychoanalysis. In each case the individual becomes less critical and less well organized. In automatic writing and in crystal gazing, disintegration is clearly induced, and this permits particular bits of the personality to find unimpeded expression. In hypnotism the hypnotizer assumes the control usually exercised by the organized interests and habits of the individual. Under his guidance the subject is directed to the forgotten memories.

Do the foregoing facts warrant the claim that we never completely forget anything? Most psychologists believe they do not, holding it unreasonable to assume that we remember all experiences. They think that if an event cannot be recalled under any of the conditions described, we should consider it completely forgotten. Just as we lose muscular skill through disuse and nervous deterioration, so, for various reasons, we may lose the ability to recall past events or the knowledge which we once had of a subject. There are times when this clearly seems to be the case. When, for example, the brain has suffered from an injury or disease, a complete loss of memory seems to result.

Instances of such amnesia, involving the loss of all knowledge of a language with which the patient had previously been familiar, are reported to have followed severe fever. Regarding such cases Conklin writes: "As the material so lost can never by any means be restored to voluntary recall, and as it is never reproducible in dreams, hypnotism, or crystal gazing, the conclusion is inevitable that the impression made in the nervous system has been obliterated." [12]

THE PRINCIPLE OF ASSOCIATION

Ideas are somehow connected. When asked to give the first word that comes into consciousness at the mention of *day*, practically every one responds with *night*, though perhaps, if the temperature at the time is extreme, a few will respond with *cold* or *hot*. *Day* and *night*, *day* and *hot*, and *day* and *cold* are, therefore, in some way connected. Connections between ideas are called *associations*. Other things being equal, the strength of an association varies with the recency, frequency, and intensity of the connection between the ideas associated. Frequency of connection between the two ideas explains the association of *night* and *day*. Intensity and recency, however, would explain the association of *hot* and *day* in extreme summer weather.

In order to be associated, things or ideas must, in some way, have been experienced together. Why do we think of the American Revolution when we think of Washington? Our first answer, that they have been frequently thought of together, is correct to a certain extent, but it is not complete. Why does experiencing two things together cause us to think of one when the other is presented? The explanation is that the two things experienced together constitute a whole, and that when one is subsequently presented to us, we perceive it as a part of the original whole. Washington was first presented to us as a part of the American Revolution; when we think of him, we think of him in this established connection, and consequently we think also of the American Revolution.

It is not enough that things should have been together in space or even that they should be causally related for one of them to make us think of the other. Two students may sit next to each other in a class day after day; yet the presence of one may not remind us of the other. Only when we have, in some way,

bound the two together does this happen. In other words, separate things must be experienced as parts of a whole before they are effectively associated in our minds.

There are two ways in which diverse things may be associated so that recalling one leads to the recall of the other. In the first place, the things may, in some way, be similar to each other; in the second place, they may be experienced together in time or space. We commonly group together similar things as members of a single class which itself constitutes a whole. For example, if we are asked to name various kinds of building material, we form in our minds a group or class, *building material.* If some one at some later time mentions a member of this class, we may think of the other members. Sometimes, however, we make associations between opposites — excessive heat may cause us to think of cold; sorrow, of former joys; black, of white — and association between opposites is due, not to similarity in nature, but to contiguity in experience. We have frequently asked whether it is hot or cold, wet or dry, clear or cloudy. The members of each pair have occurred together in our verbal experience many times, and the association has been formed between them in this way.

Association makes intelligible our responses. We do not respond to separate objects, but to complex wholes which, of course, can be dissected into various objects. The child does not respond to the bounding dog alone, but to the dog and to the protection of its mother's arms. Remove the latter and his response changes. We do not respond to the crushed finger in the presence of others as we should if we were alone. We do not respond to a kick in the shins merely as a kick, but to the kick plus our estimate of the size and strength of the kicker. Our responses are always to a thing in its relations, that is, to a complex whole. When we meet the same thing again, we may make all the responses that we formerly made to the complex whole in which it then appeared. This gives rise to a disorder of recognition, which we shall discuss shortly. On the other hand, we may experience it the second time as having been a part of a formerly experienced whole. In that case, it brings to our consciousness a recollection of the former total experience, and it may go further and bring recollection also of many of the other parts of that former experience.[13]

An attempt to explain associations in physiological terms, even though such explanations are highly speculative, may make clearer the principle here set forth. If we respond to a total situation in a coördinated manner, our responses are modified by each change in the situation. Thus, Pavlov stimulated a dog by a bell and then fed him. (See page 357.) The sound of the bell set up an activity or tension. That activity was given definite direction by the food. The response then became a response to bell plus food. After this response had taken place a number of times, the response of secreting saliva was made at the sound alone. Similarly, a child, after responding to the sight and the taste of chocolate at the same time, will later, merely at the sight of candy, begin to secrete saliva and to swallow.

The same process may be observed on a higher level. The aborigines of Australia come together from time to time and dance in celebration of their religious festivals. On these occasions they experience an ecstasy caused partly by dancing and by the presence of the crowd, partly by religious enthusiasm. At these times the sacred emblems are conspicuously present and they figure prominently in the consciousness of the dancers. The result is that after the group has separated, the mere presence of the emblems may be sufficient to provoke something of the same response as was originally produced by the religiously excited group.[14] Our own religious life is affected in the same way. In the church service we respond to the music, the quiet solemnity, and the sermon of the preacher. Later, merely being in the church may cause us to experience feelings closely akin to those experienced when we were there as a worshipper with others. The response of reverence and respect is originally to the whole; later, a part of the whole arouses the same response. If, accompanying the later response, there is imagery of the original whole or a part of it, then we make a recall.

We have discussed association at some length because this principle, in one form or another, is one of the most widely used explanatory principles in psychology. It is used in explaining learning, conditioning, and emotional responses to certain stimuli. It is employed by the psychoanalyst in reviving forgotten experiences. With sufficient study, it enables us to make intelligible the content of our dreams. And memory itself may be thought of as one form of association.

RECALL

The facts which are now known concerning the recall of experiences when they are needed merit special consideration. We need not believe that *all* experiences are retained to recognize the fact that there are *some* retained experiences which, at any given time, can be recalled only with great difficulty and perhaps not at all. Likewise, it is clear that past experiences which are unrecalled have a marked effect upon our present behavior and on our likes and dislikes. We are assimilative creatures, and our present behavior is influenced by what we have assimilated. Just how the effect of the past is "stored up" in our organisms to affect the present is a matter still in the field of speculation, though a physiological theory of one kind or another has been the most common explanation. Thus, the projection of the recent past into the conscious present in after-images and memory after-images has been explained as due to a continuation of physiological processes after the stimulus has been removed. Efforts have been made to explain the possibility of recalling more remote experiences also, in terms of physiological modifications in the brain; but such efforts have not been wholly satisfactory. The difficulty may be simply illustrated. Consider the recall by an expert skater of the process of learning to skate. The state of his nervous system on the day he first attempted to skate we may designate by the symbol *A*. The next day his nervous system, modified by his previous efforts, is somewhat different. Let us represent its condition by *B*. The third day it is still different, and we will indicate this third state by *C*. And so on. Each day of practice leaves its mark on the nervous system, with the result that there is continuous improvement in skating. The skill is thus explained by the modifications of the nervous and muscular systems, though we do not know just what the modifications are. But, in any case, the skater is able not only to act his past; he is able to recall in idea the stages through which he passed in becoming a skater. He may recall with great vividness how he almost cracked his head open in a fall on the first day he ventured on the ice. How is this to be understood? We can understand very well that every act modifies a functional system, but it is more difficult to understand how the functional system can reconstruct in idea the activities that are responsible for its

present condition. Physiologically, one state follows another. When state *B* comes into being, state *A* is no longer; and yet the skater with the nervous system represented by *B* is able to relive, in idea, his experiences before *B* came into existence. In other words, the individual, though constantly changing, is able to remember consciously more or less of the course along which he has traveled.

Physical analogies are of little value in explaining conscious recall. To understand it we must think in psychological terms. One of the chief characteristics of living things is that they are affected by the past. Like a snowball rolling down a hill, conscious organisms feed and grow on their experiences. When the past is preserved merely as habit, it affects us in much the same way as a "talking machine" or as a phonograph record reproduces the past — "mechanically." But an advanced organism may also recall its past and relive it in consciousness. Like other phenomena of consciousness, such as sensation and feeling, recalling the past has no parallel in the inorganic world.[15]

Recalls are made in the process of making adjustments. Sometimes the information needed to make an adjustment has not been acquired or has been insufficiently assimilated. Then, in spite of need, we cannot make the proper recall. Sometimes we wish not to make a recall because to do so would be unpleasant or would make our adjustments more difficult. The first failure of recall has to do with learning, and little remains to be said regarding it. More needs to be said regarding the influence of our desires and needs on recall.

(1) *Desire to avoid the disagreeable influences recall.* Common sense recognizes the effect of desire on recall. Lovers know better than to admit forgetfulness as an excuse for not keeping their appointments; they realize that it is unpleasant engagements that are easily forgotten. In general, we are apt to forget experiences that cause pain when remembered. If, for example, recalling a social blunder lowers our self-esteem, we tend to forget it. We thus free ourselves from unpleasant tension. For the same reason, we are apt to forget acts contrary to our moral code, such as being party to a questionable business transaction. The forgetting of unpleasant experiences, however, seems to be a protective device that is made use of as a last resort. According to Henderson, we first try to remove the unpleasant character

of a disagreeable experience by dwelling upon aspects of the experience which tend to change its nature.[16] Thus, if we have been uncivil to a friend, the memory of our behavior will not be unpleasant if we can convince ourselves that he deserved the kind of treatment we showed him. However, if we fail in our attempt to make a pleasant out of an unpleasant memory, there is a marked tendency to banish from our minds the whole experience.

An excellent, though extreme, illustration of the latter procedure is given by Janet in his description of one of his patients, a young woman of twenty, named Irene. Irene lived in extreme poverty with her mother, who was slowly dying of tuberculosis. For sixty days and nights she attended her mother, at the same time sewing in order to provide them both with food. To make matters worse, her father, who visited them from time to time, quarreled with her because she would not give him money. When at last her mother died, Irene was completely distraught. In an effort to reanimate her mother's body, she tried to make it sit up; but it fell on the floor, and she had to undergo the strain of putting it back on the bed. In her grief she contemplated suicide, and discussed it with the corpse.

A few weeks later, it seemed to Irene that her mother, instead of being dead, was on a journey and would soon return. Irene had no recollection of her extreme suffering in trying to nurse her mother and to provide herself and her mother with food. But the experiences were by no means obliterated; for, from time to time, she would reënact in detail and with considerable dramatic ability the death scene of her mother and many of the events that preceded it. Yet, on regaining normal consciousness, she would have no recollection of the scenes just enacted.[17]

Solving one's difficulties by repressing the disagreeable is a device more often followed by persons of lower intelligence than by those of higher intelligence. At least, enlisted men during the war were more likely to resort to it than officers. Also, persons who have been pampered as children and those who are excessively anxious about the opinion of others seem more prone to practice repression as a mechanism of adjustment than do persons with greater self-reliance.

Shaffer has suggested an interesting theory of repression. Suppose, he says, that a small boy after fleeing from two of his play-

mates has been caught and beaten. If one of the playmates were named Bishop, this name would subsequently revive a memory of the painful and disgraceful episode. Therefore, the recall of the name "Bishop" would be inhibited in the same way as a person inhibits any painful response, or as a dog that has been conditioned to secrete saliva inhibits the response after a few disappointments. The memory of the disagreeable incident, according to Shaffer's theory, is not driven into the unconscious or into any other region; the recall is simply not made at all.[18]

(2) *Emotional states or moods influence recall.* Our emotional states tend to cause us to recall events or facts in harmony with them. When we have a tender emotion for another, our recalls are different from what they are when we are angry. When a quarrel occurs between friends, the recollections of each regarding the other change. Other moods besides love and anger similarly influence our recollections.

(3) *The need of the moment influences recall.* The need of the moment seems to attract and pull into consciousness memories in line with it. Our recalls are largely determined by the problem that confronts us. This is indicated by the fact that what we remember when taking an examination on psychology is different from what is remembered for a history examination. Our recalls will not be the same when we are confronted with a problem of social relations as they are in the study of a problem in farming. The problem confronting us seems to place in tune with it those memories that are relevant. The related facts seem to be drawn into consciousness as by a magnet.

To put the matter in this way seems to overlook the fact that we are frequently not able to make a desired recall. Students on examinations, for instance, find themselves unable to recall facts that they need and that they are sure they know; speakers forget some of their best illustrations when they are most needed; a person may forget the most familiar name. How can we account for such lapses of memory if the need of the moment draws into consciousness the relevant facts? The fact that memory often lapses goes to show that the determinants of recall are numerous. While the need of the moment is an important, perhaps the most important, cause of recalling one thing rather than another, yet it is not the only one. Emotional states, distraction, lack of

proper connections between the confronting problem and the relevant facts — all these may make impossible the recalling of what we really know and need to recall.

In showing that retention is much broader and more inclusive than recollection, we described various methods (such as hypnosis, automatic writing, crystal gazing, and psychoanalysis) of aiding a person to recall what he seemed unable to bring to consciousness. But these methods are too cumbersome for ordinary problems, though they sometimes accidentally help in the solution of them. A woman, for example, who had lost her key was surprised to discover in writing to her son, that she absentmindedly wrote where she had placed it.[19] However, to use these methods ordinarily for common matters would be like bringing up a steam shovel to dig a small ditch. As aids in everyday affairs, we make the following suggestions.

(a) Cultivate an attitude of confidence. If, for example, you become anxious on approaching a person whose name you know and wish to use, your anxiety tends to block the recall. On the other hand, if you approach a person with confidence, the confidence serves as a helpful suggestion, not wholly unlike the suggestion of a hypnotist, and increases the likelihood of making the recall. Likewise, if a student goes to an examination excessively anxious about the outcome and, instead of suggesting to himself that he can do well, says to himself, "I can't do it," he thus places himself under a handicap.

(b) Let the matter drop for the time being. If you find you are unable to make a desired recall, it may come without effort if the matter is dropped. As we sometimes find it impossible to solve a problem after getting on the wrong track and therefore put the problem aside in the hope that with a fresh start we shall do better, so, in trying to make a recall, it is sometimes helpful to cease trying for a while and later to make another attempt. When we do so, we are frequently surprised and delighted to find the needed recall flashing into consciousness. Perhaps this is the result of the tension which is produced by an unfinished task and which, as we have previously noted, improves retention and makes learning more efficient.

(c) Make sure of the initial learning. Inability to recall is frequently due to poor original learning. If, upon being introduced to a stranger, we concentrate our attention on such things as his

manner of dress, or perhaps on our own feelings of self-consciousness, it is small wonder that we later find ourselves unable to recall his name. The investigations of Boswell and Foster [20] and of many others confirm the common-sense observation that memory and recall are improved by the intention to retain.

(d) Make numerous associations around the fact to be recalled. Many times we are unable to make the needed recall because there is no connection between the present situation and the material that would be of help to us. In other words, we have the facts, in a sense, but they do not seem relevant, and hence they are not at our command. Thus a student, on being told the answer to a question, is surprised to find that he knew it all the time, but did not know what was wanted. He failed because he had not looked at the facts in the needed way. Our mastery of facts or of a subject consists essentially in viewing them from more and more angles, or in seeing how they may apply to more and more situations. When we wish to fixate an impression so that we shall be able to recall it, we should consciously seek to relate it to previously learned facts. The importance of this is indicated by an investigation made by Key, which showed that material presented in commonplace relations is more easily recalled than material presented in unusual or unique relations.[21] Rote memory, that is, memory of things without reference to their meaning, is one of the least permanent forms of retention.

Some persons have unbounded confidence in the accuracy of their memories. Such confidence is not conducive to the improvement of memory or to tolerance toward others who may remember the same events differently. Knowledge of some of the more common sources of error in recall should therefore be of considerable value.

(a) Pleasant *vs.* unpleasant experiences. We have already called attention to the tendency to forget experiences or facts that are unpleasant to remember (see page 282) or which would give us trouble if recalled. Darwin, in order to guard against the tendency to forget objections to his theory, and facts that were difficult to explain in terms of it, made a practice of writing down every suggestion or fact that seemed incompatible with it. As a result, he was able not only to call attention to the weaknesses of his theory and the objections to it, but to answer them in a way that did much to make him famous as a painstaking as well

as a brilliant scientist.[22] Knowing his weakness, which is common to every one, he took effective steps to offset it.

(b) Simplification. A second source of error in recall is the tendency to simplify our recollection of the past by making it conform to the commonplace and typical. This has been demonstrated by the work of Wulf and Koffka, who showed their subjects geometrical figures of complex patterns, which they asked them to reproduce at stated intervals. They found that their subjects tended to leave out the distinguishing and difficult features of the figures and to make their drawings symmetrical and more and more like familiar figures. By simplifying, of course, they used less effort.[23] Perhaps this is the true explanation of the inaccurate reproduction, though, in addition to our tendency to save effort, there is also a tendency for details of remote events to fade out.

(c) Self-deception. A third source of error in recall is the tendency to supply details so as to make something reasonable and intelligible, or to make a good story. Some one has said that we have to change the truth a little to make it interesting enough to tell. Whether or not this is so, many of us certainly act as though we believed it.

Over and above the foregoing tendencies to error in recalling experiences, there are two broad classes of more serious distortion which may be described as disorders of recall. One group is of functional origin; the other is due to organic or structural defect. In the first class should be placed defective recalls due to excitement, to emotional inhibition or repression, and to exhaustion. The case of Irene given above and those illustrating the use of automatic writing, crystal gazing, and hypnosis are instances of functional disorders. Memories in all those cases were repressed because they were unpleasant. The following account of an experience of a seventeen-year-old girl illustrates the influence of fatigue on recall:

In the spring of last year while attending the University I became exhausted through overwork. One afternoon when returning home something seemed to snap in my head and it went whirling. This itself is clear in memory, but how I got home and what happened the next three days or in the whole preceding month are forgotten. Of course from what has been told me I know now about what did happen but it is still impersonal as a story. I have no memory of the lessons

we studied, and though during the time I was sick and before it, I wrote verses constantly, I do not know them now or recognize them as my own work.[24]

It will be noticed that the girl forgot events that occurred not only at the moment of her crisis and in the three following days, but also during the previous month. The forgetting of events that precede a crisis is called *retroactive amnesia.* This disorder of recall may be produced by a physical shock, such as a blow on the head. Football players, for example, have been known to forget events which occurred hours before the game in which they received a severe blow on the head.

In many instances the exhaustion or physical shock combines with general dissatisfaction to produce the amnesia. This was the usual combination among the soldiers in the World War. Exhaustion and worry weakened their self-control. All that was needed to produce a radical break in the stream of consciousness was a physical shock. Frequently a relatively slight one was sufficient.[25]

The second kind of disorder of recall is due to organic defect. We shall merely mention two common examples. One is the forgetfulness of old age. This is due to actual degeneration of the brain, which is consequently no longer able to operate as successfully as it formerly did. The other example is also a case of degeneration of the brain, but degeneration due to disease and not to mere age. Paresis and high blood pressure are two disease conditions that affect the memory.

RECOGNITION

To *recall* is to think of an absent object previously experienced. To *recognize* is to identify a present object and to place it in one's system of memories or of logical relations. If I look out of my window and see a moving object, I may recognize it as an automobile. I may not have seen the particular car before, but still I realize that it is a member of a familiar class. In addition to recognizing it as an automobile, I may also recognize it as the car of a friend. Recognition in both cases is essentially the same. In one case the content is more specific and involves a more definite placing of the recognized object than in the other. We recognize an object as a member of a class when we are able

to classify it; we recognize an object as an individual thing when we can place it in our past experience.

The basis of recognition is the feeling of familiarity that results from partial rearousal of responses that occurred when the particular object or objects of the same class were previously experienced. Suppose a group of objects, automobiles, for example, gives rise to a certain response; any member of the same class, whether new or old, will then be able to rearouse this response and thus awaken the feeling of familiarity. Sometimes our responses are more definitely related to a single object. For example, if you were unable to tell by looking at them which of two pens was yours, you would try them out. Usually you would be able to tell yours by "the feel." Rats show a similar tendency when placed in a new position in a familiar maze. At first, a rat so placed is bewildered, but he soon discovers a clue and runs with assurance down the proper alleys. Similarly, when the appearance of a person seems familiar to us, it is because we are making the same inner adjustments that we formerly made when we saw the person or one very much like him. Without these inner changes we should not have any feeling of familiarity. In the hope of reawakening the memory of an old man who was suffering amnesia, his favorite daughter was brought into his presence. On being told that his daughter stood by him, he replied, "Oh no, she is not my daughter! If she were my daughter, I should feel joy within." Failing to experience any of the organic changes he had formerly experienced in the presence of his daughter, he thought her a stranger.

Though the feeling of familiarity plays an essential part in all acts of recognition, it is not in itself sufficient to justify our saying that we recognize an object. A second step is necessary: namely, the placing of the object definitely in our past experience. When we have done this, the act of recognition is complete.

There are four disorders of recognition or forms of *paramnesia*. We shall discuss each of them briefly.

(1) *Feeling of strangeness in a familiar environment.* One morning a professional man who had for months been suffering from overwork, and probably from a nervous disease, went to the place where he usually boarded the street-car to go to the city. Suddenly he felt that he was in a strange environment. He made an attempt to recall the houses that surrounded the place

where he took the car in order to compare them with the houses that he now saw, but this he was unable to do. However, he decided to wait for a car. When it came, he was able to read the sign correctly and, boarding the correct car, to make a safe journey to the city.[26] Conklin, who reports this case from Burnham, attributes the disorder to emotional excitement of a profound and depressing nature, combined with fatigue. These may well have caused a state of temporary disintegration, involving the repression of bodily sensations. Because the bodily sensations no longer made their contribution to the stream of consciousness, however, everything seemed strange. Hence the sufferer knew that he was in a familiar place, but felt as if he were in a strange one.

(2) *Feeling of familiarity in a strange place.* This disorder is much commoner than the feeling of strangeness in a familiar environment. Perhaps the reader, when entering a room for the first time or while watching the sunset for the first time in a strange place, has experienced a feeling of familiarity and yet of strangeness. The feeling of familiarity in a strange place may be due to one of several causes. One cause is incomplete recall. The following experience, reported by Morgan, is an illustration.

One day a clergyman went with a party of friends to visit a castle. As the party approached the gateway, the clergyman became conscious of a very vivid impression of having seen it before; and he "seemed to himself to see" not only the gateway itself, but donkeys beneath the arch, and people on the top of it. Upon asking his mother if she could throw any light on this experience, he was told that when eighteen months old he had been taken by his mother with a large party to the castle, and that while the ladies and gentlemen ate their lunch on the top of the wall, he had been left with the servants below.[27] In this instance the feeling of familiarity was undoubtedly due to incomplete recall. Had complete recall taken place, the clergyman would, on his second visit to the castle, have thought of his previous one, and there would have been no haunting feeling of familiarity. As it was, he had the feeling of familiarity, based upon bodily sensations, yet was unable to recall the previous experience.

The feeling of familiarity may also be caused by a present situation which closely resembles one that has been experienced but that is not recalled. If the earlier situation were recalled, there

would result only an association of the usual type, and the similarity would be noted. But if the similarity between the two situations provokes only the bodily changes that underlie the feeling of familiarity, the haunting feeling of recognition arises, because the individual is making the same adjustments to the new situation as he once made to the old one.

A break in the continuity of an act may also produce the feeling of familiarity. If your attention is momentarily distracted by an unusual noise or by a picture when you are "set" to enter a room, you are apt to feel, as you enter the room, that you have done so before. The explanation is that when preparing to enter the room, you surveyed it, but that because of the distraction, the survey was forgotten. It persists sufficiently, however, to give rise to the feeling of familiarity when the act is resumed. Because of the break, the final action does not seem to be a continuation of an act just begun, but a repetition of an act previously performed at some unknown time. Such experiences are more apt to take place when a person has been somewhat disoriented by fatigue or depression.

(3) *Confusing one's inferences with what actually happened.* This is a third disorder of recognition. If some one has witnessed an interesting event and is telling his friends about it, there will, more than likely, be breaks in what he actually recalls. Instead of telling only what he can remember, he is apt to supply substitutes for the missing parts. So readily do we do this that we ourselves cannot separate what we remember from what we supply. Our unconscious inferences are taken for parts of our experience. Particularly is this the case after we have repeated a story a few times. This is one of the reasons for taking with a grain of salt the reports of even our most trustworthy friends about their summer's vacation. With the best intentions in the world, it is hard to overcome the urge to make our accounts intelligible (that is, connected) and interesting by dressing them up and by supplying missing links. This is very likely to be done by old people whose memories are deteriorating. The procedure is called *retrospective falsification.* We tend to falsify our account of things in ways that will be flattering to us or that will enhance our feeling of importance.

(4) *Confusion of ideational experiences with actual events.* Dreams — daydreams or regular dreams — and information got from others

are sometimes confused with our overt acts. This disorder is called *retroactive paramnesia.* When some one asserts that he can remember what happened when he was a few months old, we are justified in believing that he is confusing what he has been told with his own first-hand memories. The confusion of fantasy with memories of real events may, on occasion, have important consequences. Morgan tells of an apparently normal woman who told her husband that an uncle, with whom she wrote poetry when a child, had died and left her a large estate in England. "The gullible husband, elated at his wife's good fortune, resigned his position and made all preparations for the wonderful journey, when he was brought to the earth with a jolt upon learning that the whole story was the sheerest fabrication. Investigation showed that from early childhood this girl had been accustomed to weave such fairy tales and to act them out as though they were the truth." [28]

CAN MEMORY BE IMPROVED?

A person has a good memory if he is able to recall those experiences that are of help to him. Can this capacity be improved? It is a common belief that native retentiveness, whatever that may be, cannot be improved. But retentiveness in the sense of the ability to fixate information for recall when needed can be improved. Certain correspondence schools offer courses which they claim will improve memory, so that if one is introduced to fifty strangers before dinner, he will be able to call them all by name during and after the dinner. Though a skeptical attitude is reasonable regarding this claim, there is no doubt that a person can improve his ability to fixate important facts and impressions so that they can be recalled more readily. The superiority of the blind students of Perkins Institute over the students of Harvard and Radcliffe and over a group of technical-high-school students in remembering logical material presented orally indicates that few of us have made full use of our ability to fixate and retain important experiences.[29]

Observance of the following suggestions will lead to improvement: (a) Discriminate in what you attempt to remember. In studying a lesson, pick out the important facts and memorize them. Some things are of little importance; memorizing them will not be worth the time and effort it costs. (b) Memorize thoroughly

important facts and principles. If material is learned so that it can be barely repeated, it will be forgotten far more quickly than if it has been studied beyond the point of immediate recitation. A little overlearning pays handsome dividends in prolonged retention. (c) Plunge into the subject you desire to master. The more you know of any field the easier it becomes to assimilate additional facts in it. (d) Stimulate your interest in the subject to be learned. This will make the fixating process more intense. (e) Practice frequent repetition. (f) Learn logically; that is, note as many relations or meanings as possible. To the extent that you organize the facts you wish to remember, you make for yourself a logical system in which one fact suggests another.

SUMMARY

Memory is the retention of experience. It may be conscious or unconscious. For unconscious memory, experience and retention are necessary. For conscious memory, these two steps plus recall and recognition are required. The major forms of memory are: (1) the conscious present, (2) after-images, (3) memory after-images, (4) memory images, (5) imagination, (6) dreams, (7) habits and skills, and (8) likes and dislikes.

Memory is determined by five factors: (1) degree of learning, (2) distribution and concentration in learning, (3) type of material, (4) method of measuring retention, and (5) individual differences in retentiveness.

Many experiences that cannot ordinarily be remembered are sometimes recalled during dreams, under special circumstances (such as delirium or somnambulism), or by means of special techniques (such as automatic writing, crystal gazing, hypnosis, or psychoanalysis). Experiences which cannot be remembered even with the help of these techniques are probably permanently forgotten.

Recall of past experiences is a unique characteristic of consciousness. It cannot be explained except in psychological terms. Experiences which we recall are determined by several factors: (1) desire to avoid the disagreeable, (2) present emotional state, and (3) the need of the moment. Recall may often be aided by: (1) an attitude of confidence, (2) returning to the matter later, (3) adequate initial learning, and (4) numerous associations involving the material.

Two ideas or experiences are associated when there is a tendency for one to come to mind if we are conscious of the other. This tendency is called the principle of association. The principal laws of association are recency, frequency, and intensity. Many (if not all) of our recalls are made intelligible by the principle of association.

Recalls often involve errors; that is, they do not always reproduce accurately the original experience. The main factors that determine the accuracy or inaccuracy of our recalls are the following tendencies: (1) to forget facts or experiences which are unpleasant to remember, (2) to simplify memory of the past by omitting things difficult to remember, and (3) to supply details, or to dress up the past to make it a good story.

Disorders of recall are due to (1) functional difficulties and (2) structural or organic difficulties.

Recognition is the awareness that we have had an experience before, combined with the ability to place the experience logically in our past. Disorders of recognition (paramnesia) are of four types: (1) feeling of strangeness in a familiar environment, (2) feeling of familiarity in a strange environment, (3) mistaking inferences for recollections, and (4) confusing ideational and perceptual experiences.

Though native retentiveness probably cannot be improved, the serviceability of one's memory may be enhanced in the following ways: (1) by discriminating between what is worth remembering and what is not, (2) by building up a background in the field, (3) by memorizing the important things thoroughly, (4) by keeping your interest stimulated, (5) by repeating the material, and (6) by learning logically rather than by rote.

QUESTIONS ON THE CHAPTER

1. What is memory? What are the two steps of organic memory? The four steps of conscious memory?

2. What are the principal forms of memory? Why do we say that habits and skills are a form of memory?

3. What are the five main factors that determine memory for any experience?

4. Under what conditions are "forgotten memories" sometimes recalled?

5. Define automatic writing, crystal gazing, hypnosis, and psychoanalysis.

6. List the main determinants of recall of an experience.
7. State the principle of association.
8. What factors tend to make our recalls inaccurate?
9. What are the four forms of paramnesia? Illustrate.
10. List several ways in which the serviceability of one's memory may be improved.

QUESTIONS FOR DISCUSSION

1. How can one distinguish between a visual after-image and a memory image?
2. Why do we speak of the conscious present as a form of memory?
3. Discuss: No experience is ever completely forgotten.
4. Give examples of some one's memory (perhaps your own) influenced by the tendency to forget the disagreeable.
5. What is your reaction to the statement: The principle of association and the conditioned reflex are essentially the same?
6. Give instances where you have distorted your memory to make a "better story" of an experience.
7. How can the fact that retentiveness cannot be improved be made compatible with the statement that one can increase the serviceability of his memory?

SUGGESTED READINGS

H. E. Garrett, *Great Experiments in Psychology* (revised and enlarged; D. Appleton-Century Company, 1941), Chapter X. An interesting summary of the major work of Ebbinghaus, who first applied experimental methods to the investigation of memory.

J. J. B. Morgan, *The Psychology of Abnormal People* (2d edition; Longmans, Green and Company, 1936), Chapter VI. How one who badly distorts his memory is mentally sick.

R. S. Woodworth, *Psychology* (4th edition; Henry Holt and Company, 1940), Chapter XI. Further discussion of the facts and findings in experimental studies of memory.

MORE ADVANCED READINGS

H. Ebbinghaus, *Memory: a Contribution to Experimental Psychology* (originally published, 1885; translated by H. A. Ruger and C. E. Bussenius; Teachers College, Columbia University, 1913). Ebbinghaus's own account of his important work.

W. S. Hunter, "Experimental Studies of Learning," *Foundations of Experimental Psychology* (edited by C. Murchison; Clark University Press, 1929).

D. Rapaport, *Emotions and Memory* (Williams and Wilkins, 1942).

CHAPTER TWELVE

Perception: How We Know the World about Us

EVERY reaction we make is an adjustment, or reaction, to some condition or stimulus either in the world about us or in our own bodies. Our emotions, attention, memories — these and all other reactions we make are responses to stimuli which play upon us. But these stimuli could fall upon us until doomsday and have no effect whatever were it not for the fact that we are equipped with certain organs especially adapted to receive them. These organs are known as *sensory end organs*. They are structures that are sensitive in specific ways to the world about us or to the conditions within our bodies. Popular psychology speaks of the five senses and their organs, meaning the eyes, ears, nose, tongue, and skin. The eyes, ears, and nose enable us to get information about objects which our bodies do not touch; the tongue and skin, about objects in contact with us. All these sense organs are referred to as *exteroceptors*, since they give us information of conditions external to our bodies. Scientific psychology also classifies kinds of sensation. It treats the cutaneous, or skin, sensations under four heads: cold, heat, pressure, and pain. In addition, it recognizes kinaesthetic, or muscular, sensations; static sensations, or sensations of equilibrium and position; and organic sensations, or sensations of the conditions within our bodies. These eleven kinds of sensation may be grouped as shown in Table XIX.

Each of the senses has a definite mechanism and is adapted to respond to certain kinds of stimuli. The structures of the eye

TABLE XIX

THE SENSATIONS WHICH MAKE US AWARE OF THE WORLD AND OF OUR OWN BODILY CONDITIONS [1]

Class of senses and receptors	*Sense*	*Receptor*	*Sense qualities (attributes)*
1. External (exteroceptors)	Sight	Eye	Hue (color), brightness, chroma
a. Distant (teleoceptors)	Hearing	Ear	Pitch, loudness, timbre, volume, brightness (or density)
	Smell	Olfactory membrane in the nose	Spicy, burnt, resinous, flowery, fruity, putrid
b. Contact (proximoceptors)	Taste	Taste buds	Sweet, sour, salt, bitter
	Touch	Pressure receptors	Pressure
	Warmth	Warmth receptors	Warmth, heat
	Cold	Cold receptors	Cold
2. Systemic (interoceptors)	Organic	Nerves in internal organs	Digestive, vascular, sex
	Pain	Free nerve endings	Pain
3. Motor (proprioceptors)	Kinaesthetic	Nerves in muscles	Movement, effort
	Static	Tendons, joints, and semicircular canals	Progressive and rotational

(By permission, modified from H. C. Warren, *Elements of Human Psychology*, Houghton Mifflin.)

and ear are the most complicated; but all, with the exception of the sensory end organs for pain, are highly developed and very sensitive in detecting the kind of stimuli to which they are adapted.

INDIVIDUAL DIFFERENCES IN SENSORY EQUIPMENT

People differ markedly in the sensitivity of their sensory receptors. In this fact we have an explanation of musical and artistic talent and of individual preferences for certain tastes and odors.

(1) *General characteristics of sound.* Sounds may vary in pitch,

loudness, timbre, volume, and brightness (or density). Pitch is determined primarily by the frequency of vibration of the sound wave and refers to the position of a tone or sound on the musical scale. Loudness is determined by the intensity of the sound wave. Timbre, or tone quality, is determined by the complexity of the sound wave — the number and frequencies of the overtones which it contains. That the timbre of a sound should be considered as a separate attribute, and not simply as a perceptual interpretation of a combination of various component partials or overtones, is shown by such studies as the one by Lewis and Lichte. These investigators found that "a listener might perceive two complex tones as being different in timbre and yet be unable to designate the exact nature of the difference in terms of (say) saliency of specific partials." [2] Volume, which has been defined as the "largeness" of a tone, "increases with intensity and decreases with frequency." [3] Brightness, or density, has also been considered a separate attribute of tones, though it is possible that this characteristic is only a specific type of tone quality, or timbre.[4]

(2) *Measuring differences in hearing.* All persons cannot hear the various attributes of sound with the same precision or accuracy. A keen ear can detect a difference in pitch as small as one fiftieth of a tone, whereas a poor ear may require seventy-five times as much change before a difference is noted. The same is true in the hearing of loudness and timbre. The Seashore Measures of Musical Talent which were described in an earlier chapter (see page 241) measure one's ability to hear differences in several attributes of sound. They are of considerable value in determining whether one's ear is sufficiently keen to justify certain kinds of musical training. The value of the tests for this purpose rests upon Smith's important experimental work showing that training does not improve the sensitivity of the ear.[5]

Another hearing test that is of considerable practical value is the Western Electric 4-B Audiometer. With this instrument the hearing acuity of 40 persons can be tested at the same time. In the measuring of deafness, or hearing loss, the *decibel* (db) is used as the unit of loudness. If silence is represented by zero, the roar of an airplane motor close at hand would be about 110 db. The loudness of other common sounds is shown in Figure 65. Obviously, a person with a hearing loss of 60 db cannot hear any of the sounds below that point on the scale.

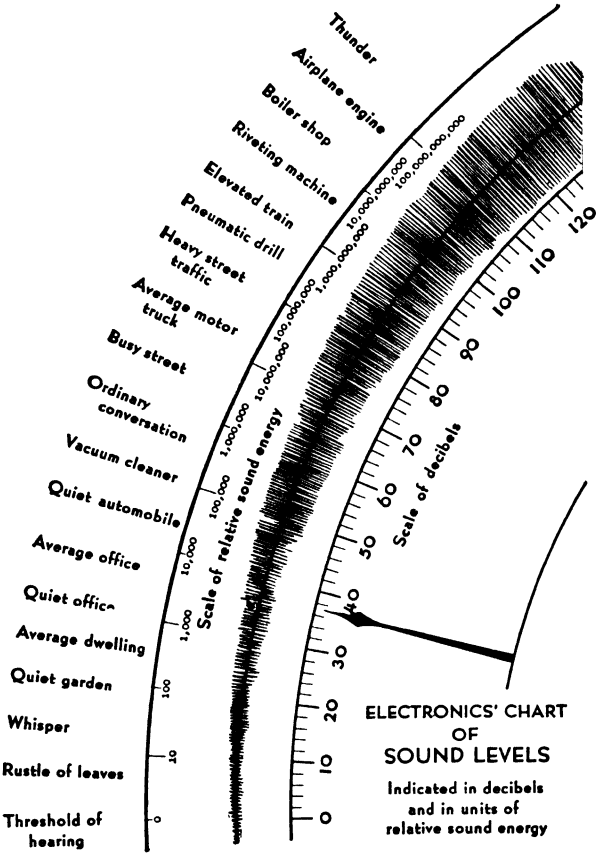


FIG. 65. LOUDNESS OF COMMON SOUNDS ON A DECIBEL SCALE

The decibel as a measuring unit will soon be used as commonly as the degree or the pound. (By courtesy of *Electronics*.)

(3) *General characteristics of vision.* The attributes of visual sensation are hue, or color proper; brightness, or relative amount of white light in the stimulus; and chroma, or the purity of the color. Hue is determined by the wave length of the light wave; brightness, by intensity; and chroma, by the composition of the stimulus.

(4) *Measurement of differences in vision.* Many tests for the measurement of visual sensitivity have been developed. In vision, as in audition, differences in sensitivity from one person to another

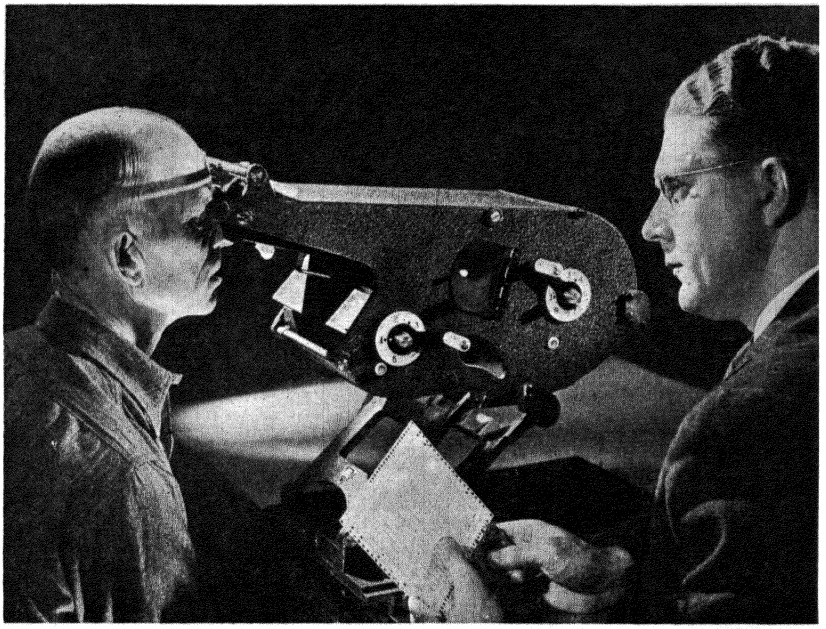
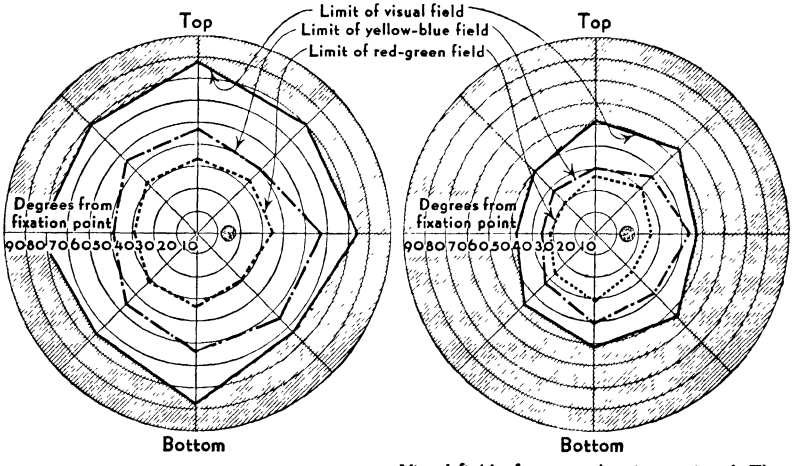


FIG. 66. THE ORTHO-RATER

A device for the visual classification and placement of industrial employees. (Distributed by the Bausch and Lomb Optical Co., Rochester, New York.)

are very great. A recently developed apparatus known as the Ortho-Rater for measuring such visual characteristics as acuity or keenness of vision, depth perception, color-blindness, and postural characteristics of the eyes is illustrated in Figure 66. This apparatus is being used extensively in industry where attempts are being made to determine the particular visual characteristics which are needed in different kinds of work.[6] Color sensitivity may be measured by means of the Ishihara Color Perception Test.[7] Among women, about one per cent, and among men, four per cent are partially or totally color-blind — they either confuse colors which are easily distinguished by the normal eye or they fail to see color at all. Obviously, a color-blind person is quite unsuited for certain types of work (wiring a radio, for example) where discrimination between colors is an important part of the job.

FIG. 67. MEASURING AND PLOTTING THE VISUAL FIELD



Visual field of a normal eye

Visual field of an eye that is restricted. This condition is sometimes called "tunnel vision."

FIG. 68. A NORMAL AND A RESTRICTED VISUAL FIELD

The figures along the radius represent degrees from the point of fixation. The person represented on the right would be a hazard in driving an automobile.

The width of the visual field also differs from one person to another. A normal eye sees objects out to 70° or 80° on either side of the point fixated. Some pathological conditions reduce this greatly. A person's visual field may be plotted by means of a perimeter, the instrument shown in Figure 67. Visual fields of two persons as plotted with this instrument are shown in Figure 68. The smaller the white area, the smaller the field. In each case the field for red and green is smaller than the field for yellow and blue, and the latter is smaller than that for black and white.

The small, shaded dot near the center of each plot is the "blind-spot," an area in the visual field which falls upon the spot in the back of the eye where the optic nerve enters. We are blind to objects falling within this small area.

The drawing on the right in Figure 68 indicates so narrow a field that the term "tunnel vision" may aptly be used to describe it. One with such a defect sees things as though he were looking through a tunnel. Tunnel vision is obviously a severe handicap to the driver of an automobile and greatly increases his chances of having an accident.

Ability to withstand glare is another visual characteristic of importance, particularly in night driving. Large differences in "glare susceptibility" among people have been found by means of a device called the glarometer,[8] which is illustrated in Figure 69. A test with a glarometer is becoming a standard part of driving tests.

(5) *The other senses.* In much the same way that audition and vision are characterized by the attributes discussed above, the other senses mentioned in Table XIX also have their individual attributes. And in these too there are large differences in sensitivity from one person to another. What is a nauseating odor to one person may be quite unnoticed by another: The sale of a candy bar, a soft drink, or a breakfast food depends in no small measure upon the taste preferences of consumers. Since these preferences can be measured by present-day psychological methods, it is no longer necessary for the manufacturer of consumer goods to rely upon the time-honored but expensive method of experience. One company has, within the last few years, set up a taste laboratory for measuring consumer preferences for its products, and for controlling the quality of the products during the various stages of their production.[9]

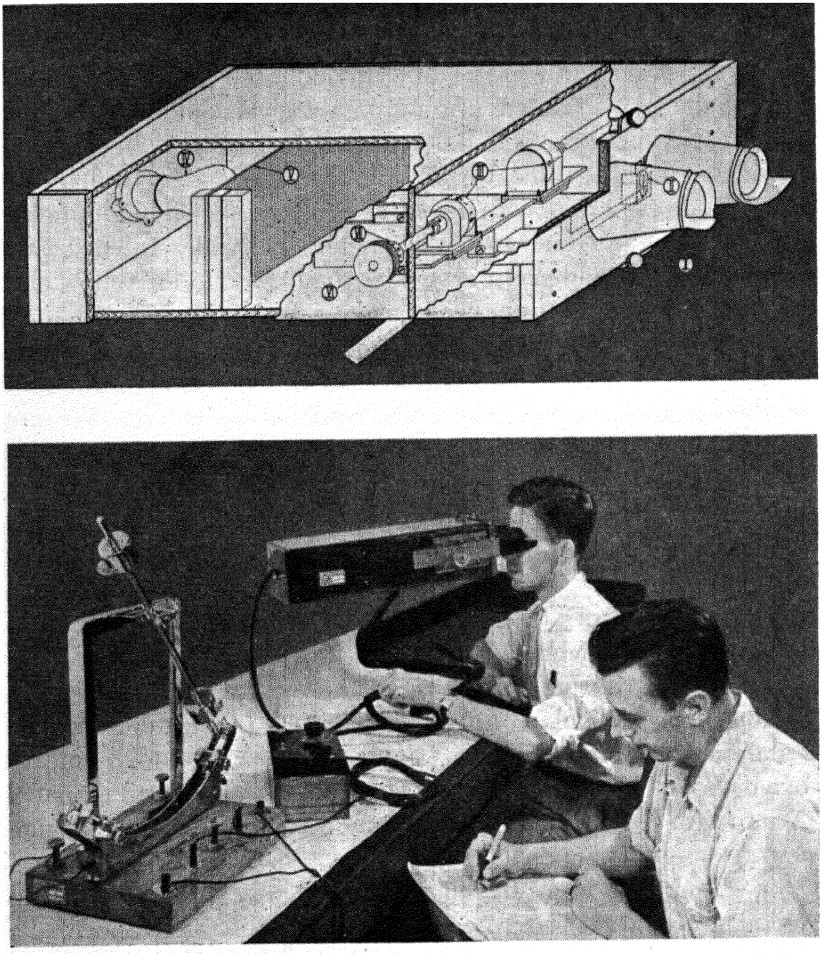


FIG. 69. THE GLAROMETER

I. Location of subject's head. II. Bulb which illuminates letters. III. Letters which subject reads. IV. Bulb giving glare illumination. V. Ground glass which diffuses glare. VI. Knob which changes letters. VII. Identification of letter being shown to subject.

A letter is presented for one second on an opaque area in the center of a ground-glass screen behind which a light is located. Ability to withstand glare is measured by increasing the glare intensity to the brightest point at which the subject can identify the letter. (From Purdue Psychological Laboratory.)

THE SIGNIFICANCE OF THE SENSORY END ORGANS

It would be hard to exaggerate the value of our sensory equipment. Without the exteroceptors we could not obtain information regarding the world about us. To realize their importance, we need only consider how hesitantly we move in the dark or with our eyes shut, and to recall the effect of impaired vision and hearing on general intelligence and personality.

The interoceptors, by keeping us informed regarding our bodily conditions, supply information necessary for the ordinary business of living. They furnish sensations of hunger when we need food, of thirst when we need fluid, of pain when any part of the body is in danger, and of nausea when injurious food should be expelled. Much of our behavior — more than we realize — is dictated by the drives coming from the interoceptor sensations. As a hungry or thirsty man will go to great lengths to obtain food or drink, so any one readily alters the course of his behavior in order to change the systemic sensations so that they will give a feeling of pleasantness and well-being.

Among the proprioceptors, one set, the organs of the static senses, plays an important part in the maintenance of equilibrium and of upright position. A person suffering an impairment of his static senses cannot stand erect with his eyes closed. The other set of proprioceptors, the organs of the kinaesthetic senses, plays an essential part in the control of muscular movements. As a deaf person is handicapped in his speech by not being able to hear what he is saying, so a person who does not have muscle sensations is handicapped in acquiring any skill and in performing any voluntary movement. We must know what our muscles are doing in order to direct them. A peculiar way of walking known as the tabetic gait illustrates this. This gait is caused by a disease in the sensory tract of the spinal cord, which deprives the victim of the ability to tell where his feet are without looking at them. For this reason, in walking he extends his feet until he can see them and then brings them back to the proper position.

The ability to localize sounds, though not as important to man as to lower forms of life, is still of some value, and especially to the blind. This ability depends largely on hearing with two ears, that is, on binaural hearing. A sound at the right arrives at the right ear about .001 of a second before it arrives at the left.

It is also slightly louder in the right ear because energy has not been lost in traveling around the head. These differences, small as they are, result in the *localization* of the sound on the right.[10] The conditions are reversed when the sound source is on the left.

In stressing the functional value of the sensory processes, we should not overlook their value as sources of enjoyment. The eyes enable us not only to get needed information but also to enjoy the world of color and form, and to enter sympathetically into the joys of those about us. And so it is with the other sensory organs. In supplying us with necessary data, they also give us a basis for appreciating the world without, and for enjoying the processes that go on within. The enjoyment of beauty in music and art, which is an unearned increment, perhaps not necessary for survival or even adjustment, but an important part of every one's life, would be nonexistent without sensory organs.

LIMITATIONS OF OUR SENSES

Limitations of our sensory end organs are readily apparent when we compare their sensitiveness with that existing in other organisms. The vision of a hawk that enables it to spy the young chick quite out of the range of human eyesight makes our own vision seem poor indeed. The ability of a dog to follow a trail made hours before puts to shame our feeble sense of smell. In comparison with that of the insects, our hearing seems equally poor.

(1) *Range of stimuli.* Our senses are also limited to a narrow range of stimuli to which they respond. Vision is stimulated by electromagnetic waves, yet it is only such waves within the relatively narrow range of 400 to 760 millionths of a millimeter that stimulate it. The stimuli for sound are vibrations of air, yet few of us can hear sound vibrations of greater frequency than 30,000 or of less than 16 per second.

(2) *Perception of differences.* Our ability to perceive differences between two stimuli is also strictly limited. If an ounce is added to ten pounds, scales of ordinary delicacy will respond, but we should not notice the addition were we attempting to gauge the weight with our hands. We are unable to perceive differences in weight less than two and a half per cent. In sound, we cannot detect the difference in loudness when one drum is added to five

drums already beating; if one drum is added to four drums, the per cent of increase will be just sufficient for us to perceive a difference. The amount of stimulus for all of our senses must vary by a rather large per cent in order for us to perceive differences.

The fact that addition to or subtraction from a stimulus cannot be perceived unless the change is a certain per cent of the original stimulus is known as *Weber's law.* Individuals differ, of course, in their ability to detect differences, as they do in their ability to sense individual objects. The amount of difference required on the average and the individual differences for each mode of sensation have been set forth by Warren in Table XX. "Each fraction denotes the *proportion of the original stimulus* which must be added to it in order that the sensation may be just noticeably greater." [11] This fraction is called the difference threshold or the least perceptible difference and is indicated by the abbreviation L.P.D.

TABLE XX

VALUES OF THE WEBER CONSTANT [12]

Sensation	*L.P.D. intensity*	*Individual range*
Visual	0.01	0.015 to 0.005
Auditory (noises)	0.333	
Auditory (tones)	0.15	0.20 to 0.125
Olfactory	0.25	0.33 to 0.25
Gustatory	0.25	0.33 to 0.25
Tactile	0.05	0.10 to 0.033
Warmth	0.036	
Cold	0.036	
Kinaesthetic	0.025	0.05 to 0.013

(By permission, from H. C. Warren, *Elements of Human Psychology*, Houghton Mifflin.)

Weber's law holds for only the middle ranges of sensations. If this were not so, and it held true at all ranges of vision, for example, we should be able to read on into twilight and pay no attention to the increasing darkness. The values given in Table XX are rough approximations. We shall make no effort to discuss here the extensive experimental literature on quantifying the relation between stimulus and sensation nor the many factors which affect this relationship. The specialized branch of psychol-

ogy which is concerned with these problems is known as *psychophysics*. It is the most thoroughly quantified — though by no means the most significant — branch of modern experimental psychology.

(3) *Perception a process of fusing stimuli.* Our ability to distinguish the temporal succession of stimuli or their separateness in space is also definitely limited. Many millions of light waves come to us each second. We do not perceive the individual vibrations. The air vibrations of sound come much more slowly, yet we cannot distinguish them either. In order to discriminate between two successive visual impressions, we must have them separated by an interval of approximately .04 of a second. To distinguish two sounds as two, we must have them separated by approximately .002 of a second. If both the visual and auditory senses are stimulated, the stimuli must be separated by as much as .16 of a second.

The inability to distinguish the separate vibrations in light and in sound is by no means a defect. It might as well be regarded as the capacity to crowd into the present much that logically belongs to the past. Upon this capacity the richness of our perceived world largely depends. If we responded to each of the millions of light vibrations, we should be hopelessly confused. Only because we react to millions at once are they allowed to take on a variety of patterns and qualities. Likewise with sounds, if we responded to each air wave, we should not perceive a chain of waves as a tone, or a succession of tones as a melody. As the trained telegrapher, by holding in consciousness many clicks of the sounder, distinguishes easily the various meaningful patterns, so we, by grouping numerous vibrations into larger wholes, make our world rich in pattern and quality. If we perceived each vibration, our world would become the pale world that physics describes, instead of the world of variety and beauty which we experience in everyday life.

(4) *The two-point limen.* The ability to distinguish, through the sense of touch, two simultaneous impressions differs in different parts of the body. On the tip of the tongue 1 mm. is sufficient to give the perception of two stimuli; on the tip of the finger, 2 mm. are necessary; under the middle joint of the finger, 7 mm.; while on the middle of the back, 68 mm. are necessary.

(5) *Sensory adaptation.* Another limitation of our sensory end

organs is their ready adaptability, leading to insensitiveness, when called upon to respond to the same kind of stimulus for any length of time. Perhaps the sense of smell is most easily adapted. Evidence of this is found in the quickness with which we become accustomed to obnoxious odors or cease to enjoy fragrant ones. Persons working in a tannery soon become quite unconscious of its odor. Vision also adapts readily to continuous stimulation. Wear a pair of colored glasses for half an hour and you will become totally unaware of the color. The eye adapts so completely that the color can actually no longer be perceived. Hearing is the least adaptable of the senses, though experiments show that prolonged stimulation by a constant tone somewhat reduces the sensitivity of the ear.[13] Adaptation to one stimulus, while rendering us less sensitive to the same kind of stimulus, may increase or decrease sensitivity to stimuli of other kinds. For example, one investigator reported that bitter adaptation increased the sensitivity of three subjects to sour and salt, and that two bitter-adapted subjects reported increased sensitivity to sweet.[14]

When there is variation in the stimuli, there is less adaptation. This is partly accounted for by the fact that in such instances different parts of the sense organ are activated, whereas, when the stimulus remains the same, the same part of the sensory organ is used continually. For example, we may quickly become insensitive to one odor, but remain responsive to all others. Our sensory organs, like our muscles, quickly tire of doing one thing. If we are called upon to bend a finger repeatedly, we soon tire; but if the same movement is part of a larger whole and there is variation and time for rest, fatigue does not set in so quickly.

(6) *Sensory fatigue.* Apart from the factor of adaptation, some stimuli have the capacity of rendering us insensitive to others. Ruch tells of an unscrupulous lawyer who took advantage of this fact to win an acquittal for a client who had been indicted on a charge of arson. The case for the state rested largely on the testimony of the firemen that they detected the odor of kerosene in the burning building. The defense lawyer claimed that the firemen had been "smelling things"; and, to prove they were not competent witnesses, he passed them several bottles and asked that they tell the court what they smelled in each. The first bottle which each fireman received contained kerosene and the remainder of the bottles perfume. After the overwhelming odor

of the kerosene, the men's nostrils were insensitive to the delicate perfume, and they reported kerosene in all the bottles. The lawyer then passed the bottles to the jurors, but this time he presented the kerosene bottle last. The jurors were convinced that the firemen were really "smelling things," and acquitted the client.[15]

(7) *Reaction time to sensory stimulation.* The biological value of our sensory organs depends in a measure on how quickly they stimulate action. In this respect, the senses show wide variation. It takes about .22 of a second for us to respond to a visual stimulus. Our response to sound takes about .18 of a second. Our response to tactual sensation is still faster, approximately .12 of a second. The time needed for reacting varies with the intensity of the stimulus applied. Generally speaking, the reaction time becomes less as the intensity of the stimulus increases. The reaction time is also decreased when a person is "set" to respond. And it is also slightly decreased by practice. It increases with the complexity of the situation to which the response is made. More time is required in making a choice reaction of the kind measured by the apparatus shown in Figure 70 than in making a simple reaction of the sort measured by the apparatus shown in Figure 71.

The reaction time of a person decreases as he approaches maturity, and then increases as he grows older. The reaction time of a man of 70 is about equal to that of a child of 10; that of a man of 45 is slower than that of a boy of 15.

The bearing of these facts on safety in automobile driving is evident. Quick reaction time is obviously an asset in avoiding accidents. Because the reaction time of the old is too slow for modern traffic, Massachusetts requires that they pass special examinations to demonstrate their fitness to drive. The average man in his prime requires about .40 of a second to apply the brakes in an emergency. If he is traveling at 50 miles an hour, he will go 29 feet before applying his brakes. Some people require as much as a second to apply the brakes. DeSilva and Forbes and Lauer have devised tests for determining driving ability.[16] If the obtaining of a license to drive were contingent upon passing these tests, the number of accidents on the highway would no doubt take a sharp drop.

(8) *Means of overcoming limitations of the senses.* Most of us do not make full use of our sensory equipment, as Helen Keller and

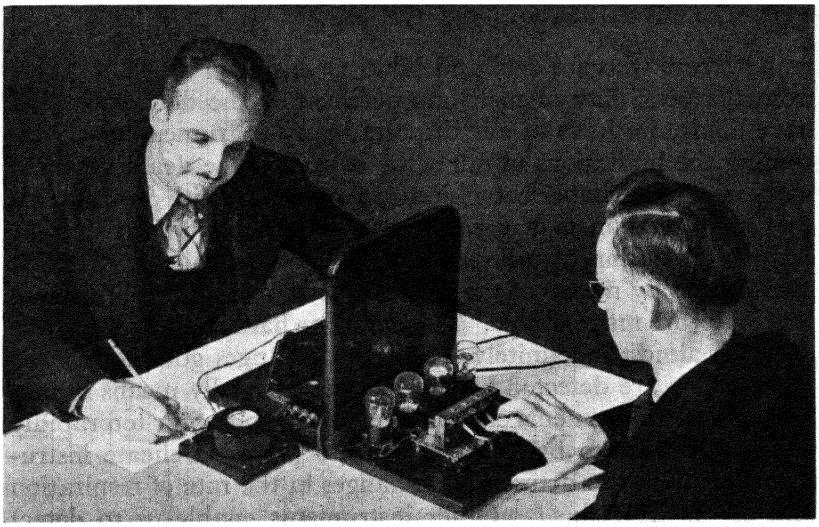


FIG. 70. CHOICE REACTION TIME TEST

This apparatus measures the time required to press one of four keys corresponding to one of four lights. Choice reactions are slower than simple reactions, but often have greater significance for the industrial psychologist. (From Purdue Psychological Laboratory.)

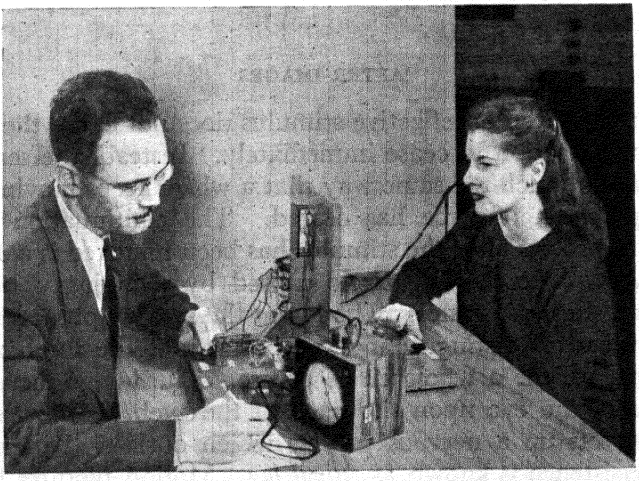


FIG. 71. SIMPLE REACTION TIME TEST

An apparatus which measures in hundredths of a second the speed of one's reaction in pressing a key when a visual or auditory stimulus is presented. (From Purdue Psychological Laboratory.)

many others who are deaf and blind have shown us. But, apart from the possibility of such improvement as the deaf and blind have made, we have at our disposal many instruments for overcoming the limitations of our sense organs. The deaf and those with weak and imperfect vision are provided with instruments that enable them, to a great extent, to overcome their defects. Sounds that cannot ordinarily be heard are made audible by amplifiers. By means of the microscope the structures of minute organisms are made visible. The telescope has extended the range of vision almost indefinitely. Chemical changes going on in the distant stars are detected by the spectroscope. By means of motion pictures movements can be analyzed which occur too rapidly for us otherwise to break them up into parts. Delicate instruments enable us to detect slight changes in the rate of respiration and of the heart beat. Other instruments enable us to detect slight tremors in the earth at remote distances. By means of the X ray we are able to see structures covered by opaque surfaces. These instruments are subject neither to fatigue nor to lack of interest; when they are set to keep watch, they can be relied upon. Through the work of his brain man has compensated for the deficiencies of his senses.

AFTER-IMAGES

The removal of an effective stimulus does not cause the corresponding sensation to cease immediately. Instead, the sensation continues in much the same way that a wheel keeps moving after the application of force has ceased. The continuation of the conscious process after the stimulus has been removed is called an *after-image*. The flaming circle caused by swinging a burning torch is a simple instance. The lag in the sensory process is such that, instead of distinguishing the position of the torch at any one time, we see a whole circle of fire. The image focused by the lens of the eye upon the back of the eyeball, or *retina*, apparently sets up a nervous process which outlasts the stimulus. This persistence is known as *retinal lag*. Motion pictures furnish another instance of the same phenomenon. A great number of still pictures are flashed before us so rapidly that an illusion of motion is created. In this instance, however, the motion which we see depends not only on retinal lag but also upon a peculiar

characteristic of vision, known as the *phi-phenomenon*, which causes us to see movement when different, but stationary, views of an object are presented in the proper sequence. (See page 443.) Lags in the sensory process which cause a continuation of what we have just sensed are called *positive after-images;* those that give rise to a contrast effect are called *negative after-images.* If you watch the rays of a powerful light moving about at night, you will notice that the path remains clearly defined when the rays have left it, and that it is defined by its standing out as an intensely dark streak. In other words, there is a contrast effect.

Some interesting contrast effects can be observed with colors. If a person gazes intently for a few seconds at a gray background with a green card against it, fixing his eyes on the gray, he will experience, when the green card is removed, an after-image of red. If the original card is red, the after-image will be green. If the original color is yellow, the after-image will be blue, and *vice versa.* Colors which give rise to each other as negative after-images are called *complementary* colors; thus, red and green, and yellow and blue are complementary colors. When combined, complementary colors do not mix, but neutralize each other and produce a gray. For example, if a disk, half yellow and half blue, is revolved rapidly, we perceive, not yellow, blue, or any other color, but a neutral gray. The fact that we cannot see a yellow and a blue is caused by the lag in our sensory processes that makes us unable to separate two things coming so close together. The fact that a gray is produced is explained by an elaborate theory of color vision which is beyond the scope of this book.

PERCEPTION AN INTERPRETATION OF SENSORY STIMULATION

(1) *Perception is a twofold act.* It involves a sensation through the stimulation of a sensory end organ and an interpretation of the sensation. We sense the physical world; we perceive what it means. The two processes involved in perception can be easily detected by a simple experiment. Walk about blindfolded and take up one object after another, noting your process of interpretation. Is this *Newsweek*, or *Time*, or *The Nation?* Is the long, round object a pencil or a Tinker Toy? Interpretations are made slowly under such conditions. The two steps sometimes stand out separately even in everyday experiences. Is the faint

noise we hear the sound of an aeroplane in the distance, or of an automobile, or of a gasoline boat, or is it the buzz of a fly? Is this farm implement a potato-digger, a fertilizer-spreader, or a tobacco-planter? Such lags in our mental processes cause us to realize that the act of perception is not complete until a convincing interpretation (whether right or wrong) has been made.

The two steps of perception may also be observed by examining ambiguous and shifting figures. Do you see Figure 72 as the

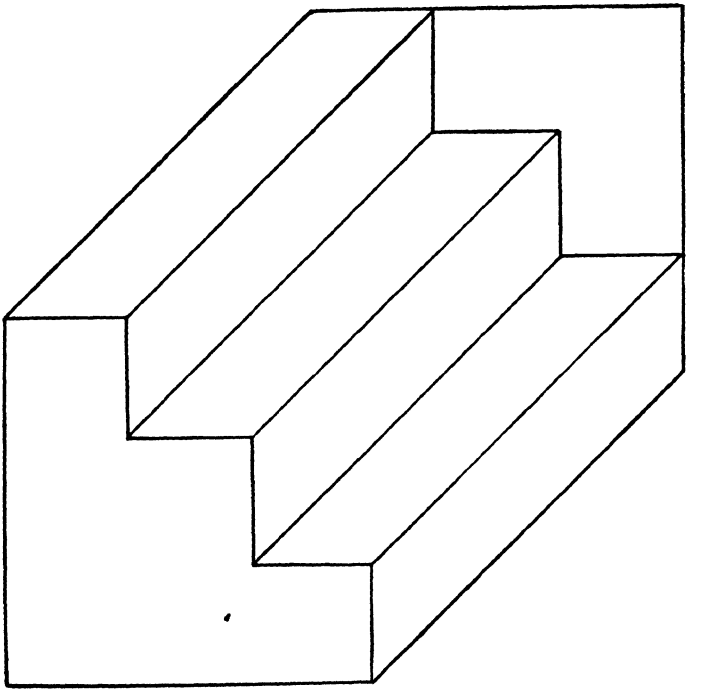


FIG. 72. DO YOU SEE THE STAIRCASE FROM ABOVE OR BELOW?
A perception changes with the interpretation of it.

upper or the lower side of a staircase? It may be seen as either. Since the sensed object remains the same, fluctuations in the way in which we see it must be due to different interpretations.

(2) *Disorders of perception.* Disorders of perception caused by deterioration or lesions in certain areas of the brain show even more clearly the distinctness of the two steps in perception. There are people who can hear speech as a flow of sound, yet

they are unable to cut the flow into words and to understand what is being said. This condition is called word deafness or *sensory aphasia.* There is a corresponding disorder, *alexia,* which involves the ability to read. One suffering from alexia can see the printed page, but the words mean nothing to him. A similar disorder, involving the loss of ability to recognize familiar objects, is called *asymbolia.* It is thought that in each of these conditions deterioration in the parts of the brain adjacent to the sensory areas makes impossible the interpretation of the sensation.

HOW PERCEPTUAL PROCESSES ARE INFLUENCED BY EXPERIENCE

(1) *Detail.* As a result of experience, we learn to supply more detail and to distinguish the nature of objects when only a slight clue is given. For example, we may perceive an apple by its smell alone, or recognize a friend by his walk or by his voice. We "see" a wet street or a heavy piece of iron or a hard stone. In all such instances limited sensory data provide sufficient clues for us to understand the presented object. This is what happens as a person becomes a rapid reader, though his improvement is due also, in part, to his developing a broader eye span; that is, to his learning to see more words at a time. Likewise, in looking at complex objects we may supply missing parts. For example, in reading we frequently supply missing words unconsciously, and are apt to pass mistakes in spelling without noticing them.

(2) *Meaning.* Objects also become more meaningful through experience. A fluffy kitten is, to the small child, something to be handled and squeezed; to the older child, it is something to be played with carefully and gently. The older child has learned that kittens can suffer and enjoy, that there is a limit to their patience and that their claws are sharp. Many adults are unable to perceive the pathos or joy or moral quality of any situation because it is too remote from anything they have themselves experienced. How can a person who has never endured sorrow appreciate the sorrow of another? How can one who has never performed an unselfish act perceive the unselfishness of another? Experience limits what we can perceive and understand; as our experience becomes broader, objects become more meaningful.

(3) *Serviceability.* Through experience we increase the serviceability of our sensorial processes. This is clearly seen in the case

of the blind, some of whom are able to make use of the slight reverberations caused by their footsteps to get about in a familiar room with ease. If they are given soft-soled shoes, they are at a much greater loss. Learning to read through the fingers is further evidence of the fact that, when compelled to do so, we can greatly increase the extent of our perceptions. The use by the deaf of a telephonic device to understand spoken words through their fingers is another instance of trained perception.[17]

(4) *Wrong interpretations.* Experience, by creating mental sets, sometimes causes wrong interpretations. This, as we shall point out later (page 443), is a fertile source of illusions.

(5) *Loss of appreciation.* Experience frequently deadens our appreciation and wonder through long familiarity. Many of us have to visit new places in order to enjoy the beauties of nature, while the beauty about us may delight the stranger. Things become commonplace because they are with us all the time. Regarding social conditions, it would no doubt impress a stranger as absurd that an abundance of economic goods should cause more people to suffer want than does a scarcity. We do not wonder, however, because we have become accustomed to it.

THE VISUAL PERCEPTION OF DISTANCE

Perhaps the rôle of interpretation in perception can be shown most clearly in the perception of distance. The retina, on which the visual image in the eye is focused, is a spherical surface and lacks depth; yet we are able to judge the distance of objects away from us with great accuracy. Why are processes that take place on the retina of the eye and in the brain interpreted as indicating objects external to us, and what are the clues that enable us to estimate their distance? Several factors make distance perception possible.

(1) *Angle of convergence.* When we look at an object two feet away, the angle of convergence (formed by the two lines of vision, one from each eye to the object) is much greater than when an object is ten feet away. The pulling in or out of the eyes so that they will focus upon the perceived object involves muscular activity and, consequently, kinaesthetic sensations. The importance of these sensations as clues for estimating the distance of the object is indicated by the fact that when the muscles involved are

anaesthetized, all objects seem far away. Another indication of their importance is that the impression of distance can be obtained by means of a stereoscope, which causes the light rays to come to our eyes in parallel lines.

(2) *Disparity of retinal images.* When a distant object is viewed, the images focused on the retinas of the two eyes are practically identical; when the object is near, there is considerable disparity. The reader may verify this by looking at a ball first fifty feet away and then only a foot away. When it is only a foot away the left eye will see some distance around the left side and the right eye an equal distance around the right side of the ball. The varying disparity of the views obtained by the two eyes serves as a clue for the perception of distance.

(3) *Accommodation of the lenses.* When we look at a near-by object, the lenses of our eyes bulge; when we look at a distant object, they flatten. The accompanying sensations are aids in judging the distance of the object.

(4) *Angle of elevation.* The movements of the eyes upward or downward also serve as clues for estimating distance. Ordinarily, we walk with our eyes fixed on the sidewalk so that we see the walk fifteen to twenty-five feet ahead of us. As we lower the eyes, we see the walk nearer to us. As we raise them, we see more distant objects. The kinaesthetic sensations involved in raising or lowering our eyes are interpreted in terms of distance. The apparent nearness of distant objects when looked at over a cliff shows the importance of angle of elevation.[18] Artists recognize this principle by placing at the top of a picture objects which they wish to make appear far away.

(5) *Size of the retinal image.* When we see an object in the distance, the retinal image is smaller than when the object is near. For example, the retinal image of a man five hundred feet away is smaller than when he is only fifty feet away. We do not interpret the difference in the size of retinal images, however, as meaning that the man is varying in size, but that his distance from the observer is changing. Accordingly, knowledge of the size of an object is a clue for judging its distance. Artists make use of this principle in painting. Near-by objects loom up; distant ones are made small.

(6) *Clearness of outline or form.* Objects which are far off cannot be seen in detail and are more or less blurred and indistinct.

Hence, when we are able to see little if any detail of an object, we infer that it is far off. Again, artists make use of this principle by washing out all detail of objects that are supposed to be in the background, and by painting in the detail and the brighter colors of objects close at hand. The tendencies to consider blurred objects as distant and those making large retinal images as near are responsible for the illusions of distance and largeness that we experience in a fog.

(7) *Interposition.* Our view of objects in the distance is often partly obstructed by other objects. We know that those which obstruct our view are nearer than the ones that are partly obscured. This provides us with some insight into relative distances, and it accounts for the greater ease of judging distances when we are looking over a field covered with various objects than when we are looking over an open prairie.

(8) *Parallax.* Focus your eyes upon an object; then move your head to the right or left. Objects that are nearer than the point of fixation will seem to move in the opposite direction from your head, while those that are farther away will seem to move in the same direction. Objects that are very near the point on which your eyes are focused will appear to move only a little. The farther objects are from the point of reference, the more they will seem to shift when your head is moved.

EYEDNESS

It is generally thought that both eyes make the same sort of contribution to vision. This is a mistake. With the passing of infancy, one eye usually becomes dominant. Since this eye does the focusing and takes the leading part in seeing, it is called the dominant eye. You can discover which of your eyes is dominant by a simple test. Make a small hole in a sheet of paper; then hold the paper about fifteen inches from your eyes, and look through the hole at a small object a few feet away. Without moving the sheet, cover your right eye. If you no longer see the object, you are right-eyed; if you still see it, you are left-eyed. The test should be repeated two or three times. Another method is to place in a stereoscope a different picture in front of each eye. Looking into the stereoscope with both eyes open, you will see first one picture, then the other; but you will see one for longer

periods than the other. The one that is seen longer is seen by the dominant eye.

About 30 per cent of adults are left-eyed, a small percentage are ambi-eyed, and the rest are right-eyed. In a study dealing with the importance of the dominant eye Crider investigated the marksmanship performance of two untrained companies of naval recruits and another group of 856 men. He found that the purely sinistral men made the worst showing, while the purely dextral men made the best showing.[19] Knowledge of eyedness is important when one is dealing with nervous and unstable children. Many of these have been taught to write with the right hand, though they are left-eyed. If other tests besides that for eyedness indicate that such children are left-handed, they should be encouraged to use their left hands in writing.[20] Not to do so may result in a defect of speech (see page 524).

THE PERCEPTION OF TIME

Any act or any experience requires a minimum of duration. Time, as lived and experienced, is made up of these moments of duration and is called the conscious present, in contrast to the logical present, the name we give to the dividing line between the past and the future. The conscious present, instead of being a sharp point separating the past and the future, is, as James said, more "saddle-backed." [21] The length of time embraced by the conscious present varies. If we should count, one by one, the strokes of a metronome beating at the rate of 120 strokes a minute, our conscious present would be half a second long. If we were counting the strokes in groups of six, that is, if we included six beats in one of our reactions, our conscious present would then be three seconds long. Physiological conditions may also affect the duration of the conscious present. Intoxication caused by hashish speeds up our conscious present to such an extent that, when we are talking, the first part of a sentence seems remote before we can complete it; and if we enter a short street, it seems as though we should never reach the end of it. Other activities also influence our perception of time. When we are greatly interested in what we are doing, we are apt to crowd so much into the conscious present that time seems to pass quickly. It is for this reason that an hour seems shorter to an instructor than to

his students. Factors of a more mechanical nature can have the same effect. In hearing sounds, for instance, we have a tendency to perceive high-pitched tones as longer in duration than low-pitched tones.[22]

Ordinarily we measure time intervals by a watch or by the position of the sun. When deprived of such objective measures, we make use of changes in consciousness and in our physical states. And, indeed, our perception of time is often more important psychologically than is an exact measurement of time. Objectively, a week is a week and a year a year, but the equality often seems to disappear. The psychologist asks such questions as: Why does time spent waiting for some one seem so long? Why did last week pass so quickly? Why does a year seem longer to a child than to an adult? Changes in physiological states are probably an important basis for the estimation of time. If any changes occur in consciousness or if we become tired, we judge the time to be long. The quality of the conscious states we pass through also influences our judgment. Five minutes seem longer in a dentist's chair than at a musical comedy. Both seem longer than five minutes of absorbed study. Two seconds of the kind of time that is generally thought of as empty, that is, time filled only with bodily sensations, seem longer than two seconds that are filled with interesting events. For intervals of less than two seconds the reverse is true. Periods less than three quarters of a second are apt to be overestimated; longer intervals are apt to be underestimated. As we grow older weeks, months, and years seem shorter than they did when we were children.[23]

The reliability of estimations of time by the average person has been studied by a number of investigators. Their general conclusion has been that our judgments are a very poor substitute for a clock or a watch. Münsterberg asked a large group of students to estimate the time between two clicks. The clicks were made exactly ten seconds apart, but the students varied in their estimates from half a second to sixty seconds. This clearly shows that one's judgment of a temporal interval has little possibility of being even approximately correct.[24]

According to Janet, years seem longer to the young than to the old because a year *is* relatively longer to a child.[25] To a child of ten, a year is one tenth of his life, whereas it is only one thirtieth of the life of an adult thirty years old. James thinks

the discrepancy is better explained in terms of difference in interest and zest.[26] To the youth, life is full of interesting events; to the adult, it is rather monotonous. Hence, as the youth looks back over a year, many interesting events stand out, whereas an adult looks back over what has become commonplace through long familiarity. Moreover, youth is impatient to get somewhere, whereas the adult often likes to tarry.

ERRORS OF PERCEPTION

Since perceptions, instead of being mere photographs of physical events, are largely made up of the interpretations of the observer, we should expect to find many errors in them. "Seeing is believing" is not a particularly convincing statement to one who understands the imperfections of our sensory organs and the influence of bias and emotions on our interpretation of what is seen. Every one has noticed that mothers find it hard to perceive the imperfections of their children. The thick-skinned and the thin-skinned find it hard to evaluate social situations correctly. The strong partisan finds it hard to perceive political realities. The lover is not the most reliable judge of the beloved. Desires have a profound influence on our perceptions.

(1) *Excitement.* That excitement increases errors of perception is shown by the following account of a "planted" assault.

> Into a hall in which a congress of psychologists were holding a meeting, a clown rushed madly pursued by a negro, revolver in hand. They stopped in the middle of the room, fighting; the clown fell, the negro leapt upon him, fired, and then both rushed out of the hall. . . . The president asked those present to write a report immediately, since there was sure to be a judicial inquiry. Forty reports were sent in. Only one made less than 20 per cent of mistakes in regard to the principal facts; fourteen had 20 per cent to 40 per cent of mistakes; twelve from 40 per cent to 50 per cent; thirteen more than 50 per cent. Moreover, in twenty-four accounts, 10 per cent of the details were pure inventions, and this proportion was exceeded in ten accounts and diminished in six. Briefly, a quarter of the accounts were false.[27]

(2) *Suggestion.* Suggestion is another source of error in perception. One of the authors once uncorked a bottle in his class after telling his students that there was a very delicate perfume

in it, and requested that the members of the class raise their hands as soon as they detected the odor. Although the contents of the bottle were odorless, every hand was soon raised. Sleight-of-hand performers take full advantage of our suggestibility in causing us to see what they wish us to see. It is reported that the yogis of India are able to cause the gaping and admiring crowds to see a tree grow fifty feet in a few minutes from a seed. Sea-sickness seems frequently to be produced by the mere expectation of it. Even where physical conditions give less encouragement, the repeated suggestion that he is sick may cause even the strongest to feel ill.

(3) *Normal illusions.* Some errors of perception are made by every one and are in a constant direction. Every one is inclined to see a vertical line as longer than a horizontal line of the same length. It is a general error, when coming out of the cold into a heated room, for a person to overestimate the temperature of the

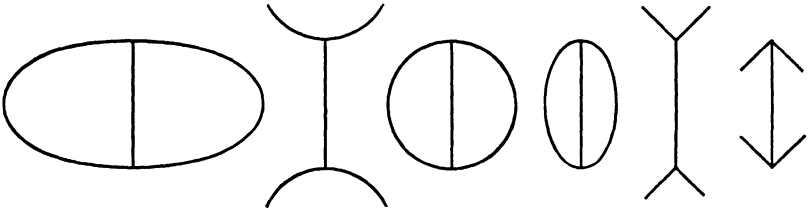
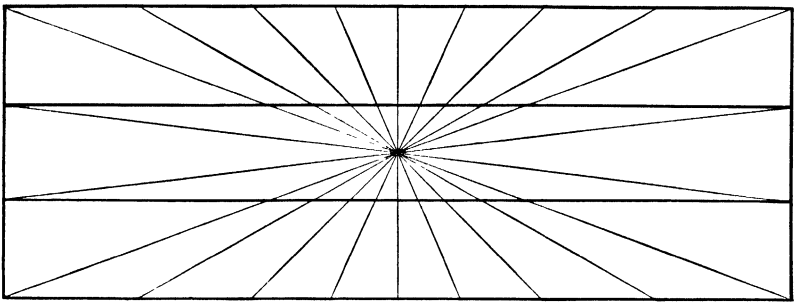


FIG. 73. EXAMPLES OF THE TERMINAL ILLUSION

The vertical lines are all of equal length.

room. Perceptions like these that fail to give the true character of the object presented are called *illusions* or false interpretations. Because they are experienced by every one, they are often called "normal" illusions. Illusions may be divided into three groups: (a) those that are due to the nature of the stimulus; (b) those that are due to subjective conditions; and (c) those that are due to the nature of the sensory organs.

(a) Illusions due to the nature of the stimulus. Vision furnishes the best examples of illusions of this type. Several normal visual illusions are shown in Figures 73 and 74. Visual illusions have been subjected to extensive study, and many laws concerning them have been discovered.[28] These findings are of particular interest to artists, painters, decorators, printers, and architects.



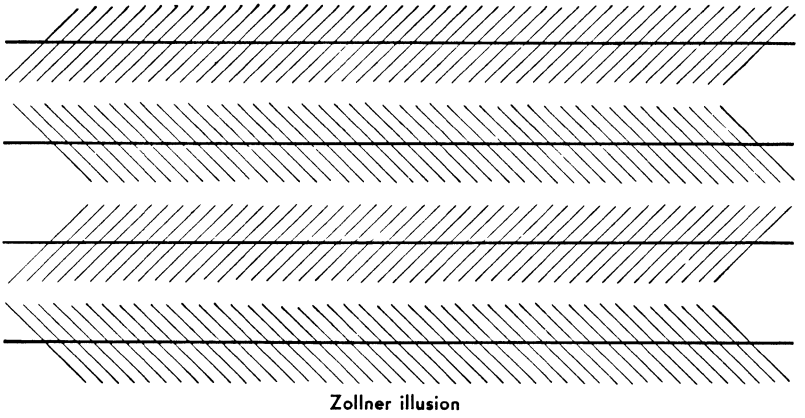


FIG. 74. THE HORIZONTAL LINES IN THESE FIGURES ARE ALL STRAIGHT AND PARALLEL

If the lines of a finished building are to "look" straight and square, it is often necessary to construct them with slight bends and curvatures, in order to overcome certain tendencies to see things different from what they are. For example, if the end of a building is like the drawing in Figure 75, we see the line *AB* as dropping slightly in the center. To overcome this, the Greeks raised the center of such a line, thus giving the final construction the desired appearance.

It is interesting that chickens and men make the same mistake in judging the size of such figures as those shown in Figure 76. Révész taught a hen to peck corn always from the smaller of two figures. Sometimes circles, sometimes squares, sometimes triangles were used. In every case, one of the figures was smaller

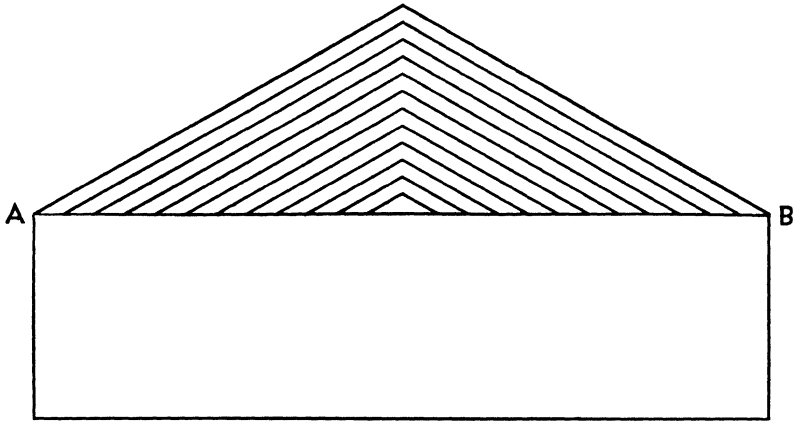


FIG. 75. IF THE END OF A BUILDING IS BUILT LIKE THIS THE LINE *AB* WILL SEEM TO SAG

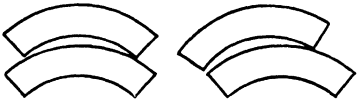


FIG. 76. IN EACH PAIR, WHICH IS LARGER — THE UPPER OR LOWER FIGURE? MEASURE THEM

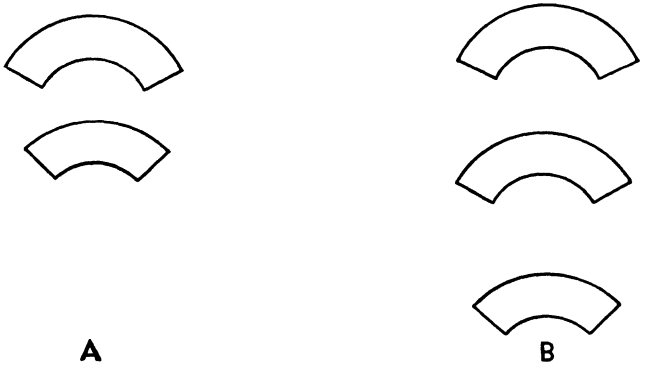


FIG. 77. EVEN CHICKENS EXPERIENCE OPTICAL ILLUSIONS

Révész demonstrated this with figures like those shown above.

than the other. After the hen had been taught to peck the corn lying in the smaller figure, Révész put corn in the figures shown in *A*, Figure 77. The hen pecked from the smaller figure. Finally

Révész placed corn in the figures shown in *B*. The upper two figures are objectively the same size, but the top one seems smaller. The hen, as a rule, upon seeing corn in the three figures, would eat first from the bottom figure and then pass by the middle one and eat from the top one. In the majority of instances the corn in the middle figure was left untouched.[29]

A very common illustration of illusions due to the nature of the stimulus may be found in motion pictures. Though we speak of "moving" pictures, actually the movement is in our perception, not on the screen. A series of stationary pictures, each slightly different from the preceding one, is flashed on the screen at the rapid rate of twenty-four pictures per second. We "see" these still pictures as moving; that is, we supply the movement as an illusion. The illusion of movement found under these conditions is called, as we have mentioned before, the *phi-phenomenon.* The laws of the phi-phenomenon have been carefully studied, beginning with the work of Wertheimer.[30]

(b) Illusions caused by subjective factors. Illusions caused by subjective factors are those which are brought about by our expectations, interests, and habits. A famous simple example is known as Aristotle's illusion. Cross your index finger with the one next to it. Now, with your eyes closed, have some one place within the V formed by your fingers some object such as a pencil. You will have the feeling of two objects rather than one. The reason for this is that ordinarily whenever the opposite surfaces of two fingers are stimulated two objects are involved. Mistaking a piece of paper or a dandelion head for a lost golf ball illustrates the importance of expectancy and desire. Mistaking the creaking of the house for the footsteps of a burglar shows the importance of anxiety and fear in causing illusions.

(c) Illusions due to the nature of our sensory organs. For an example of illusions caused by the nature of our sensory organs, run the points of a pair of compasses over the lips. The points will seem farther apart when just under the nose than at any other point. An individual may report that a sound is heard directly in front of him when in reality it is directly behind him, because the ears are incapable of providing correct perceptions in this plane. A vertical line seems longer than a horizontal line of the same length. The seemingly great size of a cavity in a tooth when the tongue is inserted in it is another illusion of this type.

WAYS OF MAKING OUR PERCEPTIONS MORE RELIABLE

There are several ways of determining whether we are seeing accurately or are experiencing an illusion. In the first place, we may seek the confirmation of different senses. A stick that appears bent in the water may be found to be straight by running our hands up and down it. In the second place, we may simplify the conditions under which the observation is made. In the case of the stick, we could do this by removing it from the water. In the case of the Hering illusion (Figure 74), we can simplify the conditions of observation by laying a ruler over the confusing lines. In the third place, we should check our experiences with those of other people. Of course, in the case of illusions due to the nature of the stimulus or to the nature of our sense organs, every one is "fooled," and confirmation by others is simply evidence that they too are experiencing the illusion. But in illusions due to our subjective conditions, it is very helpful to check with others. The creaking stairs which bother you probably sound not at all like a burglar to your roommate.

The importance of simplifying the conditions and isolating the object to be observed is recognized by all scientists. It is illustrated in the accompanying figures. Find the K in Figure 78 *A* and the 4 in Figure 78 *B*. To hide a thing to be seen in a mass of irrelevant material makes an interesting puzzle, but should be avoided where accurate observation is desired.

To increase the reliability of our observations, we should also correct all sensory defects, maintain alertness, avoid emotional disturbance, preserve open minds, remember what to look for, and make allowances for ill health, moods, and attitudes. Above all, we should realize that accurate observations are hard to make, and we should be on the lookout for errors and ways of eliminating them. A man's testimony may be quite inaccurate in spite of his desire to give an honest report.

DISORDERS OF PERCEPTION

The illusions just discussed are in no sense abnormal or pathological. There are, however, pathological disorders of perception, which may be caused by a diseased condition of the sensory apparatus, as when an infection of the eye causes blindness or dis-

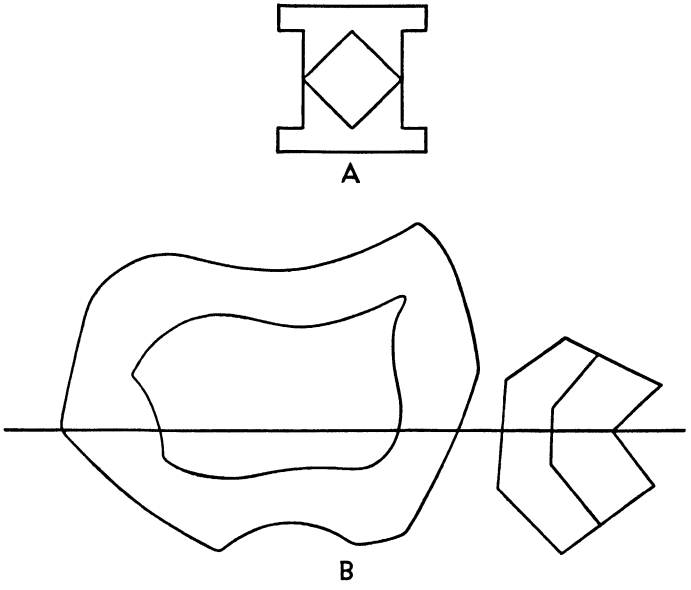


FIG. 78. FIND THE K IN *A* AND THE 4 IN *B*: THINGS HIDDEN AMONG IRRELEVANT MATERIAL ARE DIFFICULT TO SEE

ordered vision, or by a person's not using his sensory equipment, as when a man becomes blind even though his visual organs are intact. The latter conditions are called functional disorders, and they are of more interest to the psychologist than those due to organic conditions.

Certain functional disorders are classified as *functional anaesthesias*. Those who have read the history of witchcraft will recall that the presence on a person's body of areas insensitive to pin pricks was regarded as conclusive evidence of witchcraft. Perhaps many readers doubted the existence of such areas, and suspected that the poor old women on whom they were found were not given a fair test. We now know that such disorders do sometimes occur. Before physicians were careful not to make suggestions regarding such areas, they were frequently found in hysterical patients.

The following is a case of functional anaesthesia which McDougall reports that he treated by suggestion:

A youth of flabby moral texture was sent home from the Mediterranean with lower limbs paralyzed and anaesthetic; a diagnosis of

post-diphtheritic paralysis had been made. However, the signs were all in favour of a functional paralysis; and it appeared that, though he had suffered from a sore throat, the paralysis had set in just about the time that the transport on which he was going to the Gallipoli front had come within sound of the guns on that tragic grave of so many brave men. I tried hypnotic suggestion; but, though he passed into hypnosis, I could not fully control him; when he was forced to move his legs, he fell into weeping and moaning. I therefore decided to proceed more slowly by waking suggestion. Following an explanation that the anaesthesia would recede day by day and that, when it was gone, he would have full use of his legs, I ostentatiously mapped the upper limit of the anaesthesia on both limbs each morning, and in this way drew off the anaesthesia like a pair of stockings, drawing it two or three inches lower each day.[31]

Other senses may also become functionally upset. An individual may become insensitive to certain odors, not because of some organic defect, but because of some emotional disturbance. The same is true of the sense of taste and of organic sensations. Janet tells of a man who, as the result of being struck in the face by a greasy rag, became blind and remained so for four years. In another case, a woman was struck in the face while working in a laundry. Her face was slightly burned, but none of the water penetrated her eyes. Nevertheless, she became completely blind for two years.[32]

Functional anaesthesias have several peculiarities. They conform to the popular conception of functional units. That is to say, instead of the anaesthesia affecting an area that would be involved if a nerve trunk were destroyed, it may affect part of an area which includes several nerve trunks. The anaesthesia may be produced by suggestion, and is frequently so caused among hysterics. It is variable in character. Hysteric episodes or fits may aggravate the disorders or eliminate them. During sleep the disorders may disappear. Drugs, such as alcohol, chloroform, morphine, and hashish, may cause them to vanish, and suggestion may modify them. For example, a physician may merely pretend to be treating his patient with electricity, but if the patient believes that he is being so treated, there will be contractions of the muscles similar to those caused by electricity. Finally, functional anaesthesias are not consistent in their appearance. Janet proposed to one of his patients that she say "yes" when she felt

herself touched with an instrument and "no" when she did not feel it. (Her vision was obstructed so that she could not see when she was touched.) Whenever Janet touched the normal areas of her body, she would say "yes"; when he touched the supposedly anaesthetic parts, she would naïvely answer "no." [33]

Recovery from functional disorders frequently seems mysterious. The whole personality must be understood. Regarding such recoveries Morgan makes the following comment:

> When a cure is effected, it is not of a definite organic lesion, but of something deeper in the psychological mechanism of the victim. We must understand that seeing is not simply the function of the eye with its nerves to the cortex. *It is a function of the whole personality, using the optic nerves and visual apparatus in a complete integration.* [Italics ours.] It is obvious when one becomes blind with no disturbance of the optic apparatus or its connections, and when the vision returns as abruptly, that one must look to the rest of the personality for the explanation.[34]

INFLUENCE OF PERCEPTUAL DEFECTS UPON PERSONALITY

In Chapter II reference was made to the handicaps which such sensory defects as deafness and blindness place upon an individual. The blind, in addition to being deprived of valuable information, are apt to become excessively timid and cautious. The deaf and the hard of hearing, being deprived of social contacts, are likely to be suspicious. Noticing that people are talking, but rarely able to understand what is said, they are more inclined than normal people to believe that they are being talked about.

The deaf child in school is inclined to do his best to hide his defect. He taxes himself to the utmost in an effort to understand his teacher. Yet no matter how hard he tries, he makes mistakes. The teacher who regards these mistakes as indications of disobedience or carelessness is apt to scold the child for them. If this happens, the child, already suffering anxious tension and trying to do his best, is filled with the sense of injustice. He grows resentful, and lives more and more within himself. Deprived, in large measure, of the instruction of the teacher and the stimulation of hearing other pupils talk and recite, he becomes a "retarded pupil." The retardation of the deaf, however, is not wholly due to lack of hearing; for, at least in many cases, the

conditions which lead to deafness also injure the central nervous system and thereby impair the general intelligence.

To guard against aggravating the effects of blindness and deafness, children with these handicaps should very early be given special training. Every effort should be made to stimulate them to use their other senses to the fullest degree, and they should be helped to develop self-reliance and confidence. Solicitude should be avoided, for it may prevent them from putting forth the effort necessary to make the most of their lives; it may cause them to cease trying to take care of themselves and make them expect others to provide for them.

Perceptual defects that are functional in origin indicate that something is radically wrong with the personality. When a person gives up the use of his eyes, for example, something is badly amiss. That something must be found and, if possible, corrected. If the functional disorder continues, the individual, besides depriving himself of many experiences that would be helpful, develops the habit of shirking; and his personality becomes more and more abnormal.

The ability to ignore sensory stimulation, as when we become negatively adapted to sounds and voices and even to visual stimulation, throws considerable light on the nature of perceptual processes. It shows that perception, instead of being a passive mirroring of the world about us, is an integral part of the process of adjustment. If the sensory intake brings us only tension and trouble, we have ways of shutting it off. In thus protecting ourselves from prolonged tension, we act as we do regarding unpleasant memories. As we modify memories that are unpleasant to recall and, if we are unable to do this, repress them, we similarly seek to interpret unpleasant sensory intake in a way that is congenial to us, and, if we fail, we repress this also. Such repression occurs only in seriously maladjusted individuals, and is pathological. Yet the abnormal is only an accentuation of the normal. Because the abnormal is the running wild of a normal process, it frequently throws light on the latter. The function of perception is to help the organism to make adjustments. If, instead of doing so, it makes adjustments more difficult, the personality may discard some of its perceptual ability. To what extent this is voluntary it is difficult to say. A person certainly does not stutter because he consciously wishes to do so. Yet he

may regard the stuttering as an explanation of his social ineffectiveness. This may cause continued stuttering, because he would rather attribute his ineffective personality to stuttering than to some cause more basic but also more unpleasant for him to contemplate. A person who develops a severe headache when something distasteful is to be done does not consciously desire the pain, but it is significant that it nonetheless resolves a tension, and is less *undesirable* than the task which is escaped. Similarly, one does not consciously desire blindness, but blindness may be the easiest way out of some difficulties, especially if they have been accompanied by prolonged worry and fatigue.

EXTRA-SENSORY PERCEPTION

Within the last few years a group of psychologists, headed by Rhine of Duke University, have reported some sensational experimental results in perceiving without the use of a sense organ. In popular language this is known as *mind reading*, or *mental telepathy*, when we are supposed to perceive what some one else is thinking about, and *clairvoyance* when we perceive something which no one else knows.

Let us take as an example the performance of two individuals who are not in view of each other. One concentrates on a number between one and five; the other attempts to call this number correctly. If the latter succeeds in more than twenty per cent of his trials, he has given what might be called evidence of mind reading. Again, if a deck of twenty-five cards, containing five cards each of five designs, can be called correctly in more than twenty per cent of the trials, some proof of the existence of clairvoyance would have been established. Rhine and a number of other independent investigators claim that their subjects have accomplished both those results.[35] Many psychologists feel that such an accomplishment is impossible and that the apparent finding in favor of it is due to an experimental error of some kind in the procedure. It is, perhaps, wisest to suspend judgment on the existence of extra-sensory perception.

SYNAESTHESIA

The mistaking of the stimulation of one sensory organ as the stimulation of another is called *synaesthesia*. The most common

form of this is the perception of tones as colors. "Sensations of color have also been reported to accompany sensations of taste, smell, pain, pressure, or temperature. There have been rare instances where subjects have reported the experience of a sound sensation when presented with a light stimulus; others have reported smells and tastes when presented with a sensation from another field. Quite commonly an elementary sensation results from hearing a spoken word."[36]

Synaesthesia is probably due to incomplete differentiation of function of the various sense organs. Any response of an infant to a stimulus involves practically the whole individual. With growing maturity, muscular responses involve chiefly the muscles needed, the rest of the body remaining relatively at ease. Very possibly a similar development of differentiation takes place on the sensory side of experience. During infancy, sensory stimulation probably involves the whole of the sensory areas in the brain. As we develop, different parts of the sensory area take the lead in different sensory experiences, the other parts of the cortex remaining relatively passive. In the case of those who experience colored-tones or other forms of synaesthesia, there has probably been an arrest of the usual differentiation of sensory areas, and sensory stimulation, therefore, is responded to by more than one mode of sensation, as was probably the case with all of us during infancy.[37]

THE RELIABILITY OF TESTIMONY

What is the value of our testimony regarding our experiences? A number of facts have been pointed out in this and the preceding chapter which should cause the careful reader to take with a grain of salt the popular saying, "Seeing is believing." In the first place, we have learned that our biases, prejudices, and desires greatly influence our perceptions. We have also learned that other conditions frequently make correct perception difficult. The chances of erroneous perception are greatly increased by excitement of any kind, and yet we are frequently asked to submit as testimony our recollection of observations which took place under excitement.

To the errors due to faulty observation must be added those due to poor memory. The memory of an event gradually fades

with the passage of time until only a few dim outlines of the original experience can be recalled. The reader can easily discover this for himself by trying to recall his first day in school, or even his first day in high school. If he has been out of college five years, he will probably find the same thing true of his first day in college. Although all of these days were for most of us exceptionally interesting, we are able to recall only the barest outline of what happened, and we cannot be sure that even this is accurate. What we have said of the disorders of recognition should be sufficient to convince us of the pitfalls of memory.

In addition to the normal fading out of memory traces through disuse, we must keep in mind that we tend to repress events that are unpleasant to recall, and that, on the other hand, we are liable to dress up our past in a way that will make it a source of greater satisfaction to us. Furthermore, emotional excitement may prevent us from recalling at all what we might otherwise have remembered. Unfortunately the feeling of certainty, as we have seen in our study of the disorders of recognition, is no guarantee of accuracy. Even the most honest person may be mistaken in his efforts to report his past observations.

When testimony is given under conditions that produce nervous tension, as it frequently is, the chances of error become all the greater. In addition, we may be asked leading questions, that is, questions which suggest the answer; and this adds yet more to our confusion. With all of these sources of error, there is little wonder that respected and honorable men should give different accounts of the same events. We know that children report more accurately what they have witnessed if they are permitted to tell what they have to say in their own words and without prompting or questioning. It is quite likely that the same is true of adults.

SUMMARY

All of our reactions are to stimuli received through sensory end organs. End organs are bodily structures that are sensitive to specific types of stimulation. Ability to adjust to our environment depends upon our sensory equipment, and individual differences in this equipment account for differences in ability to do different kinds of work. They also account, at least in part, for differences in musical and artistic talent. Tests are available to

measure the several aspects of sensation, particularly visual and auditory sensitivity. Our senses are limited in that each responds only to stimuli within a certain, rather narrow range, and in that changes in stimuli below a certain amount cannot be detected. We are saved from prolonged and unnecessary stimulation by adaptation of sense organs, a phenomenon which makes an end organ less sensitive to a stimulus after a period of stimulation.

Reaction speed, or time, varies with the sense organ involved. It is most rapid to a touch stimulus, next to sound, and slowest to pain.

After-images are experiences which are due to a continued activity of a sensory organ after a stimulus has been removed. In vision, after-images may be positive (the same color and brightness as the stimulus) or negative (opposite in brightness and complementary in color).

Perception always involves the interpretation of sensory stimuli. Experience affects very markedly the meaning of perceptions: (1) by enabling us to supply detail from slight clues, (2) by increasing the associations upon which meaning depends, (3) by giving practice in interpreting clues important to us, (4) by supplying a mental set which may distort a perception, and (5) by causing a decrease in our appreciation because of familiarity and monotony. Distance, or depth, perception depends upon several physical conditions: (1) the angle of convergence of the eyes, (2) disparity of retinal images, (3) accommodation of the lens, (4) the angle of elevation, (5) size of retinal image, (6) clearness of outline, (7) interposition, and (8) parallax. We are right- or left-eyed, in much the same way that we are right- or left-handed. As it is usually advisable that eyedness and handedness should correspond, a test for eyedness is helpful in determining which hand a child should be taught to favor.

We overestimate periods of time spent, (1) when we are tired or exhausted, (2) when we are enduring unpleasant experiences, (3) when we are without activity or something to do, and (4) when we are very young. Judgment of time is, in general, very inaccurate.

Perceptions are distorted by (1) excitement, (2) suggestion, and (3) normal illusions. Illusions are of three types: (a) those due to the nature of the stimulus, (b) those due to subjective factors, and (c) those due to the nature of our sensory end organs. To

make our perceptions more reliable, we should seek confirmation of the other senses, simplify the conditions of observation, check our experiences with those of other people, and be sure our sense organs, emotional state, and attitude are not influencing or biasing us.

While most illusions are normal and therefore have no serious effect upon personality, certain other disorders of perception, known as functional anaesthesias, are indicative of profound and deepseated maladjustment. Perceptual defects often have a marked effect upon personality — for instance, when they cause the blind or deaf to become suspicious. Synaesthesia — the "mixing of sensations" — is the confusing of sensations from two different sense modalities, most frequently auditory and visual. It is more common in children than in adults.

Testimony, which is only our memory of perceptions, is likely to be unreliable because of the numerous things which may affect perception itself plus the other things which may affect memory. We should be on guard against accepting as accurate any one's report of his perceptions, even though we know that he is an "honest and reliable" person.

QUESTIONS ON THE CHAPTER

1. What is the rôle which our sensory equipment plays in our everyday behavior?
2. List the senses we have, and compare this list with man's traditional "five senses."
3. In what ways may individuals differ in their visual sensory equipment?
4. In what ways may individuals differ in their auditory sensory equipment?
5. Will different sense organs respond to the same stimulus?
6. Why are we able to localize a sound fairly well even though we cannot see the source?
7. What is Weber's law?
8. What is sensory adaptation?
9. How fast can one react to a stimulus? How does the speed of reaction depend upon the nature of the stimulus?
10. What are complementary colors?
11. What is the principal difference between sensation and perception?
12. How are perceptual processes influenced by experience?

13. What factors enable us to see depth or distance?
14. What is meant by eyedness and what is its significance?
15. What general kinds of errors do we make in estimating periods of time?
16. What factors tend to make our perceptions inaccurate?
17. Why are certain common mistaken perceptions called "normal illusions"?
18. What are the three types of normal illusion?
19. What safeguards may be taken to make our perceptions more reliable?
20. What are the main differences between a false perception due to a normal illusion and one due to a functional anaesthesia?
21. In what ways may sensory defects influence personality development?
22. What is synaesthesia?
23. List a number of factors discussed in this chapter which show that testimony is likely to be quite unreliable.

QUESTIONS FOR DISCUSSION

1. How do you account for the fact that when one has a cold all foods seem to taste alike?
2. If musical talent depends upon the sensitivity of the ear, does every one with a very keen ear therefore have talent for music?
3. What jobs or occupations require good color sensitivity?
4. What practical situations call for rapid reaction time? Other things being equal, would a pedestrian respond more rapidly to the sight of an approaching car or to the sound of the horn? Why?
5. Does a blind person develop more acute hearing than the normal person, or simply learn to use his hearing more effectively?
6. How do you explain the fact that we see depth, or the third dimension, in a stereoscope?
7. Recount an experience where you overestimated an interval of time. Give one where you underestimated it.
8. Give some examples of normal illusions used in designs, paintings, or decorations.
9. May sensory defects be both a cause and an effect of personality maladjustment? Explain.

SUGGESTED READINGS

H. E. Garrett, *Great Experiments in Psychology* (revised and enlarged; D. Appleton-Century Company, 1941), Chapter XIV. An excellent summary of the early studies in reaction time.

F. L. Ruch, *Psychology and Life* (Scott, Foresman and Company, 1937), Chapter XIV. Further discussion of the importance of our senses in everyday living.

MORE ADVANCED READINGS

E. G. Boring, *Sensation and Perception in the History of Experimental Psychology* (D. Appleton-Century Company, 1942).

J. P. Guilford, *Psychometric Methods* (McGraw-Hill Book Company, 1936). A treatise on the mathematical methods of analyzing psychophysical data. Recommended to those who still believe psychology is not a quantitative science.

CHAPTER THIRTEEN

Imagination: When and Why We Make Up Things in Our Imagination and Dreams

When we are hungry we think of food; when lonely we think of friends. In such instances we become conscious of what would satisfy us, though the desired object is not present. These are instances of imagination.[1] The significance of this capacity is evident. There are organisms which, when dissatisfied or in a state of disequilibrium, must wait for a stimulus to aid them in discovering what they need. And the same thing, too, happens with human beings. We may be discontented and ill at ease without knowing what is the matter. Then if we luckily meet an old friend, our unrest gives place to a state of satisfaction. In such a case our need is defined with the aid of a stimulus. Frequently, however, we are able to imagine what would satisfy us, that is, to discover without a stimulus what would restore our equilibrium.

Sometimes imagination is a guide to action, at other times it is a source of enjoyment, and at still other times it is an outgrowth of anxiety. When we sit before our fire and idly dream of what we should like to do, or recall the pleasant events of the past, we make of imagination a source of enjoyment. When a small boy imagines that he is a fireman and acts the part as best he can, imagination is a guide to action and, at the same time, a source of enjoyment. Similarly, at a higher level, imagination may guide action. Artists, scientists, and social philosophers imagine what would be desirable or what would work, and attempt to embody their ideals in practice. But we do not always

imagine the useful and desirable. Placed in a world of uncertainty and sorrow, we at times imagine the death of loved ones, or other possible sources of sorrow. Such acts of imagination are outgrowths of our anxieties and fears.

IMAGINATION AND PERCEPTION

Imagination occurs when no external stimulus corresponds specifically to our conscious ideas; perception, when there is an obvious correspondence between sensory stimulation and consciousness. Though it is easy to distinguish imagination from perception in definition, it is not always easy in real life to tell whether we are imagining or perceiving, as an occasional mistake reminds us. Ordinarily we are able to distinguish images from perceptions by the following differences: (1) The perceived object is usually more realistic and stands out in greater detail than the imagined one. (2) We can examine a perceived object in such a way as to get more knowledge about it. Images are too unsteady and fleeting to serve as sources of new information. (3) By stopping the functioning of our senses, that is, by closing our eyes or by putting our hands over our ears, we can cause perceptions to disappear. Images are, if anything, made more vivid by so doing. (4) Finally, perceptions fit in with our general understanding of reality; images frequently do not.

Because children have not learned these differences, they sometimes confuse images and perceptions. If a ghost were to appear to an adult, the latter would know he was imagining; but a child, having no clear conception of reality and phantasy, might well take the "ghost" to be a perception. The images of children are also more vivid than those of adults. They frequently experience a very vivid type of imagery called *eidetic images*. In an eidetic image one can see details, such as the number of windows in a house, that do not usually appear in ordinary imaginings.[2]

An experiment reported by Titchener [3] shows how strong images may be confused with weak sensations:

> If, for instance, the observer is seated in a well-lighted room facing a sheet of ground glass, behind which is a screened projection lantern, it is often impossible for him to decide whether the faint colours that he sees on the glass are due to the lantern or to his own imagination. You say to him: Imagine that there is a picture of a banana on the

glass! . . . and in many cases it makes no difference at all whether you show a strip of very faint yellow light from the lantern or whether you shut off the objective light altogether. The strip of seen yellow is confused with a yellow image. The experimenter, who regulates the course of the observations by signalling to a third person when the lantern is to be turned on, is sometimes greatly surprised at the gross errors made by the observer. What seems to him obviously sensory may be reported, without hesitation, as imaginative.

Again, we are frequently in doubt, in everyday life, whether we hear a particular sound or merely imagine it. And if, in the laboratory, the observer is required to listen intently to a continuous faint noise, such as is produced by the falling of a stream of fine sand, the same confusion will be noted. The experimenter may reduce the stream to a mere trickle, and may finally stop it; the observer will still, in many cases, believe that he hears the hiss.

Lastly, a similar confusion is found in experiments upon pressure and tickling. If, for example, in the course of a series of stimulations of a pressure spot, the experimenter says Now! but omits to touch the skin, the observer may, nevertheless, report the arousal of a pressure sensation.

In everyday situations similar confusion results. Mothers are not always able to tell whether they hear or only imagine that they hear a baby crying. Violin players are said to take advantage of our inability to distinguish images from perceptions when they wish to produce an extremely *pianissimo* effect by pretending to bow, though actually they do not touch the strings.[4]

Adults can help children to distinguish between imagination and perception by teaching them to distinguish between the real and the unreal. An effective means of doing this is to tell a child fantastic stories, which forces him to understand that we can talk about unreal as well as about real things. At the same time, the child should be taught a reasonable view of the world in order that he may have a background to distinguish the perceptual from the imaginary.

HALLUCINATIONS

An imaginary object mistaken for a perceptual one is an *hallucination.* Some drugs cause hallucinations by making our images so vivid that we mistake them for perceptions. The alcoholic, for example, is apt to see snakes and other terrifying objects. Other

drugs, such as hashish, opium, and pyote, have a similar influence. Hallucinations are also caused by powerful emotional states. A person who has recently lost a close relative may experience a sense of his presence. In rare instances he may even "see" him or "hear" his voice. A person dying of thirst may project so vividly into the external world what would satisfy him that he "sees" a beautiful stream of water. That such hallucinations may be experienced by a group of individuals is indicated in a recent report of the experiences of shipwrecked men isolated on the sea. These men experienced hallucinations of ships, often vivid enough to permit "identification" of the ship. The average duration of the hallucinations was about twenty minutes.[5]

Hallucinations may also result from repressing the memory of some painful event. The following is an example. An officer on board a torpedoed transport was greatly agitated by the suffering of so many dying men. He stayed on deck until the last. Just before the ship went down, another officer already in the water called to him asking for his life-belt. Since the man in the water already had a life-belt, the officer refused. That event he tried to forget, but he did not succeed and he had frequent hallucinations of it.[6] Soldiers often suffered hallucinations of the cries of enemy soldiers that had been run through with the bayonet. Others, hundreds of miles from active warfare, had hallucinations of gunfire and exploding shells.

Hallucinations may result also from a feeling of unworthiness. Within many people there is a struggle between different interests of the total person. Sometimes this struggle is dramatized. For example, before making an important decision, a certain girl made a practice of inquiring what an imaginary companion would do. This "companion" was, in reality, a part of herself. This girl, fortunately, had insight into what she was doing, but some lack this insight. Consequently, there is for them no conscious bridge between their personality as known and the projections of imagination. To such persons desires which they do not wish to recognize may seem to come from without, thus giving rise to hallucinations. Such hallucinations save an individual from recognizing frankly certain aspects of his nature, and thus bolster up temporarily his feeling of self-respect; but they do so at the price of self-deception and stunted development.[7]

In a recent experiment it is suggested that hallucinations may

be the result of sensory conditioning. In this experiment a tone with a gradual onset and decline was paired for sixty trials with a light. The light was the conditioned stimulus. Thirty-two of forty subjects reported hearing the tone when the light was presented alone. Control experiments seemed to indicate that the effect was not due to suggestion.[8]

Hallucinations result from mistaking imaginary objects for perceptual ones; illusions are erroneous perceptions. In spite of such concisely defined terms, it is sometimes difficult to distinguish one phenomenon from the other. The difficulty lies in the fact that all mental life arises from a complex whole involving the personality and the environment. Since we are constantly played upon by stimuli, how can we say that any experience is merely the projection of our inner states? May it not, in some way, have been aroused by a sensation? When a person claims to hear voices which no one else can hear, we are tempted to say he is experiencing an hallucination; but can we be sure that his experience is due to the projection of his inner states? Perhaps it is due to an erroneous judgment of some actual sound, such as the creaking of the stairs. Or suppose a person passing outside a closed window in which flowers are placed should enjoy their fragrance. Would he experience an hallucination or an illusion?

A good working principle is to hold that an experience is an hallucination when it is highly individual and can be made intelligible only by viewing it in terms of the inner states of the subject, and that it is an illusion when knowledge of the external world makes the experience intelligible. We should say that the person who hears voices experiences an hallucination even though creaking stairs accompany the experience, since the noise does little, if anything, to make the experience intelligible. To understand the experience, we must study the individual. On the other hand, we should say that enjoying the fragrance of flowers behind a closed window is an illusion, because the presence of the flowers does much to make that experience intelligible, even though there is no olfactory stimulation. Illusions are not pathological; but hallucinations, unless caused by a drug or by some acute crisis, are symptomatic of a seriously deranged personality. Such disorders of imagination, if persistent, may indicate the existence of a more general mental disorder, one involving the disorganization of the whole personality structure.

EXPERIENCE AND IMAGINATION

However bizarre imaginary objects may be, the elements of which they are composed are all drawn from previous experience. The person born blind cannot imagine color any more than we can imagine life without a body. From this point of view, imagination may be defined as the recalling and recombining of experience. This definition marks imagination off from memory and at the same time indicates the essential rôle of experience in imagination. Conscious recall, we have learned, is the consciousness of the past, or the reliving of the past in idea. Error arises when the past as recalled differs from what it really was. Imagination, on the contrary, though based on the past, involves a new combination of past experience, and there is no pretense of recalling the past accurately.

But how can memory images be distinguished from imagined ones? Let the reader think of some object. Is the image a recollection or a product of fancy? How can we tell? For one thing, we judge by our manner of responding. One mental image seems familiar, the other strange. If we were asked to justify the feeling of familiarity, we should proceed to tie the memory image to other memories; that is, we should find for it a place in our organized mental life. In brief, we recognize images in the same way that we recognize physical objects. Both feel familiar. When we are able to place the image or perception in our organized experience, we complete the act of recognition.

REPRODUCTIVE AND CREATIVE IMAGINATION

Imaginings are divided into two groups, depending on how closely the organization and structure of the past are preserved. If the product of the imagination differs little from an earlier experience, it is spoken of as a product of *reproductive imagination.* The recalling of an experience of last summer and weaving it with slight changes into a story would be an instance of this. When the past provides the elements of the imaginative product but little of its structure and organization, we speak of creative imagination. Fairy stories, novels that are not biographical, and scientific hypotheses are instances of creative imagination. For example, the hypothesis of ether as an invisible, imponderable,

and perfectly elastic body which transmits wave motion was created from these separate concepts to make intelligible certain phenomena not to be understood otherwise: the action of distant bodies upon each other and the passage of light from the sun to the earth. The nebular and the atomic hypotheses are also products of creative imagination designed to make our world more understandable. Similarly, the creations of musicians, poets, and novelists are also products of creative imagination.

DEVELOPMENT OF IMAGINATION

The development of the imagination depends on the maturation of the nervous centers, especially of the higher areas, and on experience. Little need be said of maturation except to point out that imagining, as we experience it, is as truly beyond the range of the possible activities of an infant as is walking. The fertility of imagination depends upon maturity. Moreover, as we mature, new interests give direction to our imagination.

(1) *Importance of experience.* More important from the psychological point of view is the influence of experience on imagination. As previously stated, all the elements of imagination come from experience. It therefore follows that a rich and varied life of the imagination depends upon a rich and varied experience. The individual who understands people and is familiar with the world about him, who is acquainted with the world of fairy stories, who has read widely in history and in the best literature, who has a knowledge of the different scientific and philosophical systems, and, above all, who has the habit of playing with ideas, has a background and an attitude that are well calculated to increase the fertility of his imagination and to invest all things with deeper meaning and significance. The development of imagination may also be stimulated by varied motor experiences. The active person, one who has danced, hiked, fished, hunted, and tended a garden, has a background for reverie which adds much to his enjoyment of music, painting, and aesthetic dancing. Imagination is also stimulated when desires are thwarted. For example, children who have no real playmates create for themselves imaginary ones with whom they talk and play. When real companions are provided, the imaginary ones tend to fade away. Similarly, out of thwarted romance arises much of romantic literature and music,

productions that have done a great deal to enrich human life by idealizing a primitive impulse.

(2) *Valentinier's study.* An interesting study of the development of imagination has been made by Valentinier, who gave to almost 5,000 boys and girls between the ages of nine and eighteen the following story to complete in one of the ways indicated:

> This is the beginning of a story about the moon.
>
> "On a recent night," narrated the moon, "I was sliding through heavy clouds of snow. My beams tried to pierce them in order to see what was happening on earth. Finally, the clouds parted before me and . . ."
>
> 1. The moon saw a shipwreck.
> 2. The moon had a conversation with the giant, Roland, at the town hall of Bremen.
> 3. The moon comforts a sick man who is lying in bed.
> 4. The moon tells about a camp of hikers in the neighborhood of Bremen.
> 5. The moon talks with a pupil who cannot prepare his lessons.[9]
>
> There were three outstanding differences between the themes of child and adolescent. The children represented the moon primarily as an acting being, while the adolescents described the moon's thoughts and emotions. The older pupils enlivened their stories with various minor episodes, droll happenings, and artistic touches. The children's style was bald, but that of the adolescents showed numerous embellishments. The girls showed evidences of maturity earlier than the boys.[10]

A typical composition by a child, Cole continues, "shows certain elementary imaginative touches — the spyglass, the glowworms, the moonbeams used as messengers. But on the whole, the story is prosaic; the tale would not have varied essentially if the boy had been helped by his uncle." The adolescent shows greater imaginative power, a finer sense of humor, and more genuine psychological insight. Greater maturation and a wider range of experience yield a bountiful harvest of imaginative embellishments and of appreciation.

(3) *Ink-blot studies.* Ink blots, such as the one shown in Figure 27 (page 178), may be used to show the development of imagination. An ink blot similar to this one was shown to a group of children and to a group of adults. A boy of eleven saw in the blot "a boy running and puffing along a dusty road." It reminded his thirteen-year-old sister, who had recently spent a summer in the

South, "of a little black pickaninny on a frosty morning, delighted with watching her breath shoot out like smoke from a pipe."

Age differences come out clearly in the accounts of a girl of twelve and a man of thirty. The girl wrote: "It reminds me of two women sitting down by a low tea-table, with a vase on it. The women have large bonnets on." The man wrote: "The ink blot in one position appears to be a silhouette of a man and woman talking to each other. The man has a very thin neck, which perhaps typifies a sort of thin weak personality. The lady has a lot of hair which reminds one of the Revolutionary days when ladies wore white wigs. There is an upright object in front of them which could be a dice cup. They may be playing backgammon while they talk. The man's hair is white so he probably is past middle age." The older person drew a more complex picture. The use of ink blots in studying personality was described in Chapter V.

INDIVIDUAL DIFFERENCES IN IMAGINATION

There are other factors than those just discussed which create individual differences in imagination. Variations in age and in ability to define problems at the abstract level are two factors. People also vary considerably regarding the type and vividness of their imaginations. Some are able to bring before their mind's eye images which they claim are as vivid as perceptions. Others have only faint images. In some individuals, visual imagery is the most vivid; in others, auditory or kinaesthetic. These differences have led to a theory of types of imagination. This theory, however, has been generally abandoned. For only a few people belong to one type or another; that is, few experience one mode of imagery that is consistently more vivid than the others.

Generally speaking, the imagery of children is more vivid than that of adults; that of women is more vivid than that of men; that of men in general more vivid than that of men of science.[11] Differences in the strength of imagery seem to go hand in hand with preoccupation with concrete things. The child's interests are almost wholly centered around the concrete; the scientist's are centered to a considerable degree about ideas and principles which cannot be imaged. He cannot, for example, form an image of gravitation, evolution, or the law of diminishing returns.

IMAGINATION AND ADJUSTMENTS

The important place of imagination in adjustments was indicated in the opening paragraph of this chapter. The person who can tell without the aid of a stimulus what would satisfy him obviously has an advantage over one who cannot. Take two men who are restless and worried. One man cannot tell what the trouble is. His energy is spent in unhealthy bodily tension and anxiety. Perhaps in time his difficulty will drive him to consult a psychiatrist or a friend, or to commit some impulsive and foolish act. The other man proceeds deliberately to discover the cause of his worry and tension. He considers the various possible causes of his condition. Is there some physiological disorder? Is the tension due to lack of opportunity for professional advancement, to the coldness and indifference of friends, or to financial difficulties? Let us assume that it is due to the last of these. Having defined his difficulty, he is able to proceed more intelligently to discover the best way of meeting it. Shall he cut out some unnecessary expenditure? Shall he try to increase his earnings through additional work? Shall he postpone paying some of his bills? Or shall he borrow money? If he should decide to borrow money, he would continue the same rational procedure. Should he borrow it from a bank, or from an individual who makes a business of lending money, or from a friend? If from a friend, from which one? Shall he ask the friend for the loan when he happens to meet him, or shall he make a call at his home or at his office, or shall he invite him to lunch and there make known his needs?

Through this procedure he rationally decides his course of action. By so doing he moves from an abstract definition of his need to concrete action. There is thus opportunity to consider possible alternatives and objections before committing himself to the consequences of an overt act.

All rational guidance of behavior involves imagination in the foregoing way. Suppose, for example, a committee is appointed to deal with the problem of an increasing number of accidents in a factory. The valuable men on the committee are those who can see in advance the situations that are likely to arise and can plan to meet them. Some one makes the statement that the workmen must be educated and warned of the danger. So far,

so good; but how is this to be done? The course of action is then defined a bit more by the suggestion that signs with proper warnings printed on them be placed at all dangerous places. It then occurs to another member of the committee that some of the employees cannot read, and the suggestion is made that pictures be painted on the signs to represent possible accidents.

To be able to define one's problem in abstract terms and then to proceed to a definite course of action after examining all the possibilities is, as Thurstone says, a mark of genius.[12] Yet there are times when quick thinking that issues into action is also a mark of genius. One of the most essential qualities of leadership is the ability to imagine quickly what will meet the needs and desires of the group. Perhaps it is for this reason that some people boast of being "concrete-minded," and enjoy showing their contempt for those who think in abstract terms. Apparently, they have not paused to consider that the development of science, government, and philosophy depends upon the ability to think imaginatively and abstractly. They do not realize that the lower animals are even more concrete-minded than those who boast of their inability to think in abstract terms.

Imagination may sometimes make adjustments more difficult. It does so when we create imaginatively a world of fearful objects. For example, the child who has peopled the world imaginatively with witches and goblins which torment his sleep and make him afraid of the dark has created for himself a heavy handicap. Similarly, adults, by imagining fearful dangers and by magnifying slight ones, may undermine their confidence and capacity for action. Such persons do not take an opportunity when it is offered, but imagine so many dangers that they prefer to hold to what seems to them a safe course. In these cases, imagination, instead of being a spur and director of activity, becomes a source of timidity and an inhibitor of action.

On the other hand, imagination may become a source of courage. For example, one boy who knew that he was unusually fearful was able to gain courage by going to the radiator and letting out a little steam. This served, he said, to release the friendly servants of the Three Kings who lived behind the radiator. The thought that these servants were rushing to aid him inspired him with courage. Later, by a mere gesture of turning a valve, he was able to tap this source of courage.[13]

WORRY

When we are confronted with a crisis, as when a close friend or anything we value is in danger and there is nothing that we can do about it, we worry. Worrying under such circumstances is a normal process. Some people, however, worry excessively. Sometimes this is merely a way of fighting against boredom and monotony or, as Woodworth says, a form of "indoor sport." [14] Consider, for example, the worries of a mother regarding her child out coasting. Her love for him and her fear that something may happen to him, even though she does not doubt his safety, may cause her to imagine him involved in all sorts of accidents. Such mild worries, like mild forms of fear, seem pleasant. Being thrown in the air and caught again is a source of mild fear that is a delight to the small child. Older people get pleasure in sports that arouse mild fear. Perhaps this is due to the fact that anything, unless it is too disagreeable, that raises consciousness to a higher level is pleasurable. Whatever the explanation, mild states of fear are frequently enjoyable. The mother would rather be worried than bored. Her worries give excitement to an otherwise monotonous day. In addition, the relief experienced on the return of the child does much to compensate for the element of unpleasantness that was contained in the worry.

Excessive worry is more serious. It may be symptomatic of excessive timidity, of lack of confidence, or of mental conflict. Persons who as children have been too carefully protected and who have been prevented from making decisions for themselves are apt to be excessively timid and lacking in confidence. In a situation which requires them to make decisions and to act on their own responsibility, they are likely to worry excessively. The same is true of those who have a haunting fear of making a mistake or who attach excessive importance to the opinion of others.

The following is an account of excessive worry due to mental conflict. An oversolicitous mother worried unduly about the health of her child. She shielded the child from every danger and gave her the best of care, and yet she was in constant fear of the child's dying. When she finally consulted a psychologist, he was able to discover the real source of the worry very quickly. The mother had never been able to reconcile herself to the re-

strictions imposed upon her by bearing and caring for the child. If the child were to die, she would regain her liberty. Her lavish attention and excessive worry were a means of driving from consciousness a thought which was shocking to her moral nature. This type of response is frequently resorted to in repressing something unpleasant.

In the case just mentioned, the attitude of the mother toward her daughter also illustrates what the psychoanalysts call the *ambivalence of desires and emotions.* To live we must assume obligations and duties. We bind ourselves to one another with bonds of affection. But however much we may seek such bonds and however great the satisfaction derived from them, they impose some more or less irksome restrictions upon us. In the foregoing case, the young mother's life was doubtless enriched by the bonds that bound her to her child; but at the same time, those bonds deprived her of many other desirable contacts. As a result, there was much in her that protested against the mother-child relationship and that longed to escape from it. Perhaps this is the reason that the death of loved ones is as easily borne as it is.

When thoughts that are felt to be disloyal occupy consciousness, they may become the cause of excessive grief. For example, a girl who was devotedly caring for her invalid mother occasionally thought of the pleasures she was missing by being tied to her mother's bedside. This was almost inevitable in the circumstances. It could have deserved no censure unless the girl had dwelt upon these thoughts and permitted them to influence her behavior. This, however, did not happen, for the daughter was most dutiful. But when the mother died, the girl, feeling that she had been disloyal, mourned excessively and refused to take advantage of the freedom that she had previously regretted was not hers. When, however, she was helped to understand the causes of her excessive grief, she made a normal adjustment.

Excessive worry about one's health is called *hypochondria.* Like the mother's worry about her child, this may be due to an internal struggle. Hypochondria is frequently a way of escaping something disagreeable. To be strong and vigorous would necessitate the assumption of a more active rôle in life, and the worrier finds this prospect unpleasant. Yet it would be a severe blow to his self-regarding sentiment to recognize that he was refusing to play his part. An excuse to shirk is found in magnifying any

physical disability and developing an excessive concern over his health. To be sure, the hypochondriac does not think the matter through in this manner. We should consider, rather, that his anxiety is congenial and satisfying to him because it saves him from facing a disagreeable fact and enables him to attain an agreeable objective. It may serve as an excuse for failure or as a means of gaining attention and power. Hence it is given free indulgence.

IMAGINATION AND DEVELOPMENT OF PERSONALITY

Imagination plays an important rôle in self-development. Through dwelling on what we should like to be, we more nearly approach our ideal. To live with heroes of the past, to be thrilled by their heroism and courage, and to admire their love of honor and chivalry — these things have a wholesome effect in building character. Emphasis on this principle was the cornerstone of Plato's theory of moral education, as it has been of that of every great religious leader. In contemplating the ideal, we are drawn to it.

The imaginative play of children also promotes the development of personality. Little girls, by playing with their dolls and imitating their mothers, do much to develop sentiments of motherhood and of domestic life. The youth, in dreaming of becoming a lawyer, a doctor, an engineer, or a banker, defines to himself what would most completely satisfy him. Thus his personality development is given a definite direction. Moreover, his dreams, by arousing interest in a particular profession, stimulate him to work harder and thereby promote his best development.

There should be no mystery about the influence of imagination on personality. That it influences our motor activities can be simply demonstrated. Make a cross on a paper so that one bar points north and south and the other east and west. Then hang a small weight from a pencil by means of a short string and hold the weight over the center of the cross so that it comes as nearly to rest as possible. Imagine how the weight would look and feel if it were swinging back and forth along the bar pointing north and south. The weight will soon begin to swing in that direction. After it is moving north and south, imagine how it would look and feel if it were swinging east and west. Almost immediately

the direction of the swinging weight changes to east and west. Great as is the effect of imagination on muscular processes, it probably influences our desires and personalities even more. The person who thinks continually of engaging in some crime is influenced thereby; the person whose imagination dwells on licentious living is influenced accordingly. Fortunately, imagining a life of restraint and of social usefulness increases the strength of these traits also.

IMAGINATION AS A SOURCE OF ENJOYMENT

In addition to its value as an aid in making adjustments, imagination, like memory and perception, adds much to the joy of living. Life would be relatively drab were we limited to what is actually before us. By recalling the past and projecting our ideals into the future, we are able to contemplate a world made rich by the interweaving of many incompatible desires and freed of all annoyances. Moreover, to enjoy the future we do not have to give up equally satisfying courses of action.[15] In anticipating a picnic we seldom think of gnats and flies. The old oaken bucket in our memories is an object of quiet pleasure and joy. We do not recall how heavy it was, nor the splinters that used to get in our fingers.

Because the future, on becoming the present, frequently does not bring the joys anticipated, many people become disappointed and pride themselves on their disillusionment. Here lies an evil of romanticism. The girl who dreams of a perfect lover who will bring her complete happiness is setting the stage for a severe disappointment. So do all those who imagine that the satisfaction of a particular desire or group of desires will bring them perfect happiness. They fail to realize that life is a continuous process of adjustment and an endless series of changing interests, and that the zest and joy of life lie not so much in the satisfaction of ends accomplished as in the act of attaining them. Lacking this understanding, they fondly look forward to the day when their desires shall be satisfied, little realizing that new desires must take the place of the old unless they are to sink into apathy and indifference.

The story is told of a distinguished artist who deeply realized this truth. In the midst of his admiring friends he began to weep.

When asked why he wept in the hour of success, he replied, "I weep because I have attained my ideal; there is nothing more to work for." He realized that satisfaction meant the end of progress and that he should never again know the joy of achievement; he realized that he was spiritually dead.

Though imagination may be a source of disappointment and of unhappiness when dreams are not realized, yet the dreams themselves are sources of enjoyment. An individual may obtain satisfaction either through mastery and positive accomplishment or through make-believe. The former we shall call the realistic way; the latter, the "as-if" way. The difference between these two ways may be briefly illustrated. An individual who becomes a great financier through hard work follows the realistic way. He finds his satisfaction or happiness in accomplishment. Another person may wish to become a great financier, but, instead of working to become one, only dream of success. He may even imagine that he is already a great financier, and enjoy in his dreams his make-believe success.

The satisfaction gained through the as-if way seems closely akin to that enjoyed by hypnotized subjects who, when told that they have inherited a fortune, apparently experience the affective states that they might be expected to experience were they in fact suddenly to become wealthy. Similarly, people who cannot follow the realistic way of objective success or who do not put forth the effort necessary to do so create for themselves a world of fantasy which ministers to their desires. They may do this when awake or when asleep. The more vigorous of them give objective expression to their dreams in works of art, or use them to enrich their play. Of the various ways of gaining pleasure or enjoyment through imagination, four are particularly important: play, daydreams, dreams, and art.

PLAY

It is generally recognized that the fantasy with which children fill their play is responsible for much of its zest. The little boy picks up a stick, places it across his shoulder, and marches away a soldier; the next instant he bestrides it and dashes away on a fiery steed; a little later he puts an arrow to the stick, and it becomes a bow. The stick is only a means of focusing his imagina-

tive activities, without which his overt activities would have been lacking in zest and interest. Likewise, the little girl, as she plays with her dolls, caring for them as a mother, scolding them, dressing them, making their beds, and preparing their food, is living in a world of fantasy from which much happiness is drawn.

Occasionally a child will assume a particular rôle for a whole day, and will assume for himself a new and appropriate name. A boy may enjoy playing for a day that he is a coal-heaver; the next day he may be an iceman or a street-car conductor. Many lonely children create for themselves imaginary companions with whom they play and talk as with real children. Though such play lacks the needed give-and-take of reality, yet it does create imaginative social situations useful for the cultivation of various attributes, such as politeness, consideration, and friendly conversation.

In the foregoing illustrations of play, imagination is almost unhampered. They are genuine as-if attitudes. Play that takes the form of games is not so completely an activity of the imagination. Games involving imagination may be regarded as an intermediate step between play and the more serious concerns of professional and social life. Compare the boy who plays that he is Hal Newhouser with a boy a little older who takes part in a real game of baseball. The former takes his ball and bat and, in imagination, becomes the greatest pitcher in the baseball world; the latter is forced constantly to compare the products of his imagination with his actual performance. Games thus compel the abandonment of the world of pure fantasy for the world of real accomplishment.[16]

In the games of adults, the as-if attitude persists in an attenuated form. We play *as if* our games were serious. We attach considerably more importance to winning and losing than an objective consideration of the situation would warrant. In a somewhat similar class of activity should be placed the loves of adolescents. As viewed by the adolescent such loves are extremely serious; nothing could be more so. But the extravagance of the love and the fact that it is usually of short duration and leaves little impression other than bewilderment upon the lover show that such love does not deeply involve the personality. These experiences have been appropriately labeled "Ernstspiel" by Stern.[17] Youthful lovers play at being in earnest; but really serious things, such

as family relations, professional success, or religious beliefs, involve more deeply their personalities and their careers.

In emphasizing the rôle of imagination in play, there is no intention of implying that play is entirely an expression of the imaginative activities. Play, particularly that of children, is an act of self-expression. Not all the activities of an individual are motivated by a concern for the practical or useful. There are, it is true, some writers who have regarded play as an offshoot of work. Patrick, holding that play is a relic of the serious pursuits of our primitive ancestors, contends that children like to paddle around in water because wading in streams to catch fish was an important source of food for our ancestors.[18] Groos, regarding play as preparatory to the work of adulthood, maintains that the little girl plays with her doll in order to prepare herself for motherhood.[19] No doubt play has such values, but to regard these values as the chief function of play is to misunderstand life. Play is a simpler and more elementary response than work. When an organism develops the capacity to perform an activity, it seems to experience an impulse to exercise the capacity; from such exercise it apparently derives satisfaction — witness the playful flying of birds, the activities of pups, the gurgling and cooing of infants, the young child's constant climbing in and out of chairs, and the laughter and good fun of older children. These activities are expressions of the life of these creatures as truly as the more directed and highly organized activities of an adult are expressions of his life.[20] Play is activity engaged in spontaneously because it is intrinsically pleasant. Only when there is sufficient development of imagination and self-control do we engage in activities because they are useful. For this reason we do not expect the young child to work. We know that he will have to learn that he can attain certain desired objects only by sticking to the task of getting them, and by persisting in spite of uninteresting activities and of the loss of more immediate satisfactions. Play is spontaneous activity engaged in because it is pleasant; yet, when such activity is invested with the magic of imagination, it becomes doubly enjoyable. The activity remains pleasant; the pretense that it is of some great significance adds another measure of enjoyment. The more meaningful and significant our behavior, the more enjoyable it becomes.

DAYDREAMS

Daydreams afford an easy way of obtaining satisfaction. The stories of "Cinderella," "The Ugly Duckling," and "The Milkmaid" are excellent illustrations of the tendency to weave a world of fantasy in which our desires are fully realized. The milkmaid, evidently an unpopular girl, dreams, as she carries the milk on her head, of the eggs she will be able to buy after selling the milk, of the chickens that she will raise, of the new dress she will wear, of the fine appearance she will make, of the rush of young men to ask her for a dance and of how she will scorn them. Unfortunately, she acts her scorn too soon; for, in tossing her head, she spills the milk, and all her dreams perish.

The pleasure we get from novels of adventure or from motion pictures depends largely on the help they give us in weaving daydreams that appeal to us. We identify ourselves with the hero, suffer and conquer with him, and with him enjoy the applause of the admiring crowd. In this way the book or picture carries us away from the world of our limitations into a world patterned after our desires, where we live richly, if only for a short time.

Sometimes we daydream because of indolence; sometimes, because of discouragement; sometimes, in order to compensate for a life of monotony; and sometimes, because it is a pleasant way to pass the time when we have nothing else to do. That indolence should be a cause of daydreaming is easily seen. For a lazy person, in fact, is one who finds it more to his liking to find satisfaction through fantasy than through more strenuous exertion. Likewise, when we are discouraged we frequently "let ourselves down easy" by imagining that the next time we shall be more successful or by dreaming of success in another field.

In the stories mentioned above, the compensatory nature of daydreams can be clearly seen. People who are excessively ugly, or people who are very conscious of their lack of sociability or money may compensate for their misfortunes by imagining themselves enjoying the adulation of crowds on account of their beauty, or the envy of neighbors on account of their social prestige or wealth. Sometimes daydreams are taken so seriously that they are embodied in the overt activity of the dreamer, as a little girl may so vividly imagine herself playing with little friends that she talks and acts as though other children were actually present.

Some daydreams, instead of being dreams of success and honor, are dreams of suffering and persecution. Why should such daydreams be a source of satisfaction? One reason is that they cater to the desire to be significant, a desire so powerful that many are ready to endure pains and dangers of all kinds to satisfy it. We should not be surprised that this need lies behind many daydreams of suffering. Such dreams give us satisfaction in much the same way as boasting of our sufferings and misfortunes does. The person who boasts of his painful operations is making a bid for the attention and the concern of others. If successful, he holds the center of the stage for the time being. His craving for significance and importance is satisfied. In the same way, the individual who dreams of being the object of persecution or of being scorned and neglected by others raises his importance in his own eyes. Knut Hamsun in *Hunger* illustrates this motive excellently. The hero of that story finds satisfaction in the thought that he is important enough to be noticed by God, if only to be persecuted.[21]

Daydreams thus motivated have many ramifications. When a person believes that he is being persecuted, he feels a need of explaining the situation. If he were an ordinary person, he thinks, there would be no sense in the persecution which people inflict upon him. The fact that he has been made the object of persecution proves (to him) that he is important. Perhaps he is a prince who is being deprived of his rights. Perhaps he is a man of such limitless possibilities as an inventor or reformer that, out of jealousy, people have decided to ignore or persecute him or even to confine him in an asylum. Thus arises a whole set of false beliefs regarding himself and the attitude of others toward him. Such false beliefs are called *delusions*. Since an effort is made to defend these beliefs by arguments, they are commonly regarded as disorders of reasoning. We shall, therefore, return to them in the following chapter. However, in passing, we should note the close relation between delusions of persecution and delusions of grandeur.

Finally, daydreams of persecution, like any other daydreams, may serve as convenient excuses for lack of effort. Why should we put forth effort when every one is against us? Thus the lazy or indolent man protects his self-regard while doing nothing.

To daydream is a perfectly normal activity. All people day-

dream, children perhaps more than adults, the introverted more than the extroverted. Unless we substitute daydreaming for action, it is an innocent and perhaps a desirable pastime; for daydreams not only enrich life, but they also help an individual find himself by revealing to him his most powerful desires and ambitions. Daydreams become dangerous and pathological only when engaged in excessively and when they are substituted for action. Extravagant daydreaming may lead, as we have seen, to a retreat from reality. This danger is especially great, according to McDougall, during adolescence.[22] Too much indulgence in daydreaming may also cause confusion between fantasy and reality, as was pointed out in our account of the disorders of imagination. Finally, certain types of fantasy may influence one toward crime.

As an instance of crime produced by daydreaming we may cite the case of two wealthy Chicago boys who murdered a younger boy for the thrill of being talked about. Writing about that case, McDougall says:

> The medical experts . . . brought out clearly the fact that one of the murderers, a youth of good intellectual capacity and education, had indulged in daydreams of great crimes by means of which he would startle the world and enjoy the secret knowledge that he was the person of whom all the world was talking. In this case the daydreaming went so far that, as he walked the streets, he would be occupied with imagining the details of his fantasied crimes, and even hallucinate, it would seem, some such detail.[23]

DREAMS

According to psychoanalysis, sleep is a means of escaping from the boredom of waking life to the more exciting and satisfying world of dreams. In support of this theory the psychoanalysts claim that people in quiet, uninteresting communities sleep more and appear less alert than people in progressive ones. They also call attention to the fact that people in the frigid and torrid zones sleep more than those in temperate climates, and to the fact that men engaged in interesting work need less sleep than those not so fortunate in their vocations. Further support of this theory is found in the fact that in dreams we derive a sort of satisfaction for many unsatisfied desires.

If this theory of sleep is true, it should follow that we dream continually while asleep. This inference, however, cannot be satisfactorily tested. Suppose a person should decide to determine how much he dreams during sleep. With that purpose he sets an alarm clock so that he will be awakened at intervals throughout the night. If he recalls a dream whenever he is awakened, there is the possibility that the alarm and his unusual mental set caused his dreams. On the other hand, if he recalls a dream only occasionally, there is the possibility that the alarm caused him to forget the dreams. Since no way of eliminating these possibilities has been found, it cannot be stated what proportion of sleep is passed in dreaming.

Since dreams do not always appear, on superficial observation at least, to be an outgrowth of desire, psychoanalysts insist that the desire is frequently disguised and that dreams therefore must be interpreted. Their interpretation of dreams can only be understood in terms of their general psychology. According to their theories, there are three levels of mind: the unconscious, the foreconscious, and the conscious. The unconscious is the source of our psychic energy; in it are the roots of our instincts, and into it are repressed painful memories or desires. The foreconscious consists of all our mental life that can be brought easily into consciousness, such as the memory of what we had for breakfast, our knowledge of history, and our engagements for the day. Consciousness consists of that small part of our mental life of which we happen at the moment to be conscious. Mind may be likened to the earth. The inside of the sphere corresponds to the unconscious; the surface, to the foreconscious; and the illuminated part of the surface, to the conscious.

Desires or memories that are painful to us are driven into the unconscious. Our ideals are regarded as maintaining a close censorship over what is admitted into consciousness. However, in spite of the alertness of the "censor," the contents of the unconscious at times slip into consciousness. To do this they make use of all sorts of disguises, so that their genuine nature cannot be recognized.

Dreams offer an ideal opportunity for repressed desires of all sorts to enter consciousness, though even in dreams it is frequently necessary that they be disguised. The use of symbols is a favorite device. For example, one person dreamed of himself

as a hunter armed with a rifle and surrounded by a group of savages armed with spears. In this dream, the rifle symbolized the dreamer's feeling of superiority over his ignorant neighbors, whom he symbolized as savages armed with spears. All this becomes clear when we learn that the dreamer was a young man contemplating an adventure in marriage not approved by his neighbors and friends.[24]

Psychoanalysts assert that certain images or pictures in dreams usually mean the same thing for all dreamers. For example, they claim that a snake usually has sexual significance; the failure to catch a train frequently means the fear of missing something of great importance; having to take an examination repeatedly means the fear of facing some ordeal which the dreamer fears he will not meet successfully. It is this uniformity that provides a measure of justification for dream books. However, the same symbol may mean different things, and, conversely, the same things may be symbolized in many different ways.[25] Since symbols have no fixed meaning it is necessary that an interpretation be made in each instance.

The method of free association is frequently used by psychoanalysts for the purpose of interpretation. The dreamer is asked to think of a certain picture which appeared in his dream and then to tell the analyst whatever comes into mind. Several pictures of the dream may be treated in this way before the dreamer or the analyst is satisfied that the meaning of the dream has been reached. The difficulties of making a true interpretation of a dream are so great that any particular interpretation should, at best, be accepted with considerable reserve. In spite of this, however, the analysis frequently proves helpful. The dreamer, at least, believes that the true meaning of the dream has been discovered and that the roots of his trouble have been brought from the unconscious into consciousness, where its power for harm is greatly reduced.

(1) *Evaluation of the psychoanalytic theory of dreams.* The psychoanalysts have added much to our knowledge of dreams and of mental life in general. To them should be given credit for stressing the purposive nature of dreams and for making many dreams intelligible. On the other hand, they have probably erred in maintaining that all dreams are significant or even motivated by a definite purpose. In the second place, some of the psycho-

analysts, particularly Freud, have exaggerated the place of sex in dreams. Sex wishes are not the only wishes that may be repressed or that may serve to motivate dreams. The study of the dreams of soldiers during the World War, in which fear rather than sex was the dominating motive, has convinced most students that Freud's theory of motivation is too narrow. Freud himself seems to have recognized this before he died. In the third place, the psychoanalytic theory does not attach sufficient importance to the physiological condition of the dreamer or to the exciting stimuli.

Some interesting facts regarding the importance of the latter factors have been discovered. Retiring with a clove in the mouth has been found to cause more taste imagery in dreams than is usually experienced; gazing at colored objects causes more imagery of color. Gummed paper stuck on the body also influences dreams.[26] The smell of smoke may result in a dream of fire. Dreams may also result from such factors as the moon shining in the face, a cramped position of the body, unusual noises, bad odors, and extreme temperatures.

The importance of physiological conditions has also been shown. When pituitary extract is given to subjects, dreams become more frequent and pleasurable. When suprarenal extract is administered, their dreams become highly disagreeable.[27] Bad air or lack of oxygen may cause disagreeable dreams. One writer reports that a whole company of soldiers sleeping in a poorly ventilated barn which had a tradition of visits from ghosts dreamed much the same dream of demons jumping on their chests.[28]

The psychoanalytic view might be reconciled with the fact that sensory stimulation plays an important part in dreams. It could be argued that the elaboration or interpretation of the sensory process is the important thing to consider, and that to understand either of these we must look into the mental life of the dreamer. Undoubtedly this is true. But desires should not be regarded as little entities within the personality. They are outgrowths of changing circumstances. Kimmins, in a study of many thousands of dreams, has found that both dreams and desires change with maturity, and that the content of our dreams varies as social conditions and domestic problems create various desires within us.[29]

In other words, the psychoanalytic view of dreams is based on too narrow a view of the psychological whole. It thinks of behavior as issuing from the personality in some mysterious manner, whereas all behavior should be regarded as due to the whole situation in which exciting stimuli as well as purposes play an important part.

(2) *Kinds of dreams.* Some dreams seem to point to dangers ahead and are called *premonitory dreams;* others appear to the dreamer as *prophetic;* still others, apparently caused by some bodily disorder or incipient disease, are called *prodromic.* An instance of the last kind occurred in a person who frequently dreamed of a cat gnawing at his throat. Upon examination, it was found that he had a cancer of the throat. Dreams of flying through the air are called *dreams of levitation.* Such dreams have been regarded as outgrowths of the mastery motive. Another interpretation is that they are caused by the dreamer's becoming conscious before the cutaneous sensations make their usual contribution to the stream of consciousness. This explanation is supported by the fact that when the cutaneous senses are slowly anaesthetized a feeling of levitation results. Dreams of paralysis, with their consequent terror, are probably caused by the dreamer's awakening before he is able to move as he wishes. The dreamer evidently requires more time than usual to pull himself together sufficiently to perform the muscular coördinations involved in overt activity.

Nightmares are frequently caused by cramped positions; at other times, they may be due to a degree of disintegration which allows one's fears to run riot. As we have previously pointed out, when integrated, our emotional states are modified by our understanding of conditions and by other interests. But as the integration breaks down, there is an opportunity for a single interest or emotion to dominate our behavior. In nightmares, fear assumes such a rôle. This view is substantiated by the experience of soldiers. On account of exhaustion they often find it difficult to hold themselves together even when awake. When, thus exhausted, they fall asleep, their integration breaks down and they experience again the scenes of terror through which they have passed.

(3) *Influence of dreams on personality and behavior.* Popular thought has always been inclined to attach considerable value to dreams.

The reader will recall how Joseph's interpretation of Pharaoh's dream saved Egypt from famine by causing that country to store the surplus grain during years of plenty for the years of drought. Brutus seems to have been disturbed and unnerved by a dream before the fatal battle of Philippi. One effect of enlightenment in our culture has been a decrease of interest in dreams and their interpretation. However, in recent years, largely as a result of the influence of the psychoanalysts, more significance has been attached to them. Dreams are no longer regarded as prophetic, but rather as a source of information about certain aspects of the dreamer's personality of which he himself may be quite unaware.

Dreams may influence behavior, especially that of children, by introducing a possible source of confusion. To discriminate between dream and waking experience is not always easy. A boy of three was greatly concerned one morning about his mother's falling down stairs. He urged her not to fall again. Evidently he had dreamed of his mother's falling. Doctors, in seeking to get a full account of the history of their patients, find they must guard against this possible source of error. Even delusions may be based on dream experiences.

The prolongation of the emotional or affective states of dreams into the waking life of the dreamer may influence his behavior either by encouraging or by discouraging him. That pleasant dreams should induce pleasant affective states should be no more a mystery than that pleasant waking experiences should make us feel better. Thinking of cheerful things makes us brighter and happier, whereas thinking of sad events makes us unhappy and depressed. The influence of imagery on our affective states, even after the imagery has been forgotten, may be the explanation of the fact that on some mornings we awake feeling unusually fit and optimistic without any apparent reason, while on other mornings we awake feeling depressed with equally little cause.

Dreams may influence the behavior of superstitious people indirectly through their interpretations of them. This is apparently what happened to Brutus. A man may be depressed by "learning" through a dream book that some misfortune is in store for him. He may modify his behavior in a way that he thinks will protect him from the impending disaster. A dream may cause worry, and this may lead to other effects. For example, a person may dream of going insane, and the worry so

caused may subject his mental health to additional strain. On the other hand, a person may be incited by a dream of poverty to work hard to provide himself with a comfortable living.

AESTHETIC ENJOYMENT

Aesthetic enjoyment is the enjoyment that comes from any form of art. Aesthetic enjoyment may accompany all modes of sensory experience. The appreciation of visual and auditory objects is the most common form of aesthetic experience. To such objects we apply the term *beautiful* — a "beautiful" picture, a "beautiful" symphony. For other aesthetic experiences we do not have equally convenient terms. Yet a person may appreciate, as a work of art, the taste of a cake as well as its appearance. He may also get deep aesthetic satisfaction from an odor, or a clear-cut logical or mathematical demonstration. Again, he may enjoy a home that is filled with peace, love, and mutual consideration — a perfect home. As human beings we have broken the bonds that bind us to exclusive concern with the practical; we aspire to and enjoy the beautiful wherever it is found. Such enjoyment lies in the fact that we by nature appreciate some things, not because they are useful or practical or elevating, but because they appeal to us. We enjoy muscular activity and marching and dancing. We enjoy colors, tones, and odors. The breathing of cool, fresh air gives us pleasure. At a higher level, we find much satisfaction in peace, companionship, harmony, successful effort, security, and love. The source of all aesthetic appreciation is in these kinds of enjoyment.

Aesthetic enjoyment is greatly enriched by contrast. It is worth being cold to enjoy the warmth of the fire; it is worth being tired to enjoy the comfort of an easy-chair. Harsh, rasping noises serve to bring out smooth, melodious ones. Turmoil and disorder increase our appreciation of peace and order.

Imagination, by investing all experiences with deeper meaning and by enabling us to enter sympathetically into the sorrows and joys of others, adds greatly to the depth and range of all enjoyment. Much of the pleasure of watching a gifted dancer is thus caused. The dancer engages in an act of self-expression. Unless we identify ourselves with her, we cannot enjoy her dance to the fullest. We appreciate not only the grace of her movements but

her success in self-expression as well. With music it is the same. There is no vehicle of emotional expression more effective or more generally used than music. When we listen with maximum enjoyment to music, we enter into the emotional life not only of the performer but of the composer as well. Were it not for man's ability to enter imaginatively into the life of another and to share his emotions, music would lose much of its charm.

In the enjoyment of paintings, it is not so much color as color or form as form that counts. We enjoy paintings when they have high suggestive value, when they enable us to relive our past in an idealized fashion, or when they present our unfulfilled desires in an attractive form. A woodland scene may enable us to relive a picnic without such uninvited guests as flies and mosquitoes. The picture of a man bearing bravely his suffering may enable us to be, if only vicariously and for a short time, the hero we aspire to become.

Perfection in art consists largely in the ability of the artist to make the observer feel and live with him. To do that he must be a master of his craft. But we do not find enjoyment in living over all events. The successful artist is the one who has an interesting theme. Since this must grow out of his interests, there must be a close kinship between him and his patrons. Through his art the artist attempts to realize his longings and hopes so as to permit all who will to live them with him. In this way many of the highest aspirations of man have been made articulate, and many of his desires have found an idealized realization.

Works of art resemble dreams in an important respect. The dreamer weaves a world of imagery in accordance with his longings and wishes. However whimsical they may seem, his dreams are acts of self-expression. But there is also an important difference between the creative fancy of the dreamer and that of an artist. The former is individual and subjective; there is no pretense of universalizing or communicating to others the impulse behind the dream. In the case of the artist, on the other hand, there is no less creative fancy, but there is, in addition, a serious effort to universalize the motive or feeling behind the fancy. The wishes of the dreamer find adequate expression in an idle imagery that defies all limitations of logic and causal relations, whereas the wishes of the artist are embodied to the best of his ability in the available medium, with the result that

the artist communicates his feelings to others. Great works of art thus give a particular and concrete expression to universal sentiments.

The artist, like the conceptual thinker, rises above the particular to the universal, but his procedure is radically different. The conceptual thinker expresses in abstract terms what is true of a class of particulars; the artist expresses an abstract conception in a concrete and definite form. The abstract thinker universalizes the concrete and particular; the artist individualizes the universal.[30]

Not all artistic productions, any more than all dreams, are wish fulfillments. At times art is used to show the ugliness of vice, or to ridicule sham and hypocrisy or any value which is distasteful to the artist. This is perhaps the sole motive in showing cruelty and suffering ignobly borne. At other times, art represents sorrows, misfortunes, and disappointments in an idealized form, nobly endured. Such works of art give us a better perspective. By lifting us above our individual sorrows, they enable us to see sorrow as the common lot of man. By showing us disaster faced courageously, they half-convince us that misfortune nobly borne is not wholly misfortune.

Works of art, by symbolizing and expressing in an ideal form the longings of man, increase our belief that these longings are essentially sound and that they will find their fulfillment. Hence they help keep alive our courage. For example, Michelangelo's *Pietà*, representing the crucified Christ in the arms of his mother, acts as a sort of confirmation that our longing for protection and heavenly support is well founded. There is no argument; but the calm assurance of the artist and the beauty that clothes his theme none the less deepen our faith. Such faith is no mean asset in keeping alive our zest and joy in life and in maintaining a healthy-minded attitude toward it. Works of art serve not only to entertain, to elevate, and to inspire; in addition, they help us to maintain mental health.[31]

SUMMARY

Imagination refers to mental activity that is not directly related to or dependent upon external stimuli. Imagination is an adjustment which may be a guide to action, a source of enjoyment,

or an outgrowth of anxiety. Imagination differs from perception in that (1) imagined objects are not so realistic as perceived ones, (2) we can examine perceived objects in more detail than imagined ones, (3) we can close off perceptions by blocking our sensory organs, and (4) perceptions fit into the general pattern of reality in a more logical way than do the products of our imagination.

Eidetic images are a particularly vivid form of imagery often experienced by children. Very vivid images, such as those of the eidetic variety, are sometimes confused with perceptions. Hallucinations are images which are mistakenly interpreted as perceptions. Hallucinations differ from illusions in that the former are not directly related to external stimuli, whereas the latter are caused by misinterpreting sensory stimuli.

The content of imagination is always made up of combinations (though often strange and bizarre combinations) of impressions taken from past experience. Creative thinking is largely a product of our power to imagine.

Investigations show that the content of one's imagination experiences is definitely influenced by his other experiences, his desires, and his wishes. As in other traits of a personality, there are great individual differences among people as to kind and amount of imagined experiences.

Imagination enables one to adjust his behavior and guide his actions with intelligence and foresight, because he can try out various lines of action in the ideational stage before actually making a behavior adjustment. In this way imagination definitely aids successful adjustment. It can, however, make adjustments more difficult if it departs too far from reality.

Worry is an attempt to meet on the imagination level a situation that cannot be coped with successfully on the behavior, or action, level. When carried to excess, worry is symptomatic of a deep-seated personality maladjustment.

Imagination aids in the development of personality by permitting one to contemplate all the results of different modes of behavior. It also contributes greatly to enjoyment of life by enabling us to piece together the pleasant parts of our experience and to dismiss from consciousness the more disturbing elements. Play is largely a product of imagination, and it aids the individual both in furnishing an enjoyable type of activity and in promoting mental and physical development.

Daydreams are a form of adjustment in which we create for ourselves a world of fantasy which caters exclusively to our desires. In a mild form, daydreams, like play, are not only a source of enjoyment but an aid to development. If carried too far, however, they are a serious menace to one's ability to meet the world as it is.

Dreams are one of the least understood forms of imagination. According to the psychoanalysts, they are disguised wish fulfillments, giving to us the things which we cannot (or will not) attain during working hours. Dreams are known to influence, and to be influenced by, physiological condition and events which have recently taken place.

Aesthetic enjoyment is very largely dependent upon the imagination. By investing a picture or a symphony with meanings brought from our own experience, we attain a breadth of meaning and understanding which goes far beyond the perception of the colors or sounds.

QUESTIONS ON THE CHAPTER

1. What is imagination? Why do we consider imagination as a form of adjustment?
2. In what ways are imagined objects and perceptions alike? In what ways are they different?
3. What are eidetic images?
4. Under what conditions are images and perceptions sometimes confused?
5. What are hallucinations? How do they differ from illusions?
6. Discuss the relation between experience and imagination.
7. How does imagination function in creative thinking or invention?
8. What facts about imagination are shown by Valentinier's study?
9. In what ways does imagination differ from one person to another?
10. How may imagination aid in adjustment? How may it make adjustments more difficult?
11. Define worry from the psychological viewpoint.
12. What is the relation between imagination and play?
13. Under what conditions are daydreams good? Under what conditions are they harmful?
14. What are dreams, according to the psychoanalysts?
15. Are dreams ever affected by external stimuli? Give examples.
16. How is imagination related to aesthetic enjoyment?

QUESTIONS FOR DISCUSSION

1. Can you think of a simple test to determine whether one's images are eidetic?
2. Could imagination be thought of as both an adjustment and an aid in adjustment? Explain.
3. What do you see in the ink blot in Figure 27 (page 178)? Compare your reports with those of the other members of your class. What does the comparison show concerning the relation between imagination and experience?
4. Give some instances from your own experience in which daydreams have been a beneficial and helpful influence.
5. Give some instance where they have been a harmful influence.
6. Why do we consider excessive worry a symptom of personality maladjustment?
7. What is the main psychological distinction between play and work?
8. What significance have past generations mistakenly attributed to dreams?
9. What significance does scientific thought today attribute to dreams?

SUGGESTED READINGS

J. H. Griffiths, *The Psychology of Human Behavior* (Farrar and Rinehart, 1935), Chapter XI. The chapter contains, among other things, an interesting discussion of the relation between imagination, genius, and insanity.

J. P. Guilford, *General Psychology* (D. Van Nostrand Company, 1939), Chapter XXII. A discussion which emphasizes the rôle of association (and dissociation) in imagining, dreaming, and inventing.

MORE ADVANCED READINGS

W. McDougall, *Outline of Psychology* (Charles Scribner's Sons, 1923), Chapter X. This chapter systematically brings together and explains the relationships between imagination, anticipation, and memory.

E. S. Conklin, *Principles of Abnormal Psychology* (revised edition; Henry Holt and Company, 1935), Chapter XV. An interesting and comprehensive discussion of dreams.

C. Fox, *Practical Psychology* (Harcourt, Brace and Company, 1928), Chapter III. A number of fairly simple experiments and tests designed to measure various aspects of imagery.

CHAPTER FOURTEEN

Reasoning: How We Make, or Should Make, Our Decisions

POPULAR thought places a high valuation on reasoning. Even boys and girls in school criticize courses and teachers that require much memorizing and little reasoning. No one likes to admit he is a poor reasoner, though many willingly admit that they have poor memories, and some even brag of it. Perhaps, by so doing, they think they will get more credit for originality or for making their adjustments through reasoning. Scientists and philosophers also regard reasoning as the crowning glory of man, the distinctive characteristic that separates him from lower animals.

Why is reasoning valued so highly? In what ways is it different from and superior to memory, perception, imagination, and guessing? Can an individual increase his ability to reason? Through what stages do we pass in becoming an accurate and fruitful reasoner?

THE NATURE OF REASONING

Sometimes a person may act smoothly and attain his objective without difficulty. At such times we suspect that he acted largely from habit and that little if any thinking occurred. At other times a person may try one thing after another without success. At such times — if the problem is very remote from situations he has experienced in the past — we say that he lacks insight. Little thinking is possible, since he is compelled by the nature of the problem to proceed in a hit-or-miss manner. Instead of fumbling with an object or situation, however, a person may

quietly survey and ponder it from a distance. At such times we infer that he is thinking or reasoning, and our inference is confirmed if he reaches a reasonable solution to his problem. *Reasoning*, then, is a way of solving problems or adjusting to new situations.

But reasoning is not the only way of solving problems. The rat which threads his way through a maze, the cat which manages to escape from a problem box, and the human subject who stumbles on to the solution of a puzzle are all solving problems, but not by reasoning. Such problem-solving is accomplished by *overt trial-and-error* behavior. The organism's attack on the problem can be observed by an outside observer. To such an observer the solution seems to be quite accidental within the framework of the problem situation.

(1) *Reasoning and overt trial and error.* How does reasoning differ from this type of problem solving? Not on the ground that no trial and error is involved; reasoning is a sort of *mental* trial-and-error process. The problem brings to mind certain previous experiences. These are tried out mentally and discarded. Other experiences are recalled, broken up and rearranged, tried out, and discarded. The process continues until a likely solution is fashioned out of the person's fund of information. If the information needed for solving the problem is not available in the individual's experience, the solution of the problem may be postponed until additional information can be acquired, as in the case of Arrowsmith, who postponed work on an experiment until he could acquire certain mathematical knowledge which he found was necessary for the completion of his scientific work. During the process of mental trial and error involved in reasoning, the individual may engage in little or no overt behavior, although an outside observer may judge that the person is thinking by the fact that he is motionless, or that from time to time during the reasoning he raises an eyebrow, gazes fixedly at something which seems not to be the object of his attention, or sits with chin in hand as if supporting a head which is busily engaged with weighty matters.

Both kinds of problem-solving involve trial-and-error behavior. In one case the trial-and-error activity is open to view; in the other it is not. In one case the trials are direct responses to objects and relations in the problem situation; in the other they are indirect responses, indirect in the sense that they may go on

when the objects of the thinking are not present, or in the sense that even though the objects are actually present, there is no direct manipulation of them. This is seen in the case of an individual who, when given a puzzle box to open, proceeds without any direct manipulation of the box itself to "figure out" how it can be opened. His "figuring out" of the solution is very likely to involve a considerable amount of "talking to himself" and a great many implicit movements of fingers and hands, which are abbreviations of the direct manipulatory responses which might be made in overt trial and error.

Two things are necessary for reasoning. First, there must be a problem, and second, there must be information or knowledge out of which to fashion a solution to the problem. A problem arises when an individual's desires are thwarted or blocked, when for any reason he is unable to get what he wants. A problem box is a problem to an individual to the extent that he wants to open it and to the extent that this desire is thwarted by the fact that he doesn't know how to open it. Regardless of whether the attack on this problem is a relatively blind overt fumbling with the box itself or a systematic reasoning attack, the attempt at a solution starts with a thwarted motive.

Let us examine some of the conditions which thwart motives and give rise to problems. First, desires may be thwarted by obstacles in the environment. Such environmental conditions as cold, heat, drought, mountains, rivers, and oceans have always been serious obstacles standing in the way of man's desire for comfort, security, and survival. The solutions to the problems created by these conditions comprise an important chapter in the history of man's development. On a smaller scale, the infant's urges to "go places and do things" are repeatedly blocked by doors, chairs, steps, and the prison bars of his play pen. Second, desires may be thwarted by one's own inadequate physical and mental equipment. The high school boy's desire to be a football star is thwarted by the fact that he does not have the physical build and stamina needed for football competition. Third, desires may be thwarted by other desires. The saying "you can't have your cake and eat it too" illustrates a conflict between desires. Finally, desires may be thwarted by acquired modes of thinking, moral principles, social conventions, and taboos. The child's desire to carry off an attractive toy from the toy shop is

thwarted by his ideal of honesty. The team's desire to win at any cost may run counter to acquired ideals of sportsmanship, fair play, and honesty.

As indicated above, the solution to a problem is fashioned out of the individual's fund of information. This information may be obtained by direct perception of factors in the problem situation itself or, as is most likely to be the case, it is recalled from the individual's reservoir of past experiences. If these sources of information do not provide a solution to his problem, the individual, being motivated by the problem, may search for new facts. To give children problems which require for their solution facts not available in the children's previous experiences is an excellent means of getting the children to acquire new knowledge. The probability of their searching for new knowledge under such circumstances is a basic assumption of the project method of teaching.

(2) *Reasoning and perception.* In both reasoning and perception we size up a situation on the basis of experience. In reasoning this is done deliberately and consciously in order to deal with the problem at hand; in perception it is done spontaneously and immediately. An expert mechanic at once perceives the trouble on listening to an engine. One less expert considers various possibilities and finally reaches a judgment. Another difference in the two processes is that in perception attention is directed to the object. Its relations and qualities remain implicit as far as consciousness is concerned. In reasoning, on the other hand, attention is directed to the qualities and relations of the object. When we perceive a man, we focus attention on the individual; when we reason about a man, we think about his size, his capacities, and his other characteristics and relations. A third difference, closely related to the foregoing, is that perception involves a more complete definition of the act about to be performed than does reasoning. For example, the expert mechanic, on hearing the engine, perceived what was the matter and his perception involved the remedy — that is, his next step was defined at the perceptual level. The less skilled person, on the other hand, not being able to perceive the trouble, looked to see if various parts were in good condition. In order to determine this he first examined one part and then another. His behavior involved working hypotheses. Gradually his course of action was more clearly defined by further observation and manipula-

tion until, at last, he perceived the source of the trouble and corrected it.[1]

(3) *Reasoning and imagination.* Imagination has been defined as mental manipulation; reasoning, as mental exploration. The difference between manipulation and exploration is the difference between putting ideas together fancifully for the fun of doing so and putting them together because one seems to lead to the next in the attainment of truth or knowledge. When our mental activities are the result of the play motive, we are imagining; when we become interested in discovering new relations, we reason.

Imagination plays an essential part in reasoning. We imagine all sorts of plans with little consideration of their possibility. We begin to reason when we examine the plans to see whether they are feasible and desirable. We imagine what would satisfy us or what would solve a problem. We reason when we examine proposed solutions to see which is best.

(4) *Reasoning and memory.* Reasoning depends on memory, but it goes beyond memory in that it uses what is recalled to throw light on the present situation. When a man infers, as a result of previous experience, that an inflation of credit will cause prices to rise, he is reasoning. He not only recalls the fact that in the past high prices have accompanied inflated credit, but he also makes use of that fact to infer a causal relation between increased credit and higher prices generally.

(5) *Reasoning and guessing.* In guessing we attempt to go beyond the given to new propositions when we know that we do not have adequate facts to do so. For example, we might look at a number of horses about to run a race, without knowing much about them. If we should predict, without further knowledge, that a certain horse was going to win, we should be guessing. When we guess, we recognize that the grounds are insufficient for a reasoned conclusion. When we reason, we are aware of the grounds of our statements and we regard them as sufficient for the judgment made.

(6) *Reasoning and rationalization.* Reasoning looks toward an action or a judgment. If, when confronted with a problem or with the necessity of making a decision, we should carefully consider all the evidence and weigh every possibility, we should be reasoning. On the other hand, if we should act hurriedly

and then look for good reasons to justify ourselves for having acted as we did, we should be rationalizing. We should also be rationalizing if, before acting, we thought of several reasons for, but none against, our contemplated activity. Rationalization is the homage we pay to rationality. In reasoning we seek guidance; in rationalizing we seek justification.

Summarizing the foregoing discussion, we may define reasoning as the deliberate and critical use of one's knowledge to solve problems.

PLACE OF REASON IN THE LIFE OF MAN

(1) *Reasoning and cultural progress.* The contributions made to our culture by great thinkers justify the high regard in which reasoning is generally held. To mention the names of great scientists and philosophers is to name many of the greatest benefactors of mankind. They have done much to free us from fearful and enslaving superstititions; they have taught us how to combat disease and to eliminate pain; they have increased our power and efficiency manyfold by giving us machines of all kinds; they have increased the usefulness of our schools. Men who reason have added greatly to our understanding of social and political realities. Unfortunately we have been prevented by ignorance and selfishness from acting upon the results of their insight to banish hunger, economic insecurity, and war.

(2) *Reasoning, a source of individual efficiency and well-being.* The value of reasoning to the individual is too obvious to require elaboration. By reasoning before acting we are kept from doing many useless and foolish things and are able to prepare in advance for various contingencies. By reasoning, the life of impulse and prejudice is checked and ways of action are discovered which more nearly represent the interests of the whole personality. Conflicts are settled rationally rather than on the principle that might makes right. These values we have described more fully in Chapter IV.

(3) *Reasoning, no criterion of efficiency.* Though reasoning is our best way of solving problems, to reason about matters which are already understood is a waste of time and not a mark of superiority. The mechanic who quickly detects and corrects the disorder in an engine is more, not less, efficient than the one who must stop and reason. The same is true of the person who knows

the value of temperance without having to reason about it. Yet some people apparently feel that they must reason about everything.

How an obsession to reason about everything may destroy efficiency is shown in the following account:

> To one whose mind is healthy thoughts come and go unnoticed; with me they have to be faced, thought about in a peculiar fashion, and then disposed of as unfinished, and this often when I am utterly wearied and would be at peace; but the call is imperative. This goes on to the hindrance of all action. . . . Let me instance the morning I went to walk. The day was biting cold, but I was unable to proceed except by jerks. Once I got arrested, my foot in a muddy pool. One foot was lifted to go, knowing that it was not good to be standing in water, but there I was fast, the cause of the detention being the discussing with myself the reasons why I should not stand in that pool.[2]

Extreme indecision such as the foregoing is called *abulia*. It is clear that it renders ineffective the person so obsessed.

We should not attempt to reason about everything. Parents and teachers make a mistake when, instead of advising youth to accept those courses of conduct that have been tested and found satisfactory by former generations, they encourage their charges to reason about everything. It is as foolish for a person to neglect the accumulated wisdom of society that is embodied in traditions, laws, customs, and manners as it would be for one beginning the study of chemistry to insist upon rediscovering all of the known facts in that field. To reason about problems already solved is a waste of time. We need to reason when there is a problem for which we have no well-tried solution. But to ponder over what has already been solved is to make of reasoning a fetish instead of a process that should serve our needs. The purpose of reasoning is to solve problems, not to spin aimlessly around on itself. Reasoning represents the growing point of knowledge. When it has pointed the way and we have found the way satisfactory, we should accept that way and make it a habit. By so doing we become free to reason when new difficulties arise.

We should also keep in mind that it is the quality rather than the quantity of reasoning that determines its value. To illustrate: two men have money to invest. On consideration, each invests his money. The one who considered fifty possible ventures may

not have used his money as wisely as the one who considered only five. The latter may have learned from previous experience or training that certain investments should not be made. As a result, his reasoning processes were simpler and less elaborate than those of the other, but superior to them in quality.

(4) *Reasoning, a revelation of personality.* What one reasons about is a clue to his intelligence and personality. Take the statement: John has three brothers — Henry, Charles, and himself. If an adult should stop to reason in order to detect the absurdity of this, he would only show his stupidity. He would do the same were he to stop to figure out simple mathematical relations that are usually understood at a glance. But were he to handle masses of complicated data so as to organize them in a simple and helpful manner, as Newton did in the fields of physics and astronomy and as Darwin did in the field of biology, he would give evidence of superior intelligence.

Our characters are also revealed in reasoning; for reasoning is always guided by some value. The person who evaluates money highly is apt to spend much time reasoning or planning how he can increase his income. The person who attaches importance to social position will spend much time formulating schemes to receive invitations from the four hundred. The thoughts of a person desirous of literary fame will be colored by that ambition. In brief, reasoning is a servant employed to help us attain our aims; hence, if we can learn what a man reasons about, we have a valuable clue to his fundamental interests.

Not only do our interests and desires determine what we will reason about; they frequently serve to distort the quality of our reasoning. This is seen clearly in rationalizing. An individual wants to do a certain thing and does it. Later he uses reasoning to convince himself that what he did was the thing to do. A personal interest in the outcome of an act of reasoning or the inability to bring an objective attitude to bear on a problem results in faulty reasoning and invalid conclusions. This difficulty is common in political arguments. Morgan and Morton have shown that distortion occurs in syllogistic reasoning when the terms of the syllogism are related to the individual's personal convictions. The individual tends to accept a conclusion in keeping with his convictions with little regard for the correctness or incorrectness of the inferences involved.[3]

STEPS IN THE ACT OF REASONING

An act of reasoning may, according to Dewey, be broken into five steps as follows: (1) a felt difficulty; (2) its location and definition; (3) suggestion of possible solutions; (4) development by reasoning of the bearings of the suggestion; and (5) further observation and experiment leading to its acceptance or rejection.[4] The beginning of an act of reasoning, as we have already indicated, is a problem or felt difficulty. An individual wants something that he can't get, or some habitual way of acting is blocked, thus creating a difficulty. A noise develops in the smoothly functioning automobile motor which, while it doesn't keep the motor from running, annoys the driver. The next step is to locate and define the problem. It has been said that a clear statement of the problem is half the battle. A good reasoner is able to "put his finger on the precise difficulty." The noise in the automobile engine must be located. Is it in the generator, the motor block, the carburetor, or the fan?

As soon as the trouble is located, a number of possible causes suggest themselves (Step 3). Let us suppose that the noise in the automobile is finally diagnosed as coming from the fan. From our observation of the noise we may believe that the fan needs oil or that the fan belt is broken or that the fan is loose on the drive shaft. In Step 4 these suggestions or hypotheses are subjected to test. Each suggestion is examined carefully in the light of additional observations and previous experiences. One suggestion after another is discarded in the light of these facts until we are left with one suggestion which must be tested by actual trial. We discard the notion that the fan needs oil because we recall that we had the car greased just a few days earlier. We discard the idea that the fan is loose on the shaft because we recall an earlier experience with another car in which a loose fan produced a very different kind of noise. Having had no experience with broken fan belts, we are inclined to conclude that the fan belt must be the source of the difficulty, since this is the only other suggestion that occurred to us.

The final step in the reasoning process is to subject this final suggestion to experimental proof. We examine the fan belt or drive to a garage and ask the mechanic to do so. Our reasoning may fail to lead to a solution of the problem. It may turn out

that our experience or knowledge of automobiles was so limited that all of the possible causes of noise from fan belts did not occur to us, or that the source of the noise was not correctly diagnosed in the first place. The dependence of reasoning upon observation and previous experience is obvious.

The suggestions which occur to us as possible solutions to our problem may be thought of as hypotheses or guesses regarding the possible causes of our difficulty. The mental trial and error most characteristic of reasoning occurs in Step 4, in which the hypotheses are tried out subjectively one after another and examined critically and carefully. Here each suggestion must be followed through to its logical conclusion. If this is true, then so and so must be true. A check will serve to establish the validity of the conclusion. This process of checking hypotheses is illustrated in the following account of Pasteur's discovery of the cause and the means of prevention of hydrophobia. Pasteur, having seen a child die of hydrophobia, became interested in its cause and prevention. His first hypothesis as to its cause grew out of the common fear of being bitten by a dog suffering from hydrophobia; it was that the disease is transmitted by the saliva of the diseased animal. If this hypothesis were true, then hydrophobia should follow upon an inoculation of animals with the saliva of diseased animals. Inoculation with such saliva failed to produce the disease in a majority of instances. The first hypothesis was therefore rejected. Pasteur's second hypothesis grew out of the observation that animals dying of hydrophobia suffer many muscular contortions. This suggested that the disease involved the *medulla oblongata*, the seat in the brain of control over involuntary muscular action. If this hypothesis were true, then animals inoculated with an emulsion of the *medulla oblongata* from a diseased animal should develop hydrophobia. This implication of his hypothesis was tested, and it was found that all animals so inoculated, without exception, died of the disease. Having discovered the cause, he was faced with the next problem — to find a way of protecting those who had been exposed to the disease. Working on the theory that the living organism will build up immunity to a disease if it is exposed first to a weak charge of the virus that carries the disease and then to more virulent forms, he was able so to immunize dogs that no injection of diseased *medulla* gave them the disease. Shortly afterwards he had an

opportunity to test his method on a boy who had been badly bitten by a mad dog. It proved as effective on the boy as on dogs.[5]

It should be noted that Pasteur's theories grew out of his fund of knowledge. Hypotheses do not spring out of the clear blue sky. We accept Pasteur's verification of his hypothesis because he showed it to be consistent with all the known facts and to provide a fruitful tool with which to deal with the phenomenon. His hypothesis also meets the two other requirements of a good hypothesis, namely, simplicity and freedom from assumptions regarding unknown causal forces.

(1) *Induction and deduction.* All reasoning involves two movements: one from the particular phenomena observed to a generalization, hypothesis, or theory; the other from the generalization to its consequences. The former is called the inductive movement of thought; the latter, the deductive movement. For example, Pasteur advanced the generalization that hydrophobia is caused by the saliva of dogs suffering from that disease. This was an induction. He then deduced that, if hydrophobia were so caused, the inoculation of other animals with the saliva of a diseased animal should cause the disease. This was the deductive movement of his thought. It suggested a test which failed to verify his hypothesis. Hence the rise of a second hypothesis and its final verification.

Sometimes we speak of inductive thinkers and deductive thinkers. This is probably due to the fact that some people accept the generalizations of others and seek to guide their lives by making deductions from them. In some periods of history this is more frequently done than in others. The Middle Ages were outstandingly a period of authority. The present age has been greatly interested in extending knowledge. It has, therefore, greatly emphasized induction. In reality, however, this difference can be only a matter of emphasis; for induction and deduction are but the different directions of our mental activity when we are confronted with a puzzling situation. To understand the situation we must advance new hypotheses or pick one already advanced. Unless we did one thing or the other, we should be completely bewildered. We must also test our hypotheses in the light of their implications. Otherwise, we should act impulsively instead of rationally.

(2) *Thinking largely unanalyzed.* Most of us do not observe our

thought processes. This is perhaps due to the fact that when we think, we are so busy thinking that we have little time to observe what we are doing. We think without knowing how we think in much the same way that we ride a bicycle without knowing how we do that. In general, we learn to perform an act before we are conscious of the processes involved or are able to tell another how to do it. Excellent illustrations of this can be found in the difficulty children experience in describing their mental processes. Ask a child of eight to solve a simple problem; he may solve it readily enough, but it is less likely that he will be able to tell you how he solved it. This is a common observation of teachers. For example, when a boy of nine and a half years was asked to find $\frac{3}{4}$ of 16 matches, he muttered to himself: "A quarter of 16 equals 4; 3 times 4 equals 12." When asked how he did it, he replied, "I said, 'Four times 3 equals 12. To go up to 16 takes 4. I took 4 matches from the pile and gave back the rest.' " Still more remarkable is the answer of a boy of seven who had solved correctly the following problem: "This table is 4 meters long. This one is 3 times as long. How many meters is it?" When called upon to state how he had solved the problem, he replied: "I added 2 and 2 and 2 and 2, always 2." "Why 2?" he was asked. "So as to make 12." "Why did you take 2?" "So as not to take another number."[6]

In such cases it is clear that the children reasoned, but they were not conscious of their mental processes. To turn our attention back on our mental processes requires effort. A good way of doing this is to consider some of the difficulties children encounter because they do not possess the thought forms constantly used by adults.

(3) *Thought forms.* One of the most important thought forms is that of a homogeneous space in which we can lay out things before the mind's eye to discover the relations between them. For example, suppose an adult were told that Chicago is north of St. Louis and west of Detroit. If he were asked the direction from St. Louis to Detroit, he would probably visualize a triangle with the three cities occupying the appropriate positions, answering at once that Detroit is northeast of St. Louis. Young children, however, are unable to do this. Lacking a space schema many of them are unable to understand such simple space relations as the fact that Chicago is west of New York and east of Sioux City.

Perhaps for the same reason they are unable to understand how a person can be both an Italian and an American.

Adults do not use their space visualizations for spatial relations alone. Consider the simple problem: "If Edith is more beautiful than Ruby, and Lily is more beautiful than Edith, which of the three is the most beautiful?" To solve this, the adult is apt to make use of a line, one end of which is marked "beautiful" and the other "unattractive." He places "Ruby" near the latter end, "Edith" near the former end, and "Lily" yet nearer the former end than "Edith." Children find such comparisons difficult, partly, no doubt, because of a lack of space visualizations.

In saying that the child cannot solve such problems because he cannot visualize space, we do not mean that this is the only or the fundamental cause of the child's inability. Actually, the child has not matured sufficiently and lacks experience.

To reason accurately we must relate ideas or objects in definite and precise ways. If we merely link things together without specifying how they are related, our thinking is vague and hazy. Children are unable to relate things in specific and definite ways because they lack knowledge both of specific relations and also of the nature of things, and because they do not have the words to express what they know. Say to a young child, "The man fell down because . . .?" He is apt to complete the sentence by saying, "he broke a leg." "Falling down" and "broke a leg" are linked together in the child's thought, but the idea of a causal relation has not yet been correctly applied to this situation.

The development of the thought life of an individual, like the development of his emotional, motor, and perceptual characteristics, involves two movements. One is from the general and vague to the particular; the other is from the particular to the general. The very young infant, as we have seen, does not act emotionally in the various ways characteristic of older children and adults. He shows only pleasant and unpleasant excitement, or relaxation. Later, the emotional expressions become differentiated. The child is able to control them or to combine them into new modes of acting. Similarly, when the very young infant makes a motor response, he is apt to "respond all over." As he develops, he uses only the needed muscular patterns, and these he learns to recombine in various ways. Likewise with the development of perceptions. At first our perceptual world is

less rich and meaningful than it later becomes. As we learn the uses of things and how they affect us, we learn to notice only significant objects, and these become far more meaningful than they were in infancy.

It is the same at the level of reasoning. The general concept "relatedness" is first broken down into its various types of relations, which we learn to use in profitable ways. As young children, we saw the connections between things as a matter of course, but not in ways that were clear-cut and definite. Students may relate the content of an introductory course in much the same way that children relate things in general. Knowledge that things do hang together comes before knowledge of how they hang together. With growing mastery, we organize the material of a subject so as to make clear its unity and diversity and we comprehend clearly many relations which were once only vaguely felt.

In thinking, we make use of such relations as cause-effect and the principle of non-contradiction. One of the first that the child masters is the causal relation. Some children embody the principle of causality in their behavior when very young. For example, a child may refuse to jump off a table and explain that to do so would hurt him. Moreover, children frequently show a knowledge of this thought form before they are able to give content to it. A child of two or three, when asked why he acts in a given way, is apt to reply, "Oh, because" — in much the same way that adults sometimes "explain" their feelings.

The adult seeks to discover principles or universal sequences. Since there are many exceptions to all generalizations, conjunctions of discordance — such as *although*, *in spite of*, and *notwithstanding* — are necessary for accurate thinking. Thus we say, "*Although* it is raining, I shall go"; or, "*Notwithstanding* an expansion of credit, prices have fallen." To use such conjunctions correctly, an individual must have first formulated a general principle and then have noted an exception to the rule. Children do not master this thought process until they are about ten years old.

A thought form essential for logical thinking is the principle of non-contradiction, which means that contradictory predicates cannot be applied to the same subject at the same time. For example, I cannot say that Mr. A—— is guilty and not guilty of the crime of which he is accused, or that the same object is both

heavy and not heavy at the same time. Evident as this principle is, children frequently violate it. Observance of the principle of non-contradiction requires stable concepts and memory of what has previously been said. Stable concepts involve the combination of qualities possessed by the object under consideration. The inability of young children to combine qualities has been interestingly shown by Piaget. He found that Swiss children of nine could not solve the following problem: "If this animal has long ears, it is a mule or a donkey. If it has a thick tail, it is either a horse or a mule. Now this animal has long ears and a thick tail. What is it?" They could not put together "thick tail" and "long ears" to see that they indicate a mule.

The child, partly because he is not able to combine qualities, makes contradictory statements about an object. When, for example, he says that the sun is alive, he perhaps has in mind that things which move without help are alive. Later he says it is not alive, perhaps because he remembers that things which are alive have blood.

The forgetfulness of children makes it all the more difficult for them to avoid contradiction. As an illustration of this Piaget tells of asking a nine-year-old child: "What is the moon made of?" When the child replied that he did not know, he was shown a gold watch and was asked the same question. The child answered, "Gold." After a few minutes Piaget repeated the question regarding the moon. The child then answered, "Gold." On being asked how long he had known that, he replied, "I have always known it."

According to Piaget, a large number of Swiss boys between six and eight said either that they thought through their mouths or that thought is a voice within the head. When, however, they became familiar with the term *brain*, they seemed to forget their earlier notions. One boy of about nine insisted that he had always known that he thought with his brain and that no one had told him.[7]

Students of child psychology have frequently noted that the inner world of childhood is a closed book to the average adult. This seems strange, since we have all been children; but the inability to recall our childhood experiences becomes intelligible in the light of the inability of children to introspect and their ready forgetfulness of their recent mental states.

IMAGES AND CONCEPTS

A concept is a cluster of meanings. Our concept of man is what man means to us — his qualities, characteristics, and relations. Images are mental pictures. Our image of man is merely our mental picture of him.

Some psychologists have held that concepts are merely composite images. According to this view, the concept "man" would be the result of our having made a composite picture of tall and short men, fat and thin men, blue-eyed and brown-eyed men, and so on. Granting that a composite mental photograph of a man might be made in this way, it is more difficult to conceive how such a picture could be made of more abstract things, such as body, mass, or justice. The difficulty of forming such mental pictures is sufficient proof that concepts are not developed in this way. Their origin is far simpler. They are formed by discovering through analysis the essential qualities of the thing of which we have a concept and by combining these into a stable idea. For example, the essential qualities of man are human parentage, the ability to perform the higher mental processes, and an upright physique. These qualities we synthesize in the concept "man." This concept is enriched by comparing man with other organisms.

Images, on the other hand, are mental reproductions of a sensory object. They may be of help in thinking in much the same way that sensations are. When we are thinking about an apple, the presence of an apple may be of assistance. In the absence of an apple, a good picture may be an asset. Since images are mental pictures, they play a similar part.[8] Imagery makes still another contribution to thinking. Much of our thought involves the imaginative placing in our space schema of the objects about which we are thinking. In this operation imagery, of course, plays a part.

AUTISTIC THINKING

Prior to logical thinking is a period during which the thought process is determined entirely by the desires of the thinker, with complete disregard of logical principles or of social confirmation. In such thinking there is no balancing of cause and effect or of

means and ends. This type of thinking is known as *autistic thinking*. It is more prevalent in childhood than in adulthood. This is due partly to the immaturity and lack of experience of children and partly to the treatment accorded them. The household is regulated to meet the infant's every need. Hardly does he cry for food before it is brought to him. If he drops something on the floor, a willing attendant replaces it. When sleepy, he is made comfortable in bed. If he shows interest in an object, it is given him. His every desire is satisfied through no effort of his own. The infant has reason to believe that thought is omnipotent. It takes time for him to learn differently.

Around Christmas-time little children fight hard to believe that Santa Claus is a wonderful old man who gives presents to all boys and girls. Their thinking is not determined by what they know, but by what they desire to believe. Here is the conversation between a father and his four-year-old son:

Father: How can Santa Claus get down the chimney?
Son: He is not so fat as we think.
Father: How can he get to California and New York during the same night?
Son: Go by train or a big bus.
Father: What is Santa Claus like?
Son: A man.
Father: Who is Santa Claus?
Son: Not you and Mamma.

The little fellow was fighting hard to preserve his belief in Santa Claus as a mysterious creature. Like many adults when placed in similar situations he gave reasons and explanations that did not measure his logical comprehension or ability to think straight. That ability was more truly reflected in his last reply, "Not you and Mamma."

Though many things combine to help bring about the needed discipline, autistic thinking is seldom completely outgrown. Many adults do not see a thing as it is because of their desire that it should be different. A man who wishes to become governor of a state may convince himself that he has numerous friends throughout the state who are anxious to make him governor, when, as a matter of fact, he may be poorly qualified for the office and have only a few supporters. Or a woman may seriously argue that she needs a new dress when she already has more dresses than she can afford.

CONDITIONS THAT STIMULATE LOGICAL THINKING

Environmental conditions may stimulate thinking by presenting problems, by providing an atmosphere conducive to reflection, and by encouraging the development of personality traits that lead to thinking. We shall describe first some of the environmental conditions that stimulate thinking, and later some of the traits that are favorable for reasoning.

(1) *Language.* In the development of thought, language plays an important part. Even mathematicians need convenient symbols to carry on elaborate processes of reasoning. We can reason only in the most primitive fashion without the use of words to indicate relations. Language, then, is not merely a means of communication; it is a tool of thinking. Without language we may dimly sense a relation, but we cannot crystallize or express it. By means of language we may make the relation congeal into a word or concept, which then becomes a building-stone for more elaborate thought structures. The development of language is, therefore, a rough measure of the logical development of a people. Similarly, the mastery of language attained by each individual is a rough measure of his thought life. If a person is slovenly in his speech or if his mastery of language is poor, we may assume that his thought life is either confused or at a low level.

(2) *Social contacts.* Reasoning must be motivated. People do not reason for nothing. Social contacts create a need or an urge to reason. The desire to win social approval and to communicate with others makes thinking almost a necessity. Young children do not, as a rule, feel the importance of making their thoughts explicit, and many university students on examinations seem to assume that a mere suggestion of their thought processes is enough to enable the instructor to understand them. As we learn that understanding is not so easily imparted, we become more and more careful to express ourselves clearly. With this effort we become more conscious of our thinking and make more explicit the grounds of our conclusions. We wish, however, not only to be understood but also to convince. Hence we support our statements by connecting them with more generally accepted propositions. This necessarily involves deduction and the use of causal relations. Moreover, when others do not agree with us and we finally appreciate the fact that they may really see things

differently, we become more careful in thinking through our problems to a rational conclusion. In this way we make our thought processes more explicit and more accurate.

(3) *Change.* Social habits and traditions are sufficient to guide behavior when social change is slow, for then there is little need to think. But in a rapidly changing environment, new paths must be made. At such times we are driven to think. In this respect our own culture is one of the most stimulating the world has ever known. The invention of machinery has provided us with the means of creating enough material things to satisfy the legitimate wants of every family. Yet we seem unable to take advantage of our opportunities. Indeed, machines, instead of ushering in an era of plenty, have apparently produced scarcity and suffering for millions. One need only turn the pages of our best magazines to see how these economic changes have stimulated thought. Many problems in the fields of religion, science, and politics have also arisen during our era and are compelling us to think.

(4) *Contacts with other cultures.* When members of one cultural group are thrown into contact with those of another, thought is stimulated. An important cause of the fact that Greek philosophy arose among the colonists instead of in Greece itself was that the colonists came into contact with cultures different from their own. The discovery that men might have beliefs and values different from their own stimulated them to reflect. Thus has it ever been. Ordinarily we become set in our favored ways of doing things and cease to think of new possibilities. Today knowledge of widely different cultures, both past and present, is stimulating social thinking. Though some of us may believe that our society is so perfect that we can learn nothing from others, the large majority have become experimental in their attitude and are willing to consider the possibility that social change may mean social progress.

(5) *Environments conducive to reflection.* There are some environments that place a premium upon thought and some that regard thinking with suspicion. As has been pointed out, our own culture is especially conducive to reflective thinking by virtue of the many changes that are taking place. Yet even here, in spite of these changes and of our wide contacts with other peoples, there are communities that fear thought. They feel that reasoning

is apt to uproot custom and tradition, leaving in its wake a chaos of uncertainty and bewilderment. And their anxiety is not unreasonable; for it is easy to confuse the reasoner and the revolutionist. Indeed, the revolutionist has encouraged this confusion; for if he can show that the change he advocates has been dictated by "reason," who can say that he is wrong? We should bear in mind that the new is not necessarily reasonable and that the reasonable is by no means always new. A reasonable solution to any problem is one which is based upon an impartial consideration of all facts pertaining to that problem. Habits, customs, and traditions that have been considered satisfactory by many former generations as well as our own are often, but not always, more reasonable than untried theories. Bearing this in mind, we should be quite willing to subject current social practices to a logical analysis. Reason will probably dictate quite as much continuance of present practice as change.

SOME PERSONALITY TRAITS THAT ARE CONDUCIVE TO REASONING

(1) *Self-reliance.* A good reasoner must do more than think through his problems. He must also be willing to try out the plans of action that seem reasonable. He must have something of the adventurer in him. He must not seek to escape the trouble, responsibility, and even danger of testing his conclusions. Otherwise, he is more likely to spin out fanciful ideas than workable plans.

(2) *The inhibition of impulse.* "An angry man cannot see straight," says an old proverb. We might add that a man greatly frightened or carried away by any passion cannot see straight. To reason, one must have time and inclination to apply his experience and knowledge to a situation. In this way the whole personality decides the issue. Under the influence of strong emotion the inhibition of impulse becomes more difficult and one interest is likely to usurp the rightful place of the whole. When one is emotionally aroused the tendency to act becomes so strong that one does not think. This was clearly seen in the behavior of Köhler's chimpanzees, which, when the prize outside the cage was especially attractive, would continue to strive to obtain it no matter how hopeless their efforts.[9] So it is with a man driven by

a strong passion or desire. He is unable to control his behavior by insight or to think matters through.

This is the basis of the common classification of men into doers and thinkers, and also of the popular idea that thinking indicates a cold-hearted disposition. To think, we must inhibit action. Yet it is clear that the more powerfully we are moved the more difficult it is to do so. Other things being equal, the cold-blooded man or the one who has little interest in the outcome of a controversy is able to think more clearly than the warm-hearted one who is vitally interested.[10]

(3) *Freedom from bias.* The way in which bias makes objective thought difficult is seen in parents' judgments of their children. Our biases or prejudices against a person, a race, or a political party are equally influential in making our judgments unreliable. Prejudices may be recognized by the warmth with which we defend them and by our inability to give sufficient logical grounds for holding them. They may be combated by a strong determination to be rational, that is, to base all beliefs on the best knowledge attainable. Prejudices against a group may be overcome by putting oneself in the place of members of the group and by learning as much as possible about them. In the case of prejudices against social theories, discussion groups — not debating groups — are helpful. Exchange ideas, bring your worst fears into consciousness, and see how much (or little) is behind them.[11]

(4) *Active imagination.* As we have already pointed out, imagination is an essential element in reasoning. To guess how a problem may be solved and to anticipate the consequences of an act require imagination. The fertility of one's imagination depends in part upon knowledge. Before we can make a reasonable guess about the solution of a problem, we must know something about it. A good reasoner is not biased by any knowledge of the facts. Knowledge in several fields not too closely related is especially valuable in stimulating the flow of thought. The habit of playing with new ideas is also helpful.

(5) *Reflective attitude.* In order to think, we must give ourselves time. A person when first confronted with a problem, such as the necessity of making a speech, may feel helpless, only to find a wealth of ideas coming to consciousness after a day spent in turning the matter over. It takes time to bring to bear on a problem all the relevant facts at our disposal. There is wisdom

in the advice to sleep on a matter before making an important decision.

A reflective attitude involves, however, more than taking time to think; it also implies searching for ideas, examining a problem in as many ways as possible, and trying to anticipate the probable consequences of various suggested solutions. When one is confronted with a problem, the effort to regain equilibrium gives rise to mental activity, much of which issues in dim stirrings of ideas. The reflective person, on account of his watchful attitude, catches these and brings them into consciousness. The unreflective person allows them to pass unnoticed, and is no better off for such dim stirrings of the imagination.

(6) *Critical attitude.* Many of us are inclined to base our beliefs on insufficient grounds. We are apt to believe statements made by important people, especially if the statements are in line with our desires. At other times we base our beliefs upon inadequate evidence, because suspended judgment is painful. Beliefs which are based on insufficient evidence are irrational. Usually they are held more dogmatically than rational ones. It is a good rule to examine the grounds for all convictions that seem too obvious to question. We do not fear to examine our rational beliefs. On the contrary, if convictions are founded on inadequate grounds, we wish to know it. If another way of thinking promises to be of greater value, we are glad to embrace it.

The person who has developed a critical attitude will carefully examine the source of evidence regarding alleged facts. He will want to know whether the one giving the testimony is a witness of proved capacity and honesty. He will seek to grasp all relevant facts. He will then examine the alleged facts in the light of his accumulated knowledge in order to discover whether they fit in consistently with beliefs that have been well established. Whenever it is feasible, he will seek a demonstration of the alleged facts.

A critical person will also be careful to avoid superficial analogies. We are amused at some of the analogies which led to fallacious reasoning in the past but we often accept seriously those drawn under our very noses. For example, we smile complacently when told how Herodotus in the days of ancient Greece "explained" the southward movement of the sun in winter by assuming that, like birds and wealthy men, it seeks a warmer climate during cold weather. But it has cost many a football

coach a crucial game to learn that the brother of a star is by no means certain to play brilliantly. Two boys may be alike in name, in family background, and in appearance; but there the similarity too often breaks down. One who bases his judgments on superficial similarities rather than on basic differences is likely to make many a grievous error.

DELUSIONS

One of the greatest sources of error in reasoning is the tendency to believe what we wish to believe. This leads frequently to an effort to justify our beliefs, and thus to distorted thinking. The intensely patriotic man, for example, distorts the facts of history so that he can continue to believe that his country has always acted honorably. The desire to magnify our own importance or to stimulate our feelings of positive self-regard is a fertile source of distorted thinking. No one wishes either to think meanly of himself or to have others do so. Yet many of us fear that we are weak and that we do not merit the high regard of others. To protect ourselves from such painful suspicions, we may begin to rationalize, to make excuses for our weaknesses, or to compensate for them by developing an exaggerated idea of our importance and ability. However, pretenses to superiority are seldom accepted. The pretender often develops, therefore, the belief that every one is jealous of him. With such a start conditions rapidly become worse. To preserve the belief that others are jealous or hostile requires other fabrications. To be selected for group jealousy or hostility suggests marked superiority. Such a thought in itself does much to inflate the ego. The unfortunate person continues the process by imagining that perhaps he is Napoleon or some other great man. Such ideas are so loaded with satisfaction that the deluded person may accept them as true and finally come to believe that he really is Napoleon. To do so, of course, necessitates many rationalizations. Napoleon died; how then can a man today be Napoleon? Napoleon was Emperor; how can a poor workman be Napoleon? Such considerations, however, give the deluded person little concern; for in *paranoia*, the name given to this type of mental disorder, autistic thinking holds full sway.

Paranoiacs cannot be reasoned with. Since their thinking

grows out of the emotional need for magnifying the ego, that need itself must be dealt with. This cannot be accomplished by argument; it can be done only by helping the sufferer to attain satisfaction for his deep-seated wants in a more desirable manner. If this is done, the paranoiac may give up his delusions for more realistic satisfactions, though there is generally such deterioration, both physical and mental, that little can be done.[12]

DISORDERS OF VARIOUS MENTAL PROCESSES

Every mental process is liable to pathological developments or to gross errors. The normal life of feeling and emotion may give place to apathy or to manic excitement; memories may be repressed or distorted beyond recognition; sensations may cease making their normal contributions to consciousness, giving rise to states of anaesthesia and sometimes to a loss of the feeling of personal identity; perception may err so far as to give rise to

TABLE XXI

DISORDERS TO WHICH THE VARIOUS MENTAL PROCESSES ARE SUBJECT

Mental process	*Disorder*
Feeling and emotion	Apathy Manic excitement
Memory	Functional amnesia Distortion of past
Sensation	Psychic anaesthesia Loss of feeling of personal identity Blindness, deafness, etc.
Perception	Illusion
Imagination	Hallucination
Reasoning	Delusions Abulia Rationalization

illusions; imagination may produce hallucinations; reasoning may bring forth delusions. These disorders and the mental processes of which they are distortions are shown in Table XXI.

SUMMARY

Reasoning is the deliberate and critical use of one's knowledge to solve problems. Reasoning is a more complex activity than perception and more specifically concerned with the solution of problems than is imagination. Though reasoning makes use of memory, it involves the additional element of inference. The conclusions reached through reasoning have to do with the causative factors which are really operating. Conclusions reached by guessing are essentially due to chance, while those reached through rationalization are dictated primarily by our wishes.

Reasoning, as an activity, promotes cultural progress, as well as individual efficiency and well-being. However, actions based on reason are not always the most efficient actions. To be really efficient, activity must become habitual. But the process of reasoning is revealing, and to know how a man reasons is to know a great deal about his personality.

The steps in reasoning are: (1) a felt difficulty, (2) its location and definition, (3) suggestion of possible solution, (4) examination of suggested solution, (5) acceptance or rejection of suggested solution. The two major movements in reasoning are induction (from the specific to the general) and deduction (from the general to the specific).

Though it is possible to analyze reasoning into its essential steps (and thereby to discover possible flaws), it is by no means common practice to do so. The average person does not analyze his own reasoning, or look with favor upon another's efforts to do it for him. He reaches conclusions by processes which are largely unconscious and which are usually a mixture of perception, guessing, daydreaming, and rationalization.

Reasoning, like other mental functions, makes use of images and concepts. A concept is a cluster of associations which give meaning to an idea or a word.

Between completely random mental activity or daydreaming, on the one hand, and rigorously controlled reasoning, on the other, is a middle ground called autistic thinking. Autistic thinking is non-social thinking directed by desire instead of by objective facts.

Factors that stimulate or assist logical thinking are: (1) language, (2) social contacts, (3) change, (4) contacts with other

cultures, and (5) a reflective environment. Some personality traits that are conducive to reasoning are: (1) self-reliance, (2) inhibition of impulse, (3) freedom from bias, (4) active imagination, (5) a reflective attitude, and (6) a critical attitude.

Delusions are false beliefs — beliefs dictated by our desires (perhaps poorly recognized desires) rather than by facts. Persons suffering from delusions cannot follow normal reasoning processes.

QUESTIONS ON THE CHAPTER

1. Define reasoning.
2. How does reasoning differ from perception? From overt trial and error? From imagination? From memory? From guessing? From rationalization?
3. What conditions thwart desires? Give an original example of each.
4. Why do we say that reasoning is no criterion of efficiency?
5. What is abulia?
6. Select a specific case of reasoning and analyze it in terms of the steps mentioned on page 496.
7. What is induction? What is deduction?
8. Why do we regard true reasoning as made up of both induction and deduction?
9. What are the major differences between the reasoning of children and that of adults?
10. What is a concept? How is a concept related to images? To mental associations?
11. What is autistic thinking?
12. What conditions stimulate logical thinking?
13. What personality traits are conducive to reasoning?
14. What are delusions? How do they affect reasoning?

QUESTIONS FOR DISCUSSION

1. From your knowledge of history give some examples of the influence of reasoning on cultural progress.
2. From your own experience cite some illustrations of the influences of reasoning on individual efficiency.
3. Select a number of examples of decisions you have made in the last week. How many were made after a carefully reasoned analysis of the factors involved?
4. Give some examples, from your own experience, of autistic thinking.

SUGGESTED READINGS

J. Piaget, *Judgment and Reasoning in the Child* (translated by M. Warden; Harcourt, Brace and Company, 1928). As a report of an intensive series of experiments and observations on young children, this book is the authoritative treatment of the subject.

J. H. Robinson, *The Mind in the Making* (Harper and Brothers, 1921). A fascinating account of the development of man's ability to reason, stressing the ever-present pitfalls that we must guard against if we are to achieve real maturity in analyzing logical relationships.

R. H. Thouless, *Straight and Crooked Thinking* (Simon and Schuster, 1932). A discussion of the psychological and logical bases of sound reasoning, written in a manner to interest both the student and the casual reader.

MORE ADVANCED READINGS

L. W. Crafts, T. C. Schneirla, E. A. Robinson, and R. W. Gilbert, *Recent Experiments in Psychology* (McGraw-Hill Book Company, 1938), Chapter XXIV. A discussion and interpretation of several recent experiments on factors which affect reasoning.

J. Dewey, *How We Think* (D. C. Heath and Company, 1933). A classical analysis of the process of thinking.

CHAPTER FIFTEEN

Speaking, Reading, and Writing: How We Express Ourselves

WUNDT once said that animals do not talk because they have nothing to say.[1] Though we now have evidence that a low level of thinking may exist without language, it is clear that language is necessary if thought or reasoning is to be anything more than that found in animals or very young children. Communication of ideas from one person to another would be almost impossible without language.

The language functions — speaking, reading, and writing — present numerous psychological problems. They must be learned; skill in the learning depends upon native capacity. Manipulation of the organs of speech is a motor function and depends upon auditory sensation and perception. Reading depends upon visual sensation and perception and upon motor adjustments of the eyes. Writing, with a pen or a typewriter, is essentially a problem of motor coördination. Thinking is a process of association which leans heavily on language symbols or words. Since the psychological elements in the language functions thus bulk large, an understanding of these psychological elements should add much to our understanding of how the language functions are acquired, what factors cause special disabilities in them, and how they may be improved.

SPEECH

(1) *Learning to talk.* The first utterances of the child are random sounds made when the child needs food or attention.

In a new-born infant these sounds are quite undifferentiated, the same cry or wail indicating hunger, fright, or discomfort. Upon hearing the parent or nurse always speak the same word in connection with a certain object or situation, the child forms an association involving the auditory stimulus. Such associations develop gradually, partly as a result of the child's continuous efforts to reproduce those sounds which stand for things that satisfy his wants. Learning to talk is essentially learning to produce sounds which experience has shown to be associated with objects or situations that satisfy wants. As the child matures and his needs and desires become more diversified, he acquires more and more oral symbols.

Most children learn the elements of language with surprising rapidity, especially when one considers that the learning is largely undirected except for the urges and initiative of the child himself. Research has shown the varying size of the vocabulary of the average child between two and a half and six years. The average vocabularies at specified ages are at least as large as those indicated in Table XXII.

TABLE XXII

EXTENT OF THE VOCABULARY OF CHILDREN FROM TWO AND A HALF TO SIX YEARS OF AGE [2]

Age of child	*Number of words in vocabulary*
$2\frac{1}{2}$	707
3	1160
$3\frac{1}{2}$	1528
4	1900
$4\frac{1}{2}$	2064
5	2518
$5\frac{1}{2}$	2700
6	2877

The rate of acquiring words varies with the language stimulation provided by the environment. Homes in different social classes differ considerably in the amount and quality of such stimulation. The result, as might be expected, is that speech is acquired more rapidly by children of the more cultured classes. This is shown in Figure 79. The children of the several social

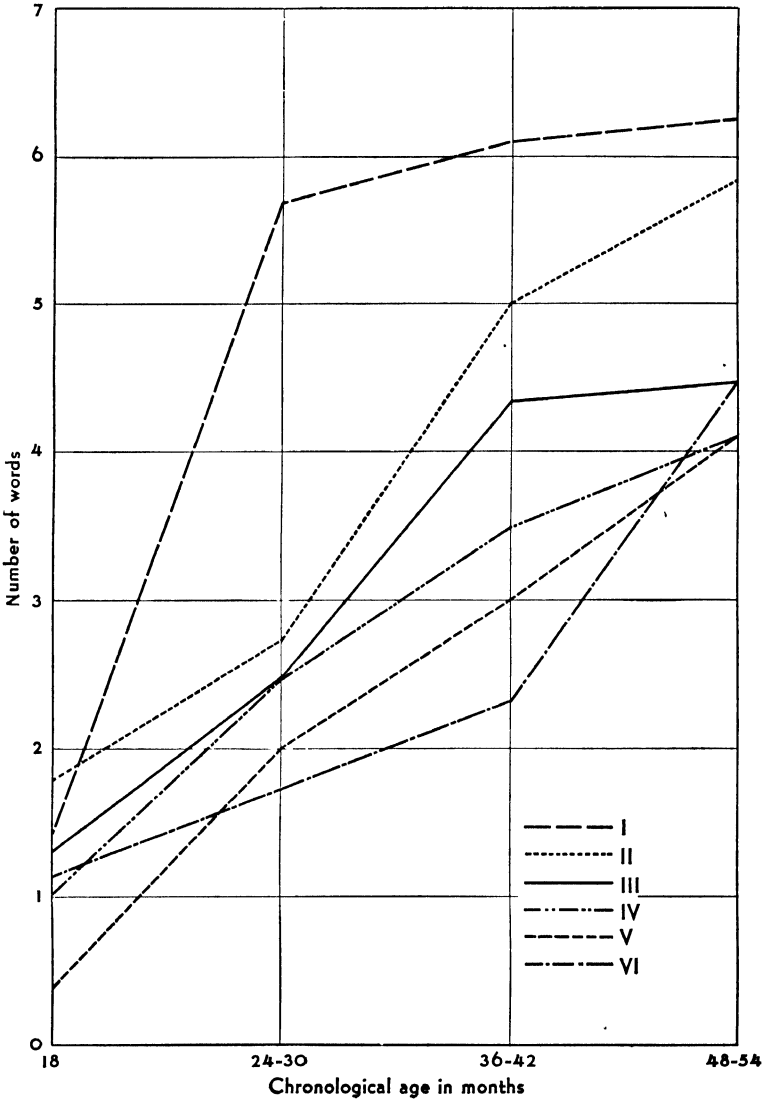


FIG. 79. PATERNAL OCCUPATION AND THE AVERAGE LENGTH OF SENTENCE USED BY CHILDREN OF PRE-SCHOOL AGE

Children of: (I) professional men, (II) business men, (III) clerical workers and skilled tradesmen, (IV) men in semi-skilled occupations, (V) men in unskilled occupations, (VI) day laborers. (From D. A. McCarthy, *The Language Development of the Preschool Child*, p. 115; by permis. of the publisher, University of Minn. Press, Minneapolis, Minn.)

groups all begin to talk at about the same age — eighteen months. Almost immediately the children in Group I (those whose fathers are professional men) begin to surpass those in the other groups. Some of the lead is still retained at the age of five years. Part of the difference is due to higher intelligence of the children in Group I, but since their language superiority is considerably greater than their superiority in intelligence, the differential is not due simply to differences in mental ability.

Many other enlightening facts about how a child learns to talk have been reported. The vocabulary of very young children contains a higher percentage of nouns than of any other part of speech; during the next three years other parts of speech, which may be thought of as less tangible, become relatively more frequent. Throughout the first five years of life, the language development of girls exceeds that of boys, which may be explained by the fact that the physiological, and possibly the mental, maturation of girls is generally more rapid. The language development of twins is retarded, at all ages up to at least six years, as compared with the corresponding development of singletons. This is due to the fact that twins receive a large proportion of their social stimulation from each other and therefore do not spend as much time with older children and adults.

(2) *Voice and the effectiveness of speech.* In its original form, speech was largely an expression of feeling and emotion rather than a means of communicating formal meaning. A great deal of this primitive element is retained even in the speech of the most educated and cultured persons. Every one recognizes a cry of anguish, a shout of elation, and an exclamation of surprise. Commercial companies realize the importance of a pleasing, forceful voice, and they devote much time to teaching their salesmen not only what to say but also how to say it.

It is a matter of common knowledge that the same words may be spoken so as to indicate belief or disbelief, admiration or scorn, sincerity or sarcasm. (See page 280.) One radio announcer will flood his company with orders as a result of a three-minute sales talk over the air, while another reading the same sales talk will lose more customers than he gains.

Because of interest in the effect of the manner of speaking and the quality of voice, the psychology of speech has recently emerged as a branch of applied psychology. In the development of this

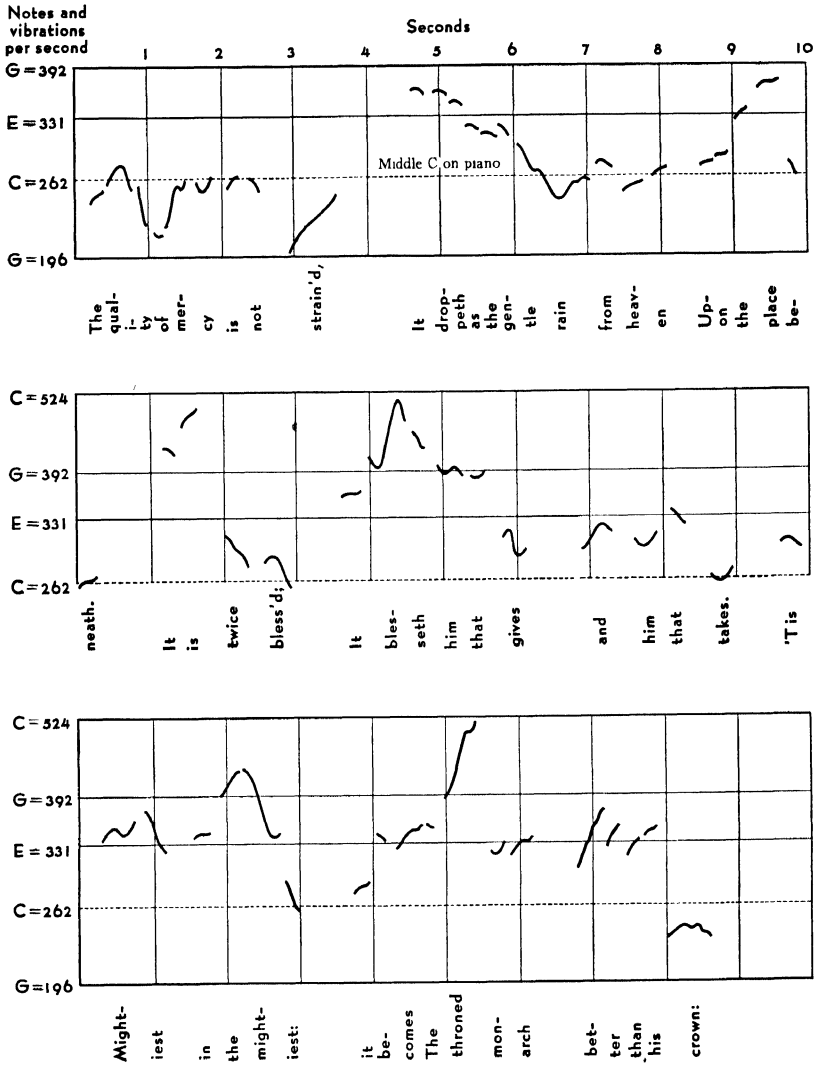


FIG. 80. CURVE OF PITCH IN THE "MERCY SPEECH" FROM SHAKESPEARE'S "MERCHANT OF VENICE," AS RECORDED BY JULIA MARLOWE ON VICTOR RECORD 74678

Notice the onomatopoetic effect of the pitch — falling like the rain — in the first line, and the marked rise in pitch on the word *throned* in the last line. (From Joseph Tiffin, "Applications of Pitch and Intensity Measurements of Connected Speech," *J. Acous. Soc. of Am.*, V, 1934, 225–34.)

branch of psychology, different kinds of voices and the responses of an audience to them have been made the object of rigid scrutiny by the use of phonophotographic methods of recording. It has been found that pitch variations are just as important in speech as in music. They determine to a large extent the effectiveness of a speaker's voice. The pitch curve or melody plot of speech may be graphed and interpreted in fine detail. A graph of this type showing the pitch variations in the voice of Julia Marlowe while reading the "Mercy Speech" from Shakespeare's *Merchant of Venice* is shown in Figure 80. A corresponding graphic representation of the voice of a well-known radio saleswoman, Lady Esther, is shown in Figure 81. These results of voice analysis are obtained by photographing the sound waves on the apparatus shown in Figure 82.

Comparisons of the voices of actors and of successful radio salesmen with the voices of untrained speakers show the former to have a wider range of pitch and intensity, greater flexibility, and different voice quality. These characteristics, once revealed, make the training of speech and voice a tangible procedure. No longer must one depend upon trial and error to achieve a desired effect. Since, as we have pointed out (page 281), voice is a reflection of personality, it follows that improvement in personality tends to be reflected in one's voice. The person who wishes to improve his speaking voice should seek to eliminate unwholesome mental attitudes. According to Scheidemann, the smooth, fine qualities of the voice are dispelled by intense mental states and by miserly and revengeful attitudes. She adds, "Extreme disappointment, selfishness, or a calloused mental condition may become so profound that it controls every act and finally finds its expressive taint even in the voice. . . . In order to treat vocal harshness a new mental outlook must first be established. The hard, repellent, revengeful, embittered state must be eradicated. High motives of conduct and a wholesome and cheerful mental outlook must be established." [3]

SPEECH DISORDERS

Some persons can understand the speech of others without being able to produce adequately these same sounds with their own vocal organs. An extreme condition of this type is found in

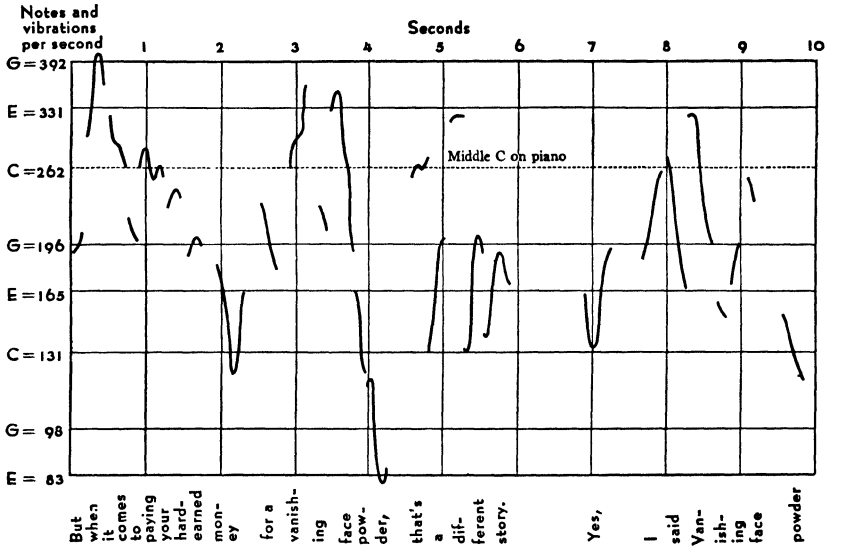


FIG. 81. CURVE OF PITCH IN THE SPEECH OF A RADIO SALESWOMAN, LADY ESTHER

Notice the large inflections and the wide range, in contrast to the speech of Julia Marlowe (Fig. 80) and of Roosevelt and Hitler (Fig. 46). (From Joseph Tiffin, *loc. cit.*)

motor aphasia, a pathological condition in which there is destruction or deterioration of a part of the nervous system which is directly connected with the organs of speech. As this condition is usually due to a brain injury or to disease, it is primarily a medical rather than a psychological problem.

(1) *Stuttering.* A less severe, though a much more frequent, deviation from normal speech is found in the stutterer. As the organs of speech in the stutterer are quite normal, from both the anatomical and neurological viewpoints, the problem he presents is essentially psychological. No one knows what causes stuttering, or rather, what causes all stuttering. Progress in the study of stuttering, great as it has been during the past two decades, has by no means entirely solved the problem, although a great many significant facts about this disorder of speech have been revealed. It is known that there are four times as many male as female stutterers; that the great majority of stutterers begin

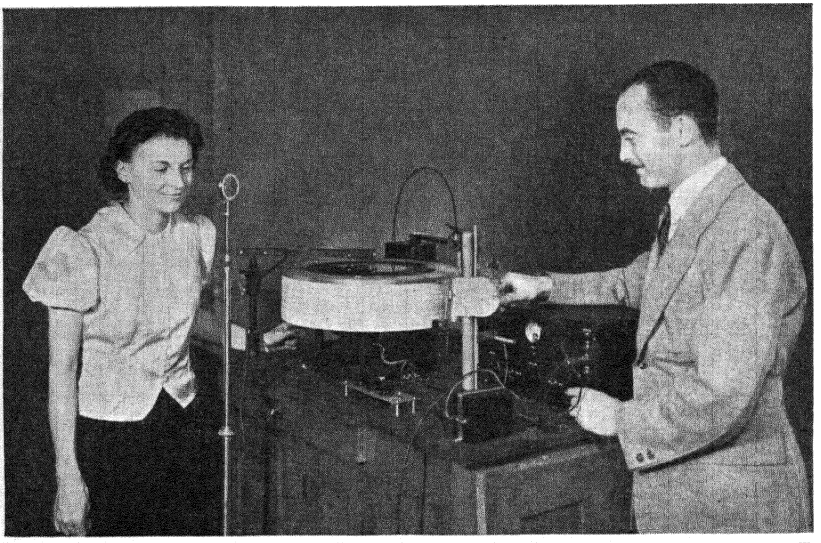


FIG. 82. THE VIBROGRAPH

This device photographs the sound waves of speech to determine the factors that make up an effective and pleasant voice. (Described in J. Tiffin and M. D. Steer, "The Vibrograph: a Combination Apparatus for the Speech Laboratory," *Quarterly Journal of Speech*, XXV, 1939, 272–78.)

to stutter before the age of eight years; that stutterers are not less intelligent than normal speakers; that a person who stutters in certain social situations may speak quite normally in others; and that, whatever stuttering may be, it is certainly not an ordinary behavior habit, nor may it be removed by punishment or scolding.

Some psychologists feel that stuttering is essentially a symptom of emotional maladjustment and of a disorganized personality. Others feel that the disorder is largely a matter of habit, that the stutterer has learned the wrong rather than the right methods of speech production and that his personality, aside from this one deviation, is essentially normal. Still others, favoring the psychoanalytic interpretation of behavior, contend that stuttering is a reversion to certain infantile activities, such as sucking and babbling. Finally, there is some evidence which indicates that stuttering in many cases is a manifestation of a neurophysiological disturbance brought about by forcing a child to use his nonpreferred hand.[4]

Each of these viewpoints dictates a different therapy, or at least a different therapeutic emphasis. If the disorder is thought to be emotional in origin, the therapy consists in striving for a better adjustment of the individual to his environment, for elimination of possible unpleasant home conditions, and for a general emotional reëducation of the patient. Sometimes this may be accomplished by dealing with the stutterer directly; sometimes it may be more readily achieved by dealing primarily with his parents, teachers, and playmates. Occasionally it is necessary to change his entire home surroundings by moving him bag and baggage to the family of a relative or a friend.

If the educative theory of stuttering is accepted, the clinician sets himself the task of training the patient to unlearn the bad habit and to relearn correct methods of speech. In this process, the stutterer is considered as a normal individual emotionally, and is dealt with much the same as if he had learned bad form in golf or tennis. The problem is viewed as one of substituting correct for incorrect habits.

From the psychoanalytic viewpoint, a cure can be effected only by a reasonably thorough psychoanalysis. It is assumed that the stuttering symptoms are retained to satisfy some infantile urge of the patient and that only a thorough exploration of his

early life will reveal the cause and make possible the elimination of the symptoms.

Finally, clinicians accepting the neurophysiological approach call attention to the fact that a large percentage of stutterers (about forty per cent) give evidence in their case histories of having once preferred the left hand, of having been forced by parents and teachers to use the non-preferred right hand, and of having developed the disorder of speech after this compulsory shift in handedness. The therapy used in cases which present this type of history is a shift back to the originally preferred hand, coupled with a program of general mental hygiene and emotional readjustment.

Strangely enough, clinicians who base their therapies entirely on one or another of these points of view obtain about the same percentage of cures. This points strongly to the conclusion that stuttering is due to a variety of causes and not to any one single factor. Although reliable psychological and speech clinics differ in their emphasis upon the several theories, all follow certain practices which differentiate them from the many quack commercial schools of speech correction. They emphasize the fact that every stutterer is a unique case and must be dealt with individually, using the therapy or combination of therapies which seems best to fit the particular case; they never make use of a stunt or trick which is supposed to cure all stutterers; and, above all, they never "guarantee" a cure. They try to help the stutterer make an adequate emotional adjustment to his condition so that, in case there is no improvement, the stutterer will still be able to adjust reasonably well to life's situations. Most clinics carry on a zealous program of research and are interested in discovering the true nature and cause of stuttering, whether or not the facts which they turn up are in accord with any one particular theory.

(2) *Other speech disorders.* There are several other disorders of speech which, although less severe than stuttering, are real problems because of their greater frequency. It has been estimated that there are about a million stutterers in the United States and perhaps ten times as many persons who lisp, have faulty articulation, or for some other reason are unable to form correctly the sounds of speech. Every language is made up of a relatively small number of sounds — in English there are about fifty. The production of each of these sounds calls for a specific

adjustment or pattern of movement of the organs of speech. Deviation from normal speech production is sometimes due to abnormalities in the organs of speech. When this is the case, there is little that can be done by the psychologist. For example, a person with a cleft palate nasalizes all sounds because he cannot close the pathway into his nasal cavity. Irregular or missing front teeth often cause incorrect formations of such sounds as *s*, *z*, *th*, *t*, and *d*. The clinical speech correctionist is always on the alert for persons with such abnormalities and immediately refers them to a physician or dentist. Speech defects are often found, however, in children or adults who have no anatomical deviation in their organs of speech. One or more of several factors may produce such cases.

The person who is hard of hearing frequently has defective speech. It is commonly known that the typical deaf-mute owes his mutism to his deafness. Unable to hear the sounds of his early random babblings, he is unable to change and correct these utterances and develop them into the sounds of speech. His vocal organs are usually in perfect working condition, but he is unable to use them effectively for the same reason that a blind man cannot paint a picture. He cannot "hear what he is doing." Certain persons of outstanding intelligence and perseverance, such as Helen Keller, have been able to learn to talk in spite of this handicap, but such persons are the exception rather than the rule. A child who is only partially deaf, and who may be quite unaware of his condition, is likely to substitute certain sounds for others, such as *s* for *th*, without realizing that other children produce these sounds differently. Physical analysis of the sound waves of speech shows that each speech sound is composed of a certain combination of overtones. If one's ear is defective in hearing the particular overtones found in a certain pair of sounds, he is apt to substitute one sound for the other without realizing that he is speaking differently from any one else.

Another cause of certain speech deviations is found in the use of a foreign language in the home. Each language contains at least a few sounds not found in other tongues. The child who is stimulated constantly by two languages is likely to learn both tongues incorrectly, especially if he is not made aware of the subtle differences between them and the correct way of forming the sounds. The psychologist and speech correctionist regard

abnormalities and deviations in speech as behavior problems in much the same way that they regard attacks of melancholia or temper tantrums as behavior problems. The clinician attempts to remove such abnormalities because, to use Professor Krapp's phrase, they "result in economic or social penalty" just as surely as do other types of personality deviations.[5]

Motor deficiencies or incoördinations may also seriously retard the development of speech. Diseases of the nervous system, birth injuries, or toxic conditions may destroy parts of the nervous system which are essential for control of the vocal mechanism. With extensive training, persons with these defects will often acquire some use of the vocal organs, but they rarely attain normal speaking performance.

The clinical psychologist must determine in each case of defective speech which of the several possible causative factors are present. He does this by extensive study and testing of each case, coupled with a thorough case history. The treatment he recommends is never stereotyped but is adapted to the particular combination of circumstances revealed by his analysis.

READING

(1) *Learning to read.* Scarcely less important than the ability to speak and to understand the speech of others is the ability to read. Education, vocational pursuits, and many avocations depend to a large extent upon reading. Learning to read consists in the formation of associations between meanings and printed or written symbols. It is one of the most important tasks of the child in the first few grades in the elementary school; for numerous studies have shown that poor reading is responsible for many failures in other subjects.

The teaching of reading may be divided into the pre-book and the book stages.[6] The function of the pre-book stage is to give the child a sufficient mastery of certain common words to enable him to undertake the book stage. The pre-book stage involves a definite application of the laws of association. The teacher initiates a conversation with the class, in the course of which common words, such as *walk* and *talk*, are used. These words, or short sentences containing them, are written on the blackboard or shown on cards. In this manner associations are formed

between the symbols and the activities or events which they symbolize. Script and print are used interchangeably from the beginning.

As soon as a small number of word symbols have been learned, "flash cards" are used. Flash cards contain short sentences made up of familiar words. Each card is shown very briefly and the pupils are asked to give the meaning of the sentence or phrase printed on it. Although flash cards have certain limitations, they have one definite advantage — they help the child to avoid the habit of learning to read individual words. The "word reader" is a slow and inefficient reader. He painstakingly reads one word at a time and usually has difficulty in grasping the meaning of large groups of words taken as a whole. Flash cards, when properly used, teach the child to grasp the meaning of a phrase or short sentence as a unit and tend to eliminate the habit of reading by words before this practice becomes fixed.

The book stage of reading emerges gradually from the pre-book stage. The first books are printed in large type, contain few and easy words, and can be read by the child with little difficulty almost at his first attempt. First readers have been prepared with great care. The great majority of words which appear in them are already familiar to the child from his pre-book stage of training. As new words are introduced, they are repeated frequently, particularly in the pages which follow immediately, to insure adequate retention. Many excellent series of readers which incorporate these principles are now available and furnish excellent guidance based on sound psychological principles from the pre-book stage through the elementary grades.

(2) *Reading disabilities.* In spite of the great progress made in teaching children to read, all children do not learn to read equally well. The great differences in reading ability revealed by a standardized test are shown graphically in Figure 83. This distribution, constructed from a random sample of sixth-grade children, shows some who read no better than the average child of the third grade, while, at the other extreme, a few read as well as the average eleventh-grade child. If a child is thirty per cent retarded in reading for his age and is twice as backward in reading as in other school subjects or in general intelligence, he is regarded as having a special reading disability.[7] Reading disabilities and the less serious variations in reading accomplishment among

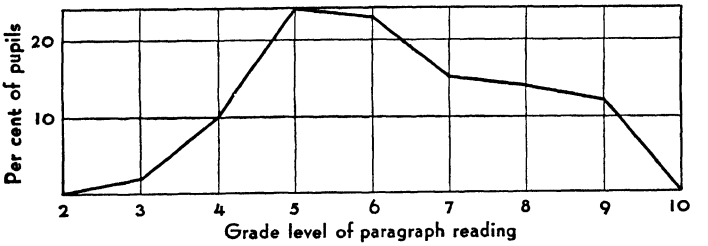


FIG. 83. DISTRIBUTION OF SIXTH-GRADE PUPILS ACCORDING TO ACHIEVEMENT IN PARAGRAPH COMPREHENSION

(This distribution was constructed from data obtained with the *Nelson Silent Reading Test* for Grades 3 to 9, constructed by M. J. Nelson and published by Houghton Mifflin.)

pupils who have been given essentially the same training have been the subject of extensive study among educators and psychologists. One of the results of their investigations is the emphasis that modern school systems are now placing upon remedial instruction in reading, that is, upon individual instruction adapted to those children who, for a variety of reasons, do not learn to read in a satisfactory manner by ordinary instruction or who, because of special sensory or perceptual characteristics, require individualized instruction. The identification of such pupils is made possible by means of standardized reading tests, and every progressive school system makes use of these tests at all grade levels.

(3) *Reading tests.* There are two general aspects of reading ability: rate and comprehension. They may be measured together or separately. A program of remedial reading must consider both factors, as it is of little value to increase the speed of reading by sacrificing comprehension of what is read, and it is unwise to increase comprehension by making an undue sacrifice of speed.

The most serviceable reading tests, from the diagnostic point of view, are those which measure rate and comprehension separately. A typical test designed to measure rate, while holding comprehension constant, is Test 6 of Advanced Form A of the *Iowa Silent Reading Tests*, prepared by H. A. Greene, A. N. Jorgensen, and V. H. Kelley. A part of this test is illustrated in Figure 84. In this test the subject reads as far as he can in a specified

ATTEMPTS TO PREVENT ABUSES AND TO INCREASE CITIZEN CONTROL

The government of the United States is merely the agency by which and through which 1
the people protect their own rights and liberties. Our government may be said to be the 2
organized will of all the people. The people govern in this country, and the men and the 3
means by which they govern, all combined, may be said to be the government. But do 4
not ever forget this fact: The President is not a master, but a servant. Does the para- 5
graph state that the source of governmental authority is in the people? Yes No. 6
The President, Senators, Congressmen, and judges in the nation, the governors, senators, 7
and members of the legislatures in the states, are only agents or servants of the people to 8
carry out the people's will. Also do not forget that the power of government does not 9
rest in Washington, the capital of the nation, nor at the capitals of the different states. 10
The power of government exists all over these United States. Is it correct to conclude 11
from this paragraph that the control of government is centralized in Congress? Yes No. 12
The power of government exists right in the homes and hearts of the people. 13

FIG. 84. PART OF A RATE-OF-READING TEST

The student reads as far as possible in a given period of time. Certain tasks are inserted from time to time to insure comprehension. (From H. A. Greene, A. N. Jorgensen, and V. H. Kelley, *Iowa Silent Reading Tests*, World Book Co., 1933 edition.)

period of time. He follows the directions as he reads. Reading rate is measured by the amount of material covered. The tasks which must be executed are inserted to keep comprehension constant for all persons taking the test.

Comprehension is measured by tests in which the pupil is allotted a specified period of time to study a paragraph, and is then asked to answer several objective questions which determine how well he has understood the material. The length of the paragraph is sufficiently short to allow even very slow readers to finish in the time allotted. The 1939 edition of the *Iowa Silent Reading Tests*[8] covers the various phases of comprehension in reading, by including separate tests to measure such factors as word meaning, sentence meaning, paragraph comprehension, and location of information. The test also includes a measure of rate of reading.

Tests of this kind have considerable value in locating the poor reader's disability. They reveal great differences in ability, not only among children in the same school grade but also among children of the same mental ability. An indication that the dif-

ferences in reading ability are not entirely due to differences in intelligence is found in the correlation between Stanford-Binet mental age and composite scores on the four Gates Silent Reading Tests. For sixty fourth-grade pupils this correlation was found to be only .66.[9] Low intelligence is a common cause of poor reading, but there are many pupils of average or even superior intelligence who are definitely below average in reading ability. Investigations of such cases have revealed a number of causes which can frequently be eliminated.

CAUSES OF READING DISABILITY

(1) *Poor vision.* One factor which will cause inefficient reading, no matter how intelligent the pupils may be, is inadequate vision. We read with our eyes, and good vision is a necessity for normal reading. Betts has recently made available a battery of tests for certain aspects of vision which are related to reading ability. The tests measure muscular imbalance of the eyes, near- and far-sightedness, and several other characteristics. Poor reading may be due to lateral imbalance — either *over-convergence*, in which the eyes turn in more than they should, or *under-convergence*, an opposite condition of imbalance. In extreme cases such conditions are readily apparent, but in mild cases they may quite escape notice and at the same time cause a marked reading deficiency and also visual fatigue with prolonged use of the eyes. Another condition, *vertical imbalance*, occurs when the two eyes do not see a word at the same vertical level, and vision in one eye is suppressed as a result. The Betts tests quickly reveal the presence of these difficulties.[10] Children who are retarded in reading and who have one or more of these visual defects should be given a thorough examination by a competent oculist. Usually the reading deficiency will disappear when the visual defect has been remedied by correct glasses or by muscular exercises which eliminate the condition of imbalance.

(2) *Poor instruction.* Another factor often resulting in poor reading is incorrect initial instruction. Formerly reading was taught almost entirely by building up associations between individual words and the objects or situations which the words stand for or symbolize. It is now realized that learning to read in this manner results in "word reading," that is, reading each word

independently of the remainder of the phrase or sentence. Obviously, the "word reader" is a slow reader as compared with one who perceives entire phrases or groups of words at a single glance. Reading is now taught by phrases, and the typical word reader is not often encountered. However, an occasional case of this type still occurs. The word-reading habit can be eliminated only by giving very elementary training, regardless of the age of the subject or the grade he has reached in school.

(3) *Left-handedness.* Another cause of reading retardation that has been found in certain cases is left-handedness. In one investigation it is reported that left-handedness is much more frequent among reading-disability cases than among normal readers. The theory advanced to explain this is that the brain dominance of the left-handed person results in reversed perceptions which interfere with normal reading.[11] Cases of this type are found occasionally, although recent investigations, particularly those of Monroe [12] and Haefner,[13] indicate that this cause of poor reading is probably less frequent than was formerly supposed.

(4) *Phonics.* Another cause of poor reading is lack of training in the principles of phonics.[14] Although reading aloud, or even sub-vocally, is inefficient as a general practice, there are cases where vocalization or sub-vocalization may be helpful on certain words. A child often encounters a written or printed word he does not recognize although the meaning would be clear if he could hear the word spoken. If he is able to pronounce the word to himself he can read and understand it, while if he is unable to form an auditory image of the sound the meaning remains obscure. One who knows the general principles of phonics, that is, how various combinations of letters are pronounced, will be able to read many words which otherwise would be meaningless.

Recently the reading tests given to the freshmen entering a large state university revealed one student who could read no better than the average child in the second grade. This student, a boy of seventeen, was given diagnostic reading tests which revealed that the major cause of his difficulty was a deficiency in phonic ability coupled with a tendency to be a word reader. He could not read such words as *baby* and *vague* although he readily understood these words when he heard them spoken. One's first reaction to such a case is that only a very stupid boy could be such a poor reader at the age of seventeen. Yet, in reality, his

intelligence was considerably above normal when measured with nonreading intelligence tests. This was not surprising to the clinicians examining him, as they realized that only a boy of superior intelligence could pass four years of high-school work and finally graduate without being able to read. Special training in phonics and reading by phrases raised this student from the bottom to the average of his class in less than a semester.

Many other factors operate to cause reading disabilities. For example, there is a relation between defective reading and defective speech. About ten per cent of the children who are retarded in reading also stutter, while only one per cent of the children who read normally have this defect in their speech. Likewise, approximately eighteen per cent of defective readers have a minor articulatory speech disorder, such as baby-speech, lisping, or mispronunciation, while these defects are found in only seven per cent of normal readers.

(5) *Eye-movements.* Another factor which has received much attention in experimental studies of reading is the movements of the eyes. In reading a line of printed material, the eyes do not move gradually across the page, but proceed by jumps from one stopping point, or *fixation*, to another. Each fixation lasts about a quarter of a second, and the time occupied by the movement is about a twenty-fifth of a second. Comparison of the eye-movements of good and poor readers indicates that the former have fewer and shorter fixations, fewer regressions (a return to a point already passed) and that in general they exhibit more even and regular progressive movements.[15] Some clinicians, impressed by these differences, have proposed that poor readers should be trained in pacing their eye-movements to make them more closely parallel to the movements found in good readers.[16] Such training does result in improved reading ability in certain cases. However, more recent work indicates that the eye-movements are determined not so much by fixed motor habits as by (a) the difficulty of the material for the particular reader, (b) the purpose of the reader at the moment (whether it be scanning, reading for detail, and so on),[17] and (c) the central aspects of the reader's perceptual ability.[18] The poor reader ponders at each fixation, looks back frequently, and moves forward in a halting and jerky manner because he is not assimilating the material. Fairbanks has shown that the great majority of regressive move-

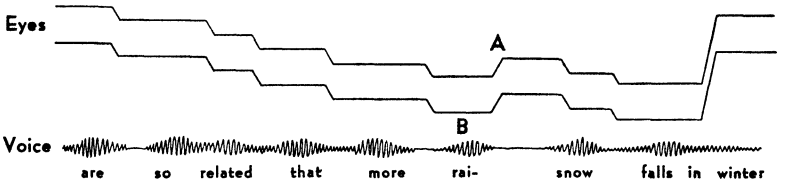


FIG. 85. SIMULTANEOUS RECORD OF MOVEMENTS OF THE EYES AND OF SOUND WAVES FROM THE VOICE IN ORAL READING

A — Regression of eyes to point where mistake was made. *B* — Mistake in oral reading. (From J. Tiffin and G. Fairbanks, "An Eye-Voice Camera for Clinical and Research Studies," *Psychol. Monog.*, XLVIII, 1937, 70–77.)

ments follow a misunderstanding of the material. The regressive movement, apparently, is resorted to in order to remedy an error in reading that has already been made. A typical case of this type is shown in Figure 85, which is a record of the eye-movements and the sound wave from the voice in oral reading. The downward trend of the lines labeled *Eyes* indicates the progressive movements across the page. The words read orally are identified below, in the line labeled *Voice*. At *B* the reader made a mistake in his oral reading, saying "rai . . ." (the beginning of *rain*, a word not in the test) instead of the correct word, *snow*. Immediately afterward, the eyes show a regressive movement indicated at *A*, and, following this regression, the correct word, *snow*, is spoken. Training a poor reader to eliminate such regressions without first improving his reading ability so that he does not need to look back is likely to do more harm than good.

An interesting apparatus which is being used successfully to increase a reader's span of perception and hence his rate of reading is shown in Figure 86. A motion picture of consecutive parts of a line is projected through the translucent screen. Films have been prepared to increase the span of word perception.

Reading disabilities, like disabilities in speech, cannot be reduced to a single cause nor treated in terms of a stereotyped therapy. Two cases seldom present the same clinical picture. Each is, in a sense, a unique problem and must be treated in the light of the particular combination of circumstances that seems to be operative.

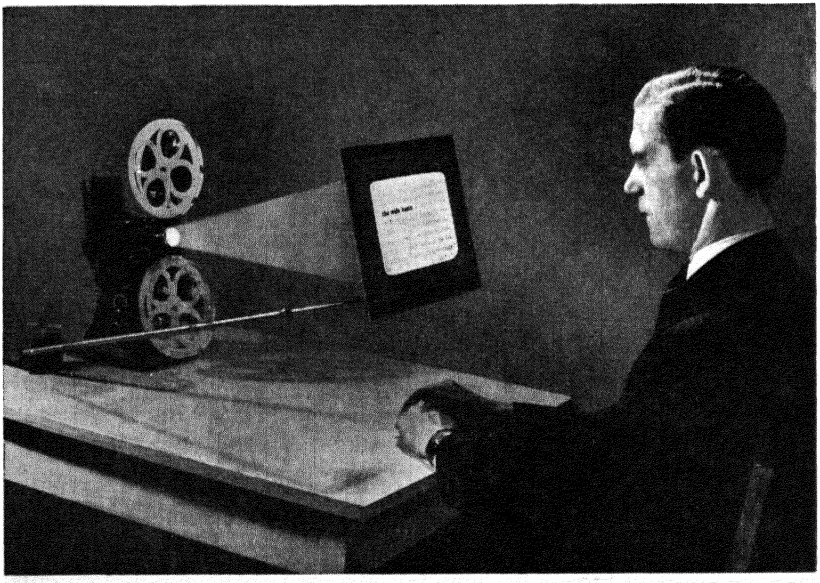


FIG. 86. A DEVICE TO INCREASE SPEED AND PERCEPTION SPAN IN POOR READERS

When used with proper motivation and material that is interesting to the reader, training with this apparatus produces marked improvement in reading ability. (From W. F. Dearborn and I. H. Anderson, "Controlled Reading by Means of Motion Picture Technique," *Psychological Record*, II, 1938, 219–27.)

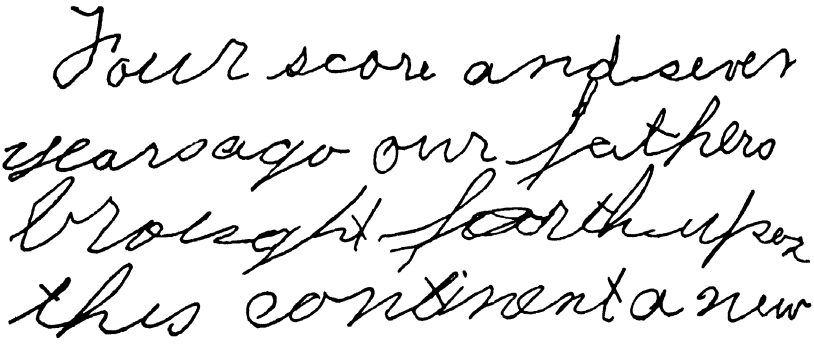
WRITING AND SPELLING

(1) *Learning to write.* The importance of learning to write well is evident; for, although handwriting no longer occupies the position of importance in business that it did before the advent of the typewriter, nevertheless a recent inquiry among several business firms in a large city showed that even today a certain skill in handwriting is necessary before an applicant will be employed. Furthermore, handwriting is, rightly or wrongly, a basis of judging personality. Finally, writing is essential to efficiency under modern conditions, and it is a sound principle to do well what must be done.

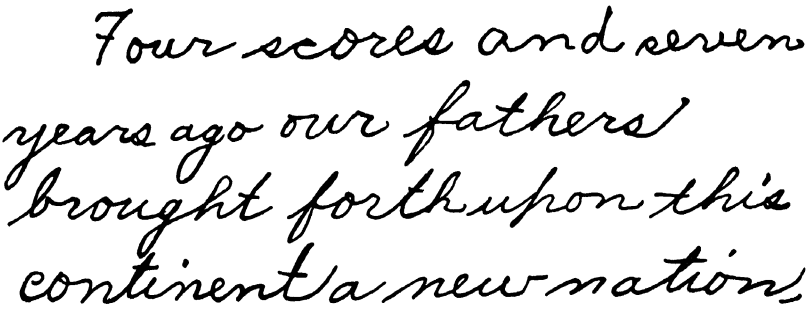
Learning to write, like acquiring any other skill, depends upon practice, repetitions, motivation, and, above all, instruction. Numerous experiments in learning show that if one is left to his own devices while learning a new skill he will usually hit upon a method of performance which may suffice, after a fashion, but which actually blocks the way to great achievement because of the incorrect and inefficient movements which become habitual. Some one has rephrased the old maxim "Practice makes perfect" into "Practice makes perfect errors." This is often what occurs when practice takes place without adequate instruction. At every stage of the learning process a competent teacher should be present to analyze errors, point out faults, indicate needed changes, and supervise the details of the learning.

(2) *Handwriting scales.* Corresponding to tests of reading, scales for the measurement of handwriting have been carefully constructed that enable one to determine how the progress of a child compares with that of other children or with a predetermined standard. One of the most widely used scales of this type is the Ayres Handwriting Scale, a sample of which is reproduced in Figure 87. This scale provides eight qualities of handwriting, numbered from 20 to 90 in steps of ten. Figure 87 shows samples of qualities 20, 50, and 90. Measurement with this scale shows that both rate and quality of handwriting improve together from the second to the eighth grade. This is shown graphically in Figure 88.

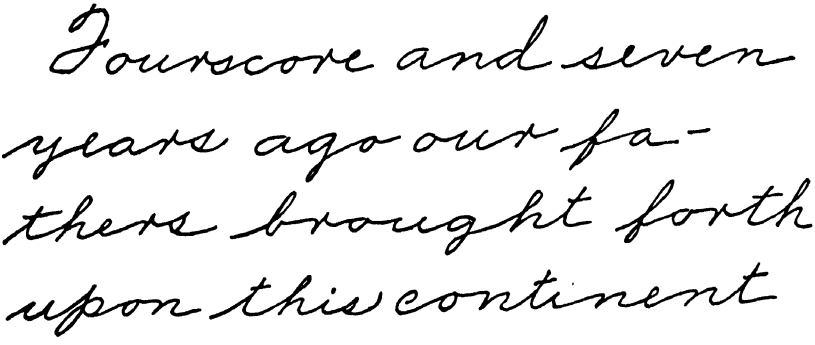
There are two types of movement in writing — the vertical and the horizontal. The former movements are made most efficiently by the fingers; the latter, by pendulumlike movements



QUALITY 20



QUALITY 50



QUALITY 90

FIG. 87. SAMPLES FROM THE AYRES HANDWRITING SCALE — USED TO RATE THE QUALITY OF HANDWRITING

(Courtesy of the Russell Sage Foundation.)

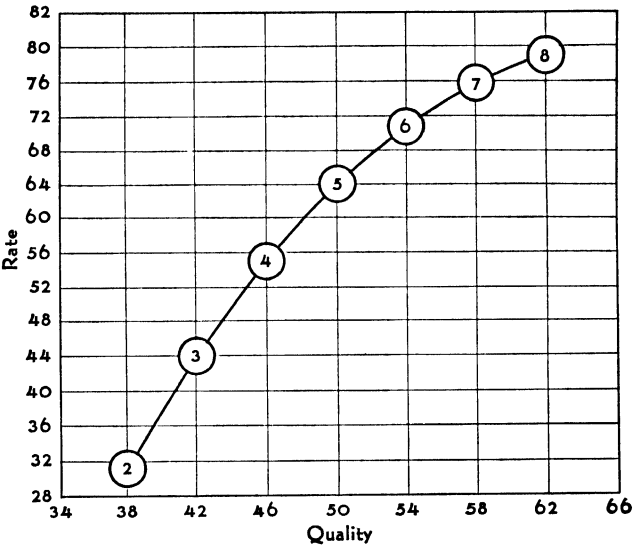


FIG. 88. GROWTH IN SPEED AND QUALITY OF HANDWRITING FROM THE SECOND TO THE EIGHTH GRADE

Rate is in letters per minute; quality is indicated according to scale shown in Fig. 87. (Courtesy of the Russell Sage Foundation.)

of the arm around the elbow as a fulcrum. At one time an effort was made to teach the production of both vertical and horizontal movements by movements of the arm, but careful studies show that this method of writing is successfully developed by so few children that it is not to be generally recommended. Investigations also show that most children revert almost immediately to the finger-movement type of writing and therefore do not profit from their instruction. It is a tenet of modern educational practice to teach a child to do well what he will later actually do — not what he might do or what some one thinks he ought to do. Progressive schools, accordingly, are again teaching finger movements for the vertical strokes in writing.

A relaxed state of the body is a favorable condition for writing. It has been shown that if any part of the body is under excessive strain, the muscular tension will spread to other, and even remote, parts of the body. Thus, one of the first requirements of efficient writing is the freedom that comes with a comfortable

and relaxed position. This is achieved by providing a comfortable chair, plenty of arm space, a desk of correct height, good illumination, and generally comfortable physical surroundings.

Correct rhythm is also important if one is to produce legible script rapidly. This has been shown by careful photographic studies made of good and poor writers. Good writers slow down the stroke whenever the direction changes, even though the letter does not necessitate a complete stop of the pencil or pen. Counting exercises which are constructed specifically for the several letters have been worked out to assist in the acquisition of the correct rhythm. Ordinary counting is of little value because the rhythm of each letter is different.[19]

(3) *Handedness in writing.* Many parents and teachers wonder whether they should teach a child who naturally favors his left hand to write with his right hand. Experiments on the relationship between forced handedness and defects of speech and reading indicate that this practice is not to be recommended. The language functions — speaking, reading, and writing — are closely related to each other. A difficulty in any one is likely to be accompanied by trouble in one or both of the others. A child should be given perfect freedom to use the hand he prefers, not only in writing but in all other activities. He will almost certainly choose the hand which will give him the greater natural skill and, in so doing, will avoid the mixed laterality which is frequently associated with other defects in the language functions. It is doubly important that the burden of learning to write with the non-preferred hand should not be imposed on nervous and emotionally unstable children. It is also important, if a change in handedness is undertaken, that the change be made with patience and understanding. It is quite possible for a child to make the change without injury under the direction of one teacher but be injured were he required to do so by another.

(4) *Spelling.* Although spelling is more of a mental than a motor function, the ability to write is contingent upon it. Hence its importance as a language function. The teaching of spelling and the research upon which it is based have become a very specialized branch of educational psychology. Although one frequently hears a quotation from some famous man to the effect that he succeeded in life even though he could not spell simple words, yet it can hardly be doubted that the ability to spell

correctly is a decided asset to any one who cannot afford a private stenographer. Unfortunately it is true of many languages, and particularly of English, that spelling must be learned by a process closely akin to rote memory. Most of the rules of spelling have many exceptions, and these must be learned along with the rules. Fortunately the number of words which we need to spell frequently is relatively small. One investigation indicates that if a person can spell correctly 5000 chosen words, he will have provided for 99.2 per cent of all those he will normally use, and that even 500 words constitute 82.5 per cent of all words used. These and similar findings are conveniently shown in Table XXIII.

TABLE XXIII

EXTENT TO WHICH COMMON WORDS ACCOUNT FOR ALL THE WORDS USED IN WRITTEN COMPOSITION [20]

The	3	commonest	words	make	up	10.3	per	cent	of	all	words	used.
"	10	"	"	"	"	26.0	"	"	"	"	"	"
"	25	"	"	"	"	36.0	"	"	"	"	"	"
"	50	"	"	"	"	46.0	"	"	"	"	"	"
"	100	"	"	"	"	58.8	"	"	"	"	"	"
"	200	"	"	"	"	69.9	"	"	"	"	"	"
"	300	"	"	"	"	75.3	"	"	"	"	"	"
"	500	"	"	"	"	82.5	"	"	"	"	"	"
"	1000	"	"	"	"	89.9	"	"	"	"	"	"
"	1500	"	"	"	"	93.2	"	"	"	"	"	"
"	2000	"	"	"	"	95.3	"	"	"	"	"	"
"	3000	"	"	"	"	97.6	"	"	"	"	"	"
"	4000	"	"	"	"	98.7	"	"	"	"	"	"
"	5000	"	"	"	"	99.2	"	"	"	"	"	"

(By permission, after P. G. McKee, *Language in the Elementary School*, Houghton Mifflin.)

Other investigations show that every word has an inherent spelling-difficulty factor which is not apparent on the surface and is by no means proportionate to the length of the word. For example, it was found in one investigation that the word *meeting* was misspelled only 5.7 per cent of the times it was used, while the much shorter word *too* was misspelled 55.2 per cent of the times. The same investigation showed that *opinion* was misspelled nearly four times as often as *personal*, although casual inspection would not indicate that one of these words is more difficult than the other. Differences of this kind have been

thoroughly investigated, and courses in spelling based upon such studies provide practice and instruction upon the various words in proportion to their difficulty. Analyses of different kinds of mistakes show that some errors are much more frequent than others and that most words that are commonly misspelled have a "preferred" error. For example, *company* is most commonly misspelled as *copany*, *truly* as *truely*. These pitfalls, once revealed, may be made the object of special study and thus eliminated more readily than if the words are studied without regard to them.[21]

SUMMARY

Psychologists are interested in the language functions — speaking, reading, and writing — both because they are essentially psychological in nature and because many other mental functions are dependent upon them. Children learn to talk by forming associations between words, or sound symbols, and meanings. Language development is conditioned by many factors, one of the more important being the environmental elements encountered in the home.

Speech and voice have developed from primitive social gestures to become the complex carrier of a manifold of meaning and emotion. How one uses his voice is, in many respects, as important as what he says. A knowledge of the development of speech and the cause of speech disorders is of value in preventing and curing speech defects. Stuttering is a behavior problem which must be both diagnosed and treated by sound psychological methods. Other speech defects, such as lisping and faulty articulation, are caused by such factors as defective hearing, use of a foreign language in the home, and muscular incoördination.

Reading is essentially a process of forming associations between word symbols and meanings. In spite of great progress in methods of teaching reading, all children do not learn to read equally well. Excellent tests for measuring both the rate and comprehension of reading have been constructed. Reading disability may be due to several factors, among which are poor vision, poor instruction, mixed laterality (handedness), and inadequate training in phonics. Though good readers and poor readers use markedly different eye-movements in reading, this difference is usually a symptom rather than a cause.

The quality of handwriting may also be measured by means of specially prepared scales. Handedness is a native characteristic and should not be changed without careful study of the case.

Spelling also has been subjected to careful psychological study. Information on such factors as the relative difficulty of words has resulted in improved methods of instruction.

QUESTIONS ON THE CHAPTER

1. List and discuss the psychological functions or processes that are related to the language functions.
2. Describe the process of learning to talk from the psychological viewpoint.
3. State briefly the theories of stuttering.
4. What factors may cause speech disorders such as lisping and faulty articulation?
5. How can reading comprehension be measured? Reading rate?
6. Why is "word reading" an inefficient kind of reading?
7. What visual disorders may contribute to poor reading?
8. Should a left-handed child ordinarily be taught to write with his right hand? Discuss.
9. Are all words containing the same number of letters equal in spelling difficulty? Comment.

QUESTIONS FOR DISCUSSION

1. Upon what does the success or failure of a radio announcer depend?
2. How could one determine what factor or factors are causing a specific case of stuttering?
3. For what purposes may a reading test be used?
4. How could a psychologist determine whether a retarded reader should be given training in phonics?
5. Discuss the statement: Eye-movements are a symptom rather than a cause of the level of reading maturity.
6. How can you account for the fact that clinicians who treat stuttering by different methods obtain about the same percentage of cures?
7. Why should defective hearing result in defective speech?

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