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Unconsciousness

By

JAMES GRIER MILLER

SOCIETY OF FELLOWS,
HARVARD UNIVERSITY

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PREFACE

The enigma of unconsciousness has been studied and disputed by psychologists for many years. It has been approached from many angles, from the neurological at the one extreme to the philosophical at the other. It has been the subject of careful experimentation on the one hand and of soaring theorizing on th[redacted]. The problem has embraced such different phenomena as fainting, hypnosis, inattention, creativity, repression, and instinctual behavior.

Some who have interested themselves in these questions have seen that all these sorts of unconsciousness cannot be identical, and they have often insisted that they do not even have similar characteristics. Therefore various terms have been invented, compounds of the word *conscious*, in order to distinguish and explain these different phenomena. Such words are *subconscious, preconscious, foreconscious, superconscious, coconscious,* and so forth. The result of this neologizing, however, has not been increased clarity, but greater confusion. Moreover, many dissimilar sorts of behavior are still called *unconscious,* without any effort's being made to define the various senses of this wide term.

This book attempts to distinguish the various meanings of the word *unconscious* which have been used, and to describe and differentiate carefully the diverse sorts of human behavior which have been included under this term. Then each of the phenomena is considered at length; the clinically and experimentally determined facts about each one are reviewed; and an evaluation is made of the present state of knowledge on that specific subject. Not until this detailed study of each sort of unconsciousness has been made can the common aspects of them all be thrown into their proper light in a way that is even slightly more than speculative. When such a procedure is followed, however, solid bases for a tentative theory of unconsciousness begin to appear. Only by such an approach

can any conclusion be reached as to how conscious behavior is like unconscious and how it is different.

This is a central problem for both the psychological laboratory and the psychiatric clinic, for academic psychologists, psychoanalysts, and psychiatrists alike. There has, however, been little co-operation between them in investigating it. It is essential that a rapprochement between the various psychological sciences be accomplished. The issue of unconsciousness offers an excellent occasion to illustrate how this can be achieved. It is only one of many problems in which all branches of the psychological science will find mutual benefit in co-operation. Such a co-ordinated program is the procedure offering the greatest hope that, in the future, sense can be made in many fields of human personality and behavior which today are realms of ignorance and nonsense.

JAMES GRIER MILLER

CAMBRIDGE, MASSACHUSETTS
November, 1941

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In the conception and in the execution of this book I have always been able to turn to Professor Edwin G. Boring for advice. From basic concepts to banal commas his criticism has been of immeasurable value, and I here express my gratitude. I am also deeply grateful to the others who have spent hours reading the manuscript and suggesting improvements: Professor Lawrence J. Henderson, Professor Henry A. Murray, Dr. Stanley Cobb, Professor Herbert S. Langfeld, Dr. J. Keith Butters, Mr. and Mrs. Donald W. Fiske, and my father.

I wish also to thank my wife for her long-suffering and continual co-operation in every aspect of the preparation of this book. She was a Without Whom Who.

To the Society of Fellows of Harvard University, of which I have been a member during the writing of these chapters, and to my friendly relationships with each of the Senior Fellows, I am deeply indebted.

Three members of the Harvard faculty will find some small part of their thoughts and beliefs reflected throughout this book. While they are by no means responsible for the errors and faults of this book, the instruction and inspiration of each in his own way have been the foundation of this writing. To them this book is inscribed—

PROFESSOR EDWIN G. BORING
PROFESSOR LAWRENCE J. HENDERSON
PROFESSOR HENRY A. MURRAY

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INTRODUCTION

CLINIC AND LABORATORY

Two principal methods of unraveling the tangled skeins of a problem like the nature of unconscious processes are available, the clinical and the experimental. Added to these two scientific procedures is a third artistic or common-sense attack on the question, the judgment of insightful individuals upon the nature of the phenomena. This last might be considered a sort of clinical procedure, because it is based on the experiences of these individuals with their fellow men. An example of such intuitive insight which has often been referred to is Nietzsche's aphorism on forgetting, which presaged by many years the psychoanalytic theory of repression (*cf.* Chapter X, p. 250). Such inspired interpretations of obscure phenomena have been the forerunners of many of the important discoveries of psychological science as well as many of its notorious fallacies.

A more careful technique for arriving at basic explanations of a question like the nature of unconscious processes is the clinical compilation of numerous cases. This approach studies the patient as a whole, but has the disadvantage of being unable to control his behavior carefully by putting him in various situations and watching his reactions to them. Such use of controls is possible only in laboratory experimentation, which is therefore the most certain method. Its greatest fault lies in the necessity of limiting any one experimental investigation to a single aspect of the behavior of the persons being studied, so neglecting the fact that they are total individuals.

The first clues concerning the operation of unconscious processes have come, for the most part since 1878, from the insights of such men as Charcot, Breuer, Janet, Freud, Jung, and Adler, but most of the present understanding of them is based on clinical evidence. Though as late as 1928 it was true that unconsciousness had been

studied only slightly in a purely experimental manner,[1] the findings of the laboratory on this subject are becoming in recent years increasingly significant.

THE SEPARATENESS OF CLINIC AND LABORATORY

It takes no astute geographer to find the Grand Canyon, and it takes no experienced psychologist to discover the gulf between clinic and laboratory in psychology. This distinction between the academic-theoretical and the practical-applied exists in all sciences and arts, but in none does it approach mutual isolation closer than in psychology. Both sides would profit by rapprochement.

Such co-operation is perhaps more possible now than it was in the last decade or two. In the early development of clinical psychology it was thought that there should naturally be some relationship between the academic laboratory psychology and the applied science. Later, because of the obviously great differences in the purposes of applied and pure research psychology, disagreements grew up between the two. The result was polemic. Especially was this true when academic psychologists felt themselves made insecure by being confronted with the tradition-shattering *enfant terrible* of the clinic, psychoanalysis. It is not difficult to find in the earlier criticism of psychoanalysis by the academics such caustic sentences as the following of Dunlap's:[2]

> Psychoanalysis is the most horrible example of the confusions and intellectual stultifications to which we are led by the abuse of abstractions, and the serious social and individual damage which this pernicious mystical system produces are striking indications of the practical dangers of this type of superstitious thinking. . . . The psychoanalytic chief devil, repression, has lost its tail and pitchfork and smell of sulphur, and terrifies only the weaker brethren. The analogical interpretation of dreams has become recognized as merely a *hocus pocus* to impress the paying patients. . . . There is hope that before

[1] F. L. Wells, in C. M. Child *et al.*, *The Unconscious: A Symposium*, New York: Knopf, 1929, 223.

[2] K. Dunlap, The use and abuse of abstractions in psychology, *Philos. Rev.*, 36, 1927, 486-7. By permission of the *Philosophical Review*.

long the psychoanalysts will learn enough psychology to abandon even their chief divinity, the Unconscious Mind.

There are reasons enough for the lack of co-ordination of clinic and laboratory in psychology. One is the historical fact that clinical psychology developed naturally as an outgrowth of medical science. The doctor was presented with a patient who had symptoms of a nervous or mental disease. His medical code made his main task doing something specific for that specific patient. He was more interested in psychopathology than in normal psychological processes, and his orientation was toward disease rather than health. The roster of renowned experimental psychologists includes in its earliest generation some physicians, some biologists, and some physiologists, but, whatever their profession, they were concerned primarily with the normal functioning of the typical human mind. They bore no responsibility, in general, for the warfare against disease, and references in their writing to pathology or psychopathology are rare.

Historically, the vagaries of academic organization have been in large part responsible for the separation of clinic and laboratory in psychology. The fathers of present academic psychology in the middle of the last century succeeded in setting themselves up in chairs independent of the medical faculty. They held professorships of physiology (which at that time was far removed from clinical practice of medicine) or of philosophy or, in America, simply of psychology. Psychological institutes sprang up in Germany late in the last century. The tradition of magnificent isolation and independence of such institutes made interdepartmental co-operation in the German universities of the last century unusual. All these circumstances bent the twigs of laboratory and medical psychology far apart so that only a few of their branches have grown into proximity again.

A second reason for the independence of the two fields is the disparity of their purposes. The clinician has always thought in terms of the individual. The research psychologist on the other hand has continually desired to understand "mind" in general. He has

hoped to be able at length to qualify as a natural scientist in good standing, his procedures often being patterned after those of the physiologist, particularly the neurophysiologist. The neurophysiologist dissects a score of cats in order to determine a certain fact about the function of nervous tissue. The names, pedigrees, and life histories of those cats are of little importance to him. What matters is the general law for all cats. Similarly for most psychologists of the laboratory tradition the life history of the subject being experimented upon or the details of his heredity were of minor importance. As long as he seemed "normal" he would be a satisfactory subject to use in determining the general law for all human beings. What interest experimental psychologists have shown in individual differences has arisen mainly from a desire to learn how they can be controlled in order to get general laws.

Certain psychologists of the academic variety have insisted, furthermore, that the study of the individual is not scientific, because they believe that a psychological law must apply to the whole of some class of individuals rather than to any one person. Expressing this attitude Meyer wrote:[3] "A description of one individual without reference to others may be a piece of literature, a biography or a novel. But science? No."

The psychological clinic and laboratory differ not only in historical background and in purpose, but also in procedure. The experimental psychologist has been continually harassed in his effort to develop a respectable natural science by the complexity of his subject matter. Dissatisfied because the difficulty of his problems forces many of his careful studies to be picayune and insignificant, while his investigations of more complex phenomena can rarely be adequately controlled, he has placed a strong emphasis upon proper methodology. He is often told by his critics that this preoccupation with method is a defense mechanism, a sort of retreat from his failures. However this may be, in determining facts the experimentalist has adhered closely to the routine of (*a*) observing a large number of

[3] M. F. Meyer, Review of Handbuch der vergleichenden Psychologie, ed. G. Kafka, *Psychol. Bull.*, 23, 1926. 271.

individuals; (*b*) abstracting one character for study; (*c*) observing how environmental changes affect this character; (*d*) generalizing and determining a law from quantitative measurements of variations of this character; and (*e*) making an empirical check to determine the extent of applicability of the law.

The clinician, whether medical or psychological, has always been unable to do this sort of experimentation under what the laboratory scientist would consider properly controlled conditions. Many physicians consider it unethical, for instance, for a physician to treat one group of patients with full doses of a drug that is known to be beneficial and give others half doses to study the effect. Doctors have, however, profited from the unpleasant fact that certain catastrophes of our civilization set up controls. Shrapnel wounds in wartime destroy parts of the nervous system which the surgeon could never conscientiously attack. The costliness of certain medical and psychological treatments makes them unavailable to the poor, and knowledge is advanced at the expense of their happiness. In general, though, adequate controls are not available to the clinician, and he is unable to advance his knowledge by the procedure which the experimental physiologist and psychologist hold practically sacrosanct.

Analysis has been the key procedure of the laboratory psychologists. The individual as a whole has almost invariably been considered too tough a nut to crack, and so ordinarily he has been divided into smaller units which could be attacked one at a time. For many traditional psychologists the units were "faculties" like the will and the reason; for associationists they were ideas; for functionalists they were single acts; for behaviorists they were stimulus-response combinations.

There has, of course, been within psychology of the experimental tradition reaction against this analytic building-block attitude toward human personality. The Gestalt psychologists have insisted that the individual and the situation as a whole should be considered. Soon they found themselves devoting their theory and experimentation to small sectors of the personality, such as visual perceptions

although certain workers influenced by this school, as Lewin, continued to view the person in the large. The psychology of Verstehen has contended more radically that there must be two entirely separate psychologies, one of total structures and the other of elements, and that these cannot have any interrelationship. More recently the personalistic psychology, especially that of William Stern, has gained importance in the experimental tradition. This orientation toward the single person as the unit of study, however, is favored by only a minority today. It is fair to say that the general ideal of the psychology of the laboratory has been to study human behavior at the molecular level with the hope that when the molecules are understood they will fit together like pieces of a puzzle to make a portrait of a man. In like manner the physiologist has dissected animals into organs and organs into cells, and the analysis of cells is now well advanced. This recourse to elements is the experimental method of natural science.

As the clinician in medicine has never followed the methods of the physiologist, so the clinician in psychology differs from the experimentalist. He who deals with problems of the psychological clinic must recognize that all components of the personality operate at once. The patient receives sensations from all his sensory organs at once; he is driven by somagenic and sociogenic needs; he is determined by his past behavior and by his environment and heredity; his goals are many and they are constantly changing. As opposed to the microscopic, molecular view, the clinician must take the macroscopic view. His unit may be no smaller than the individual.

The last cause which we shall discuss of the division between laboratory and clinic in psychology is the difference in personality and outlook of the men in the two fields. Whether because the two kinds of activity appeal to men of different temperaments or because the disparate trainings and traditions result in dissimilar viewpoints, it is true that the attitude of the psychologist in the clinic is unlike that of the psychologist in the laboratory. Murray has distinguished[4]

[4] H. A. Murray *et al.*, *Explorations in Personality*, New York: Oxford University Press, 1938, 746-7. By permission of Oxford University Press, New York.

the personality characteristics of extraception, "A practical 'down-to-earth' skeptical attitude. Enjoyment of clearly observable results"; and intraception, "An imaginative, subjective, human outlook." Clinical psychologists tend to be in general intraceptive, and academic psychologists on the whole are extraceptive.

It is understandable that these two types of temperament would find it difficult to agree on the question which they have disputed most vehemently—what it is to be scientific. To the clinician the true science is that which most adequately organizes the facts which demand explanation, and, if the data are inadequate for certain aspects of the explanation to be carefully worked out, a sad necessity postpones this investigation until the future. The investigator in the laboratory, on the other hand, is often so distressed if his results do not add up correctly in the cents column that he never gets to the dollars.

An illustration of this difference in temperament appears in the popular interest aroused by the writings of the two groups. For sheer readability the publications of experimental psychology in general fall far short of those by clinicians, whose allegories, intriguing figures of speech, and piercing flashes of insight into the nature of humanity make their writing sometimes approach the borders of prose poetry. The fascination of Freud's books, for instance, has given them such popular appeal that in the publishing world they have practically the rating of novels. Academics eschew such a style because they feel that it is usually the siren's call to loose thinking. A lawyer rising continually to object to the introduction of improper evidence in a trial risks being stigmatized as an obstructionist even though he is in the right.

In medicine as well as in psychology, and in fact in every field where the applied and the theoretical are studied by separate groups, each group naturally thinks that its own aims and achievements are the more important. This causes lack of mutual understanding. A research man has the propensities of a collector. He delights in amplifying the knowledge of his particular specialty even if it is of

no immediate importance to mankind, just as the geographer delights in mapping the jungle never before visited by man. The temperament of the clinician, utterly confident of the importance of his own attempt to help those who need care, frequently makes him view such laboratory research as sterile thirsting after useless knowledge. Co-operation of clinic and laboratory must be premised on, among other things, understanding of the frequently demonstrated usefulness of "useless" knowledge.

Anatomists have repeatedly been criticized in the past for pedantry and lack of realism because their research has proceeded ever since the Renaissance to study the structure of such apparently insignificant bits of human tissue as the vermiform appendix and the carotid body. Now the importance of accurately understanding these structures is recognized by all physicians, and the anatomists are off in quest of other "useless" facts. This same sort of applicability may well be found for "pure" psychological research now being conducted in the laboratory. It must be admitted, however, that, though in the medical sciences a large part of the work of the laboratories has found direct application to the practice of the clinic, as yet the proportion of practically useful work which has been done in psychological laboratories is much smaller.

These temperamental dissimilarities between clinicians and academicians exist and cannot be wished away, but the differences between the two groups in historical background and procedure are not necessarily barriers to co-operation, and the temperamental differences need not be either.

THE TYPES OF PRESENT-DAY PSYCHOLOGISTS

Some reasons for the schism in psychology have been considered; what are the branches of the science distinguishable today? Three main groups, unlike in training, tradition, and practice, may be differentiated.

(*a*) The first is that group of academic laboratory research workers in the tradition of the university, possessing the Ph.D. and generally referred to as psychologists. It is they who try to develop

the study of mind or behavior into a natural science. Their practical experience is usually limited to the healthy subjects of their experiments.

(*b*) The second group may be best characterized as depth psychologists. By far the majority of this group is Freudian, either orthodox or heterodox. There are others who recognize a great debt to Freud, but would by no means be willing to fulfill the requirements for becoming members of the inner circle. Then there are followers of such offshoots of the Freudian trunk as Adler, Jung, Rank, and Horney. Finally in this group must be included members of the French school of Charcot and Janet.

It is difficult to make statements concerning this varied group which will be true of every member, because the great comprehensiveness of the theories of these depth psychologists yields ambiguity of position and much dissension. What is said of them must be with the understanding that there are wide variations within the group. Certainly such basic Freudian doctrines as repression, unconscious processes, the importance of infantile events, and the life history method are adhered to by a large part of this group. These men hold the Ph.D. degree or the M.D. degree, or infrequently a lengthy psychoanalysis may be the only professional qualification. Members of this group are found both in the halls of the university and on the wards of the hospital, though more in the latter place than in the former. To a degree they unite the two other traditions.

One is justified in referring to the depth psychologists inclusively as psychoanalysts because the Freudian contribution has been overwhelmingly important. It has been the omnipresent point of reference for agreement, disagreement, and departure into new theory. It has been observed[5] that until recent years one had to be either a protagonist or an antagonist of the psychoanalytic theory in order to discuss depth psychology; a disinterested person wielded little influence. Freud himself recognized that he belonged, as he said,[6]

[5] S. Rosenzweig, The experimental study of psychoanalytic concepts, *Character and Personality*, 6, 1937, 61.

[6] S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill, New York: Random House, 1938 (*The History of the Psychoanalytic Movement*), 943. By permission of Random House, Inc.

"to those who, according to Hebbel's expression, 'have disturbed the world's sleep.'" This evaluation has been corroborated by the sober decision of many other disinterested judges. Freud, for instance, has been said to have had a major part in the downfall of Victorianism,[7] and in 1938 he was judged by a book reviewer in a national news magazine[8] to have exerted a greater influence on literature than anyone then living.

(*c*) The third group in the present psychological scene consists of psychiatrists, neurologists, and neuropathologists. These scientists usually prefer to deal with neural, glandular, or metabolic disturbances. Only when an abnormality of behavior cannot yet be explained physiologically do they turn, for want of anything else, to psychoanalysis or psychology. Such men constitute the majority of the non-Freudian psychiatrists and almost invariably have the M.D. degree. Their medical orientation makes them more concerned with disease than with healthy functioning of the normal individual. Their interest in experimental neurophysiology, however, is likely to make them more sympathetic with the laboratory than are psychoanalysts.

These three groups have been playing intellectual tag with psychological problems. The game is a free-for-all, each side playing for itself. Sometimes, on certain questions, two will side against the third, and more rarely all three will be found agreeing.

G. Stanley Hall, a psychologist of the academic tradition, first gave Freud international publicity by inviting him in 1909 to come to America to lecture at Clark University. This co-operation of the laboratory with psychoanalysis did not continue, but was followed by a period of neglect or derogation of Freudian doctrines in academic circles. A statistical study by Brown of the writings of psychologists shows[9] that the laboratory has only recently come to view these doctrines with any favor or consideration, which is by no means yet overwhelming.

[7] G. W. Allport, The psychologist's frame of reference, *Psychol. Bull.*, 37, 1940, 25.
[8] *Time*, 31, 1938, No. 21, 61.
[9] J. F. Brown, Freud's influence on American psychology, *Psychoanal. Quart.*, 9, 1940, 283-92.

THE PRESENT DEGREE OF CO-OPERATION OF CLINIC AND LABORATORY

A recent investigation of the literature of psychologists provides[10] an instructive commentary on their present isolation from psychiatrists and psychoanalysts. The contents of the fourteen journals which were listed by thirty academic psychologists as the most significant for the advancement of psychology as science were analyzed. No psychoanalytic periodicals were included. The survey showed one thing that is of particular application to the problem of this book, that the periodicals reflected an increasing loss of faith in the causal efficacy of that standby of the clinic, "the unconscious." Also indicated was a lessened interest in the subject matter of the clinic, the single case. Furthermore a decline in the percentage of contributions dealing with applied psychology had occurred. These and other findings led to the conclusion that a professional cleavage is developing between applied psychology and the science of the laboratory.

Academic psychology has withdrawn from the clinic—has the clinic on its part neglected the laboratory? Psychoanalysis was engendered in the clinic, and whether it can be fostered in the laboratory is not yet apparent. Sears stated[11] flatly that psychoanalytic concepts can be examined experimentally only by psychoanalytic techniques.

Brown made the following analysis of the situation, saying that almost all critics of psychoanalysis agree that:[12]

> *The theory has never been precise enough to allow formulation of working hypotheses for which adequate experimental situations could be found.* In his latest book [*New Introductory Lectures*] Freud himself seems to see this inadequacy. He hopes in the future to see an experimental approach and reports as a beginning experiments performed by Schrötter in connection with dream symbolism and

[10] *Cf.* G. W. Allport, *op. cit.*, 1-28.

[11] R. R. Sears, Functional abnormalities of memory with special reference to amnesia, *Psychol. Bull.*, 33, 1936, 239.

[12] J. F. Brown, Freud and the scientific method, *Philos. Sci.*, 1, 1934, 333. By permission of the *Philosophy of Science.*

> others performed by Betlheim and Hartmann on Korsakoff's Psychosis. . . . They represent an attack in the right direction, but I believe few scientists would consider them critical experiments.

Rosenzweig believed,[13] in opposition to Sears and Brown, that most of psychoanalytic theory is available to experimentation, though he admitted that it might have to be redefined. An experience which he related led him to question Freud's eagerness to subject his findings to experimental analysis. He sent Freud some of his experimental studies verifying psychoanalytic concepts. Freud replied in substance that such work was interesting, but of little value, because the wealth of reliable clinical observations on which his system rests made it "independent of experimental verification." He felt, however, that such verification "can do no harm." Though many of his followers would not agree with this opinion of Freud's, and he himself may have changed his mind, the weight of evidence and the dearth of experimental work by psychoanalysts seem to show they do not feel that laboratory techniques can provide data in any way more satisfactory than what they draw from their own clinical procedures.

Not only psychoanalysis but also all of psychiatry has largely eschewed the experimental method. It was found in one study[14] that only 0.8 per cent of textbooks in abnormal psychology were devoted to experimental discoveries, and that psychiatry textbooks were no better. Tabulations showed that, though experimentation in abnormal psychology lags well behind research in other branches of the science, there exists a body of experimental knowledge not yet utilized to any extent by the authors of the textbooks.

Glimmerings of beginning co-operation between the clinic and the laboratory have appeared, even though they have not yet reached the sluggard textbook writers. As Brown noted, here and there in his writings Freud referred[15] to experiments which he considered

[13] S. Rosenzweig, *op. cit.*, 65.

[14] W. A. Hunt and C. Landis, The present status of abnormal psychology, *Psychol. Rev.*, 42, 1935, 83-9.

[15] *Cf., e.g.*, S. Freud, *op cit.* (*The Interpretation of Dreams*), 386; also S. Freud, *New Introductory Lectures in Psycho-Analysis*, New York: Norton, 1933, 36-8.

significant, but which are usually roughly performed with many variables neglected. Fragmentary experiments on real and artificial dreams have been described,[16] and a questionnaire study on foster-child fantasy has been made.[17] All these moves toward rapprochement have originated in the clinic. An almost unique example of where a clinician has made practical use of an important experimental finding is the employment of word association to discover complexes in psychoanalysis. Freud said of this work in his history of the psychoanalytic movement:[18]

> The association experiment, started by the Wundt School, had been interpreted by them [Jung and others] in the psychoanalytic sense and had proved itself useful in unexpected ways. Thus, it had become possible to get rapid experimental confirmation of psychoanalytic facts, and to demonstrate experimentally to beginners certain relationships which the analyst would only have been able to talk about. The first bridge leading from experimental psychology to psychoanalysis had thus been constructed.

All the bridge-building has not been done by clinicians, for more and more in recent years experimentation in the academic laboratory has been directed toward the problems of the psychiatrist and psychoanalyst.[19] This work is not well known to the clinic, and many of its significant implications are neglected by the laboratory. Throughout this book much research of this sort will be discussed. Manufactured neuroses, artificial analogues of regression, frustration in rats, the correlation of glandular activity and psychodynamic processes, motor components of anxiety—these are examples of topics recently investigated. The rapprochement of the laboratory and the clinic is not yet a large, a self-conscious, or a vocal movement, but it has begun.

[16] *Cf.* J. C. Flügel, in *Psychologies of 1930*, ed. C. Murchison, Worcester: Clark University Press, 1930, 394.

[17] *Cf. Ibid.*

[18] S. Freud, *The Basic Writings of Sigmund Freud* (*The History of the Psychoanalytic Movement*), 948. By permission of Random House, Inc.

[19] J. McV. Hunt, in Psychological experiments with disordered persons, *Psychol. Bull.*, 33, 1936, 1-58, was able to publish a 210-title bibliography illustrating this rapprochement.

PROSPECT OF CO-ORDINATING THE BRANCHES OF PSYCHOLOGY

An illustration of how the co-ordination of the fields of the psychological science may progress can be drawn from the medical sciences. In the education of medical students thorough grounding in laboratory sciences is required preclinical training. There is no parallel to this in the preparation of psychological clinicians. It is exceptional for one of them to have more than one desultory course in the experimental psychology, whether he be doctor, mental hygienist, occupational therapist, or psychiatric social worker. It is even more unusual for him to know what the psychological laboratory is doing.

In the practice of medicine the place of the laboratory has assumed important proportions. It is rare for a patient in a hospital not to have a series of laboratory examinations beginning immediately after admission and continuing throughout his illness. Many diagnoses which doctors could not make in the last century are possible today only through laboratory procedures, often expensive and complicated. These techniques are based on a thorough understanding of the chemical and physiological functions of the human being determined by investigation in the tradition of the natural sciences. Academic psychology has to its credit thousands of comparable experiments which have succeeded in sketching vaguely the outlines of some types of human behavior. Almost none of this body of fact has been applied to diagnosis and treatment, or correlated with clinical data to make more adequate the description of human behavior. In the clinic the psychologist does little more than administer the standardized tests of intelligence, aptitudes, abilities, and traits which are at present practically his only contribution to the study of the patient.

It has frequently occurred in the medical sciences that long after a drug has been empirically discovered to be effective—as in the case of many of the herb remedies learned from witch doctors—the laboratory scientist has not only determined the active principle of the drug, but also discovered the mechanism of its therapeutic

effect upon the cells of the body. These discoveries have often led to further advances in therapy by related methods. Similarly in the laboratory the psychologist should be able to make carefully controlled studies of therapeutic procedures which have been used in the clinic, and be able to determine wherein their efficacy lies. Such studies would be provocative of further discoveries in the psychological sciences.

In medicine the man engaged in research is alert to find implications of his work which will apply to practical problems of the clinician, if indeed his investigations were not begun to answer some such question. As the death rate from cancer rises the study of cancer becomes more intense. The problems of laboratory psychology, however, rarely have application to the problems of neurosis and psychosis. The research worker in most cases has insufficient contact with the practicing psychiatrist or psychoanalyst to know what questions he wants answered, and he frequently and naturally follows his predecessors into the intricacies of sensation, perception, or learning, which are the only problems of which he is aware. When the student about to begin his research for the doctorate in psychology can have means of discovering what is still unknown about obsessional neuroses or the treatment of tics as easily as he learns what is not yet certain regarding the perception of vertical distance, the alliance of experimental and applied in psychology will be well on the way toward their efficient relationship in medicine.

THE PURPOSE OF THIS BOOK

In the chapters of this book is outlined for the clinician the kind of work done by the psychological laboratory to throw light upon one of the important problems of his work—unconsciousness—and to sketch for the experimentalist the sort of dilemmas in this field with which the clinician is faced and the kind of investigations he desires to have carried out. Unconsciousness has been chosen as the illustrative case because it is important to all branches of the science. It is, however, only one of many skeins which clinic and laboratory can join forces to unravel.

Chapter I

DEFINITIONS AND CRITERIA OF UNCONSCIOUSNESS

Early in this century William James, who so often reflected the future of psychology, said[1] that the discovery that memories, thoughts, and feelings exist outside the primary consciousness was "the most important step forward that has occurred in psychology since I have been a student of that science." Several years before that Lipps had told an international psychological conference[2] that he considered the question of unconsciousness less *a* problem than *the* problem of psychology. The mazes of unconsciousness have been ever more assiduously traveled in the years since these two men spoke.

Another time, at the end of the last century, James wore the prophet's mantle, seeing the hidden lures to nonsense and dogmatism in the distinction between conscious and unconscious processes, when he said:[3] "It is the sovereign means for believing what one likes in psychology, and of turning what might become a science into a tumbling-ground for whimsies." A tumbling-ground for whimsies—unconsciousness has been glibly resorted to in order to explain such varied phenomena and fantasies as the return of the spirits of the dead, the artistic skill of Paganini, and the rise of modern cities.

Unconscious processes have been subjected to a wide and fascinating variety of misinterpretations. He who investigates these processes may never allow himself to forget entirely the remarkable admonition which appears in that section of the *White Mountain Guide*

[1] W. James, *The Varieties of Religious Experience*, New York: Longmans, Green, 1902, 233. By permission of Longmans, Green and Company.

[2] T. Lipps, Der Begriff des Unbewussten in der Psychologie, in *Dritter Internationaler Congress fur Psychologie*, Munchen: Lehmann, 1897, 147.

[3] W. James, *The Principles of Psychology*, London: Macmillan, 1890, I, 163. By permission of Henry Holt and Company.

that discusses emergencies in the woods, such as sprains, fractures, etc.:[4] "Unconsciousness, it need hardly be said, may be very serious."

A MAZE OF MEANINGS

Voltaire would not discuss until he had defined his terms, and we may not consider the problems which surround the term *unconscious* without determining what its significances are. It has been said[5] that "'the Unconscious' has been the occasion for a greater flood of more abject nonsense than any other psychological concept, with the possible exception of 'Instinct'." Bernard has distinguished[6] a large number of uses of the word *instinct*, and since his work psychologists in general have become aware of the pitfalls surrounding the word, and have learned to be particularly careful when using it, or even better to substitute other more exact words. At least one reformer[7] has attempted to isolate the various significances of the term *unconscious*. This effort was philosophical in character, and because it involved assumptions that few present-day American psychologists, academic, psychoanalytic, or psychiatric, would be willing to accept, its usefulness is limited.

An instructive example of the facility with which the meaning of *unconscious* may be bent back upon itself like a pretzel can be found in the considered statement of a prominent psychoanalyst at a recent seminar. The Freudians have popularized the term, and, if anyone does, they should know how to use it properly. This man, however, said that the novelist Herman Melville, like other inspired artists, "was on speaking terms with his unconscious." Apparently this, being interpreted, means that he was conscious of his unconscious. It has been remarked[8] that this conception of *unconscious* is strangely similar to Herbert Spencer's Unknowable, of which he appeared to know so much. It is common for psychologists of

[4] *The A.M.C. White Mountain Guide*, 9th ed., Boston: Appalachian Mountain Club, 1934, 530.

[5] C. D. Broad, *The Mind and Its Place in Nature*, New York: Harcourt, Brace, 1925, 353.

[6] L. L. Bernard, *Instinct*, New York: Holt, 1924, 122 ff.

[7] C. D. Broad, *op. cit.*, 353-477.

[8] E. B. Holt, *The Freudian Wish*, New York: Holt, 1915, 179.

other credos to slip into this error—that it is possible to develop subjective familiarity with unconscious processes. Indeed Freud once noted[9] that certain of his opponents did not comprehend that one can never know directly the contents of "the unconscious."

Throughout the following chapters, the peculiar problems of the classical question of consciousness will be evaded as far as is possible, and certainly no attempt will be made to consider with any adequacy the many past and current doctrines of consciousness. It will be impossible to neglect the fact, however, that unconsciousness is, etymologically as well as for many theoretical and practical purposes, the negative of consciousness. For instance, in Chapter IV the evidence on the localization of consciousness in the body has to be investigated before the localization of unconsciousness can be determined, by a kind of subtractive procedure. In the present chapter we shall find that several meanings of *unconscious* have been derived, because of the etymological relationship, from theoretical beliefs about the nature of consciousness.

It has been said[10] that no philosophical term is at once so popular and so devoid of standard meaning as *consciousness*; and the layman's usage of the term has been credited[11] with begging as many metaphysical questions as will probably ever be the privilege of any single word. Both these observations were made early in the century, and the term has since then had more than thirty years to amass confusions.

It is remarkable, in the light of this recognized ambiguity, that Freud, hastening on to the exposition of his theory of unconscious processes, said in his *New Introductory Lectures*:[12] "What is meant by 'conscious,' we need not discuss; it is beyond all doubt." This statement is no less singular than Washburn's comment:[13] "Every

[9] S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill, New York: Random House, 1938 (*Wit and Its Relation to the Unconscious*), 747.

[10] R. B. Perry, Conceptions and misconceptions of consciousness, *Psychol. Rev.*, 11, 1904, 282.

[11] J. Dewey, The terms 'conscious' and 'consciousness,' *J. Philos., Psychol., and Sci. Methods*, 3, 1906, 41.

[12] S. Freud, *New Introductory Lectures on Psycho-Analysis*, New York: Norton, 1933, 99.

[13] M. F. Washburn, *Movement and Mental Imagery*, Boston: Houghton Mifflin, 1916, 17.

one knows what is meant when it is said that a man is unconscious. He is neither awake, aware of the sights and sounds of the outer world, nor dreaming, aware of images that are the product of his own fancy." The fog of ambiguity which has surrounded consciousness has now also enveloped unconsciousness, and it cannot be dispelled by saying it is not there.

OTHER COMPOUNDS OF CONSCIOUS BESIDES UNCONSCIOUS

In psychological writings one finds, besides *unconscious*, other words formed by compounding prefixes with *conscious—subconscious*, *preconscious*, *foreconscious*, *coconscious*, and *superconscious.*

Subconscious. It is difficult to discover any distinction between *subconscious* and *unconscious* which has received general agreement; however, if a person did not respond to stimulation because ether or a blow on the head had affected the function of his nervous system, he would almost always be termed *unconscious* rather than *subconscious.* Another common usage is that Freudians, who talk of instinctual and repressed processes, call them *unconscious*—in translation of the German *unbewusst*—while Prince, Janet, and those in the tradition of the French school, who deal with dissociated processes, multiple personalities, and so forth, call them *subconscious.*

Subconscious has been used by some[14] to refer to what is in the margin of attention, what is dimly conscious. Prince considered unconsciousness to be one sort of subconsciousness. He said:[15] "I . . . use the term subconscious in a generic sense to *include* (*a*) *coconscious ideas or processes;* (*b*) *unconscious neurograms; and* (*c*) *unconscious processes.*" Unconscious neurograms are for Prince neural characteristics capable of regulating behavior in the future, while unconscious processes actively determine present behavior.

Superconscious. *Subconscious* is sometimes used as the opposite of *superconscious.* These adjectives then characterize the two parts

[14] *Cf.* B. Hart, *Psychopathology*, New York: Macmillan, 1927, 58.
[15] M. Prince, *The Unconscious*, New York: Macmillan, 1929, 2d ed. rev., 253.

of a continuous series of degrees of consciousness, the subconscious part being below and the superconscious part above a conscious level. Psychoanalytic theory has always been strongly opposed to any such doctrine of continuity, insisting on an important distinction, more than any difference of degree, between what is conscious and what is not.[16] As Freud viewed it, the unconscious motivations of behavior are entirely cut off from consciousness and can never become conscious. However:[17] "It is by no means impossible for the product of unconscious activity to pierce into consciousness, but a certain amount of exertion is needed for this task."

Preconscious and foreconscious. These are psychoanalytic terms used synonymously. Freud said:[18]

> There are . . . *two kinds of unconscious*, which have not as yet been distinguished by psychologists. Both are unconscious in the psychological sense; but in our sense the first, which we call *Ucs.* [Unconscious], is likewise *incapable of consciousness*; whereas the second we call *Pcs.* [Preconscious] because its excitations, after the observance of certain rules, are capable of reaching consciousness; perhaps not before they have again undergone censorship, but nevertheless regardless of the *Ucs. system.* . . . We described the relations of the two systems to each other and to consciousness by saying that the system *Pcs.* is like a screen between the system *Ucs.* and consciousness.

Coconscious. Prince interested himself in his fascinating cases of multiple personality, such as Miss Beauchamp (*cf.* pp. 64-65), in which a single individual appeared to have several different personalities. Largely to explain this sort of psychopathology, Prince referred[19] to a coconscious state, a coexisting dissociated consciousness (another personality) of which the personality in control of the body may not be aware. It was Prince's belief that to call such coconscious states simply unconscious, as others did, so making them appear like other unconscious processes, is inadequate. He

[16] *Cf.* S. Freud, *The Basic Writings of Sigmund Freud (The Interpretation of Dreams)*, 544.

[17] S. Freud, A note on the unconscious in psycho-analysis, *Proceedings Soc. Psychical Research*, 26, 1912, 316. By permission of the Society for Psychical Research.

[18] S. Freud, *The Basic Writings of Sigmund Freud (The Interpretation of Dreams)*, 544. By permission of Random House, Inc

[19] M. Prince, *op. cit.*, 249.

pictured the individuals with multiple personalities to be like the weather-forecasting houses with the little man who comes out when it is going to rain and the little lady who comes out when it is to be fair. When one comes out the other goes in; neither affects the other. In like manner the multiple personalities are independent—when one is conscious, the other is coconscious. Those who disagreed with Prince insisted that one action system is unconscious and affects the other, conscious one. They suggested that the little old man and lady are only one person—a quick-change artist.

SIXTEEN MEANINGS OF UNCONSCIOUS

Sixteen specifically different meanings of the word *unconscious* which may be found in psychological writings are defined and discussed below. Certain of these senses of the word *unconscious* must be subdivided. Considered with most of the definitions are one or more objective criteria which may be employed to determine the presence or absence of unconsciousness in the sense defined.

In Chapter IV and thereafter, whenever the word *unconscious* is used on the author's authority, it is followed in parentheses by a phrase in SMALL CAPITALS to indicate which of these meanings is intended. The phrases which will be used are those in SMALL CAPITALS in the definitions of this chapter, (*e.g.*, INANIMATE or SUBHUMAN for Definition 1). To evade the present great confusion in the use of the word *unconscious* it would be well in scientific writing to substitute for it these or similar phrases which represent accurately the precise meaning.

The adjective *unconscious* may be used to refer to an individual, as: "Oliver Wendell Holmes found that he rapidly became unconscious when inhaling ether." Or it may refer to the actions, ideas, emotions, needs, or drives of an individual, as in the sentence: "Mankind has an inherited and unconscious fear of snakes, but Mark Antony had better reason for such an unconscious fear than most men."

Unconscious in the senses of the first two definitions may refer

to the individual only, and not to his actions, ideas, emotions, needs, or drives.

DEFINITION 1

Unconscious = INANIMATE or SUBHUMAN, incapable of discriminating or behaving.

Anything that is incapable of discriminating or behaving under any conditions whatsoever is *unconscious* in this meaning of the word. The inanimate pearl is *unconscious* in this sense, but the oyster is *conscious*. Koffka used *nonconscious* to convey this meaning. He wrote:[20]

> The unconscious as a systematic concept is not synonymous with the non-conscious. Rather does the existence of an unconscious presuppose the existence, potential or actual, of a conscious. The movements of a stone are not called unconscious, whereas those of an amoeba might be. The unconscious then is something which is not yet or no more conscious, but which may become conscious.

Though Koffka was wrong in saying that the movements of a stone are not called *unconscious*, for the word has frequently been used that way, it is important that he made the distinction between unconscious and nonconscious. He entangled himself, however, in a difficult question when he suggested that there is a difference between an amoeba and a stone. Behaviorists have insisted that discrimination between stimuli be the criterion of consciousness (*cf.* Definition 4, pp. 26-28), and it has even been suggested[21] that the movement of iron filings toward a magnet is conscious in this sense. There is nothing in the behavior of a moving stone that would make the rock appear less conscious than the amoeba, according to this criterion.

Koffka said the amoeba may move unconsciously, but he insisted that it is capable of becoming conscious. How he knew this he did not say. Since the behavior of the amoeba is like that of the iron filings, except that it discriminates more stimuli, and, since the

[20] K. Koffka, in C. M. Child *et al.*, *The Unconscious: A Symposium*, New York: Knopf, 1929, 43. By permission of F. S. Crofts and Company.

[21] E. G. Boring, A psychological function is the relation of successive differentiations of events in the organism, *Psychol. Rev.*, 44, 1937, 456.

amoeba cannot introspect, it is difficult to know how he found out. We see here that until animals learn to introspect and communicate, any beliefs about their consciousness, unconsciousness, or nonconsciousness resembling or differing from conditions in the inanimate world must be founded upon the uncertainties of analogy to human beings.

This use of *unconscious*, with its dangerous implications, will be of no further importance to our considerations.

DEFINITION 2

Unconscious = ABSENT-MINDED, DAY-DREAMING, ANESTHETIZED, etc., —UNRESPONSIVE TO STIMULATION.

A person is *unconscious* in this sense when he is in one of the states in which the stimuli of the external environment are not affecting his behavior, or in which he does not show normal reaction to or discrimination of these stimuli. An individual in such a state is sometimes loosely said, in terms making the popular assumption of free will, to have lost, partially or completely, control of his body. Such conditions exist during absent-mindedness, reverie, unconsciousness from concussion or other physical injury, fainting, comas, trances, hypnosis, sleep, the hypnagogic state (just at waking), and dream states (in sleep and epilepsy). Each of these conditions has characteristic subjective and objective aspects, and a host of physiological and psychological determinants. There are important differences, for instance, between coma and reverie. For clarity, therefore, it is advisable to use the specific name for the state rather than the general description *unconscious*.

The determinants of these various states are of many sorts. Subjectively, being in a faint is much different from being under hypnosis. Moreover, the physiology of the first condition is much less imperfectly known than that of the second.

Introspective report tells us, however, that subjectively these various states merge into one another gradually—*e.g.*, waking into reverie into sleep, or waking into hypnosis into dreaming sleep. We have in this sense a continuity of imperceptible gradations between consciousness and unconsciousness. Furthermore, these states

are all objectively alike in that, to a greater or less degree, the individual in them is less responsive to stimulation than normally.

The objective *criterion* indicating any of the states of unconsciousness which we have been considering is whether the individual responds to stimulation. Absence of any response or of the normally occurring response is the index of unconsciousness in the sense most frequently used by the medical profession as well as by the layman. Some of the rough tests commonly employed are maintenance of upright posture, response to questioning, reaction to painful stimuli, "voluntary" motion, proper reaction to the entire environment. Alford, in discussing his study of the neural localization of consciousness, referred specifically to this criterion:[22]

> The criterion chosen for consciousness was the ordinary psychiatric one, namely, a state of "awareness" or alertness to surroundings. Disturbance of consciousness is shown by "confusion" and disorientation. This limitation of the criterion both simplifies observation and eliminates controversy over what is included under the more extensive conceptions of psychologists and philosophers. For the sake of interest, however, one hopes there are affiliations between the two viewpoints. I have tested and retested the validity of this criterion during these two years and have found it workable and essentially accurate.

The states of unconsciousness characterized by unresponsiveness to stimulation are analyzed in Chapter V.

One sense of the word *unconscious* describes only actions, ideas, emotions, needs, or drives of an individual, and does not refer to the individual himself. This is the following usage.

DEFINITION 3

Unconscious = NOT MENTAL.

The philosophical meaning of *consciousness,* as defined by *Webster' Dictionary*, is: "That state of being which is characterized by sensation, emotion, thought, or any psychical attribute whatever; mind in the broadest possible sense; that in nature which is distin-

[22] L. B. Alford, Localization of consciousness and emotion, *Amer. J. Psychiat.*, 12, 1933, 790. By permission of the *American Journal of Psychiatry.*

guished from the physical." The wide acceptance by philosophers of this sense of the word *consciousness* has been the origin of the greatest dispute which has raged about the notion of unconsciousness. The argument has been (and it is still propounded by certain English philosophers) that if consciousness is mentality, then unconsciousness can have none of the characteristics which philosophers associate with mind. Therefore any mention of "unconscious ideas" is decried as referring to "unconscious consciousness," which one of the English philosophers[23] has considered as self-contradictory as the postulation of "cannibals in all respects except the act of devouring the flesh of the victims." After this fashion the Freudian attitudes toward unconscious processes have frequently been attacked.[24]

A good example of this equation of *mental* and *conscious* is Münsterberg's statement:[25]

> There is thus no reason to conceive a psychical fact existing outside of consciousness,—and that corresponds to the only significant meaning of consciousness. Consciousness is nothing which can be added to the existing mental facts, but it indicates just the existence of the psychical phenomena. Consciousness cannot do anything, cannot look here and there and shine on some ideas and leave others without illumination. No, consciousness means merely the logical relation point of its contents; the psychical phenomena are in consciousness as the physical phenomena are in nature; there cannot be physical phenomena outside of nature.

Freud continually attacked such conceptions of consciousness and unconsciousness. He realized that his references to various unconscious mental processes were illogical if mind and consciousness were equated, but he insisted[26] that the difficulty is verbal, for he meant something else by *conscious* and *unconscious* (*cf.* Definition 15,

[23] J. Laird, in G. C. Field, F. Aveling, and J. Laird, Is the conception of the unconscious of value in psychology?, *Mind*, 31, 1922, 434-5.

[24] *E.g.*, C. D. Broad, *op. cit.*, 356 ff.

[25] H. Munsterberg, in H. Munsterberg *et al.*, *Subconscious Phenomena*, Boston: Badger, 1910, 29.

[26] S. Freud, A note on the unconscious in psycho-analysis, *Proceedings Soc. Psychical Research*, 26, 1912, 312.

pp. 42-43). He believed that it begs the question to assert that *conscious* and *psychical* are identical terms.

The meanings of *unconscious* distinguished by our Definitions 3 and 15 continue to be confused by many psychological theorists, however, and implications of this fact are considered in future chapters.

Most uses of *unconscious* may refer either to the individual or to his actions, ideas, emotions, needs, or drives. This is true of the rest of the usages to be defined in this chapter.

DEFINITION 4

Unconscious = (applied to the individual) UNDISCRIMINATING; (applied to his actions) UNDISCRIMINATING.

Behaviorists have insisted that a person is *conscious* in the sense that has any objective, observable meaning only when his behavior indicates that he can discriminate between two or more stimuli. Then *unconscious* can mean only that such discrimination is not being made. Boring stated this position:[27]

> Discrimination is the psychical function of the organism. It is the criterion of mind, of consciousness, of knowing. Animals, children and irresponsible adults are recognized as conscious only as and in as far as they discriminate, that is to say, as they react differentially (discriminatorily) to a differentiated situation. . . . Even the "immediate, private experience" of introspection can be defined only operationally, and the operation which indicates its existence is differential reaction.

Behind all these definitions of *unconscious* which we are considering is a basic sense of *unaware* (*cf.* Definition 16, pp. 43-44) derived from the subjective experience of all who use the word. The experience of awareness is private, and these definitions indicate various circumstances under which it has been believed that this awareness does not exist (for instance, Definition 2 says it is not present when the individual is unresponsive to stimulation). Psychologists who reduce the subject matter of their science to objectively observable

[27] E. G. Boring, *op. cit.*, 450. By permission of the *Psychological Review.*

behavior have insisted that the presence or absence of this subjective awareness is a private affair not available to public science, and that the only behavioral differentiation between consciousness and unconsciousness must be based on the presence or absence of discrimination. Definition 4 is, therefore, the basic sense of *unconscious* for psychologists relying solely on objective observation, while Definition 16 represents the basic sense for those who will accept subjective report.

A *criterion* of unconsciousness in the sense of this definition is that if an individual does not discriminate between two stimuli he is unconscious of the difference between them, and, if he does not discriminate the presence of a stimulus from its absence, he is unconscious of that stimulus. Moreover, if the stimulus has been presented to the individual under question and he has not reacted to it, but then he finally does respond to it, he has been unconscious of it until then.

Tolman has written:[28] "Wherever an organism at a given moment of stimulation shifts then and there from being ready to respond in some relatively less differentiated way to being ready to respond in some relatively more differentiated way, there is consciousness."

Chapters XII and XIII deal with the obvious difficulty involved in this criterion, that it may be possible for a person to discriminate between two stimuli and not give any behavioral evidence of the fact.

A second *criterion* of unconsciousness in this same sense is the impossibility of developing conditioned responses. When a stimulus like a piece of steak is put before a dog, he responds to it by salivating. If a bell is rung ten seconds before the dog is fed every day, he finally becomes so conditioned that he begins to salivate to the bell. This is a conditioned response. If this does not occur, one may say, by the present criterion, that the dog is unconscious of the bell.

Pavlov believed[29] that the cerebral cortex of the animal must function if conditioning is to occur. It has been commonly held that consciousness is located in the cortex. These two beliefs have given

[28] E. C. Tolman, A behaviorist's definition of consciousness, *Psychol. Rev.*, 34, 1927, 435.
[29] I. P. Pavlov, *Conditioned Reflexes*, trans. G. V. Anrep, Oxford: Oxford University Press, 1927, 330.

rise to the equation of consciousness and conditioning, and to the further assumption that, if conditioning cannot be developed in a given part of the nervous system, the processes going on in that region are unconscious. When conditioning was achieved in Pavlov's dogs, which salivated when the bell was rung before they were to be fed, it was possible to tell if they were conscious of the bell (could discriminate it) by finding whether they salivated. This technique has been used extensively in animal psychology[30]—for instance to discover how soft a bell a dog can hear, and what is the intensity below which he is unconscious (in the sense of Definition 4) that the bell has rung.

The use to which this conditioned-response criterion has been put in the attempt to localize consciousness in the nervous system is considered in Chapter IV.

DEFINITION 5

Unconscious = (applied to an individual) CONDITIONED, acting sheerly on the basis of conditioning; (applied to his actions, emotions, etc.) CONDITIONED, merely conditioned responses.

Frequently statements can be found implying that, since conditioned-response formation is usually interpreted in physiological terms, for instance as an alteration of neural pathways, it is unconscious, because it is not mental but purely physiological. Behavior is often explained by clinicians and theorists in terms of conditioning which occurred in infancy, and it is often assumed that this is unconscious because it occurred at the purely physiological level.

We find implications of such a position in Murphy, Murphy, and Newcomb's discussion of the way neighboring katydids imitate the chirping of one another.[31] These writers distinguished (*a*) imitation of conditioned response type, (*b*) imitation after a trial-and-error period, and (*c*) deliberate imitation, and then proceeded to say:[32]

[30] E. Culler, G. Finch, E. Girden, and W. Bragden, Measurements of acuity by the conditioned-response technique, *J. Gen. Psychol.*, 12, 1935, 223-7.

[31] G. Murphy, L. B. Murphy, and T. M. Newcomb, *Experimental Social Psychology*, rev. ed., New York: Harper, 1937, 180-3.

[32] *Ibid.*, 181. By permission of Harper & Brothers.

> In the first of these, the behavior which is called imitative is strictly a conditioned response to a fairly simple and easily describable stimulus; the animal does not know that it is imitating, and the fact that the behavior "imitates" or duplicates the behavior of some other animal necessitates no psychological principles other than those already described in connection with the conditioned response.

This statement appears to mean that because the imitation of the animal is strictly conditioned-response behavior, it is unconscious that it is imitating. Presumably if the imitation had been of the third type mentioned, deliberate, some other psychological principle more "mental" than a physiological conditioned response would have been required to explain it.

Lurking close to the sense of *unconscious* of the present Definition 5 is usually found the assumption that what is mental is conscious and what is nonmental is unconscious, the assumption of Definition 3. Moreover this use of *unconscious* is surrounded by more than a faint aura of a doctrine which has wrought much havoc in psychology, that mentality is something over and above physiological processes, sometimes accompanying them and sometimes not.

It is obvious that this sense of *unconscious* is directly contradictory to that of Definition 4, the second criterion of which depends upon the assumption that consciousness is conditioned responses.

DEFINITION 6

Unconscious = (applied to an individual) UNSENSING; (applied to his actions, emotions, needs, drives, etc.) UNSENSED.

Several subsidiary cases in which this usage of *unconscious* may be employed are listed below.

(*a*) STIMULI NOT REACHING ORGANISM. Bassanio in *The Merchant of Venice* was unconscious of which casket—gold, silver, or lead—contained the permission to marry Portia, and in this forced unconsciousness lay the drama.

(*b*) INADEQUATE STIMULI AFFECTING ORGANISM. If the energy of the stimulus does not reach the sense receptor which it can affect, the individual will be unconscious of it. Throw a light into some-

one's ear, and, if none of the light reaches an eye, he will not be conscious of it.

(*c*) SENSORY TRACT INCAPABLE OF CONVEYING STIMULI. In the optic tract, for instance, certain drugs, bacterial or virus infections, pressure on the optic nerve, or a cataract of the lens may cause blindness and unconsciousness of one aspect of the environment.

(*d*) SUBLIMINAL STIMULI AFFECTING ORGANISM. A stimulus must be of a certain intensity in order to be conveyed along a neurone. If it is below this threshold intensity (*i.e.*, if it is subliminal), it will be insufficient to cause a nervous impulse to pass along the neurone and the organism will be unconscious of it. The passenger leaning over the rail as the ship departs sees his friends on the dock waving and sees their lips moving, but he hears no sound of their shouted farewells. The threshold or limen is not always exactly the same, but varies with innumerable physiological factors. It must therefore be treated statistically, and determined, for example, by taking the average of one hundred trials.

In Chapter IX we consider forgetful unconsciousness, which includes amnesias of impression, in which someone appears to have forgotten something which he really never had an opportunity to perceive adequately. He is unconscious of it because he never sensed it, on account of one of the situations mentioned in this Definition 6, cases (*a*) to (*d*).

Sears mentioned three *criteria* which show that the impression originally received was adequate:[33]

> (*a*) The fact of immediate recall of the experience before amnesia develops (as in the amnesias of murderers, or victims of dual personality); (*b*) eventual recall spontaneously or by aid of special methods (as with hypnosis, distraction, chloroform, emotional shock, or free association); and (*c*) agreement by competent observers that the external conditions were sufficient to provide an impression. The last criterion may be easily abused; perception depends on internal conditions as well as external and no observer is competent to judge the former as adequate.

[33] R. R. Sears, Functional abnormalities of memory with special reference to amnesia, *Psychol. Bull.*, 33, 1936, 232. By permission of the *Psychological Bulletin.*

In some cases it is possible to use criterion (*c*) with a good deal of certainty. If Bassanio had never opened any of the caskets and later could not tell what was in them, that would not be amnesia. He would be unconscious of the contents because he had never sensed them. It is certain (barring clairvoyance and telepathy) that if the stimuli could not reach Bassanio, he was unconscious of what was in the caskets.

Similarly, *criteria* of unconsciousness can be derived from the other cases considered under this Definition 6. A particularly useful one is that if the stimuli are found to be subliminal they are unconscious. This criterion has been so important in experimental work that all of Chapter VI is devoted to it.

(*e*) STIMULI NOT REACHING THE CORTEX (OR THE "SEAT OF AWARENESS" OF THE NERVOUS SYSTEM). If physical violence, a tumor, or some other agency has functionally separated the highest level of the nervous system (usually assumed to be the cortex) from lower levels, the upper integrating mechanism may not be affected by stimuli which enter the central nervous system in the region of the spinal cord, or even the medulla or midbrain. Such a patient is then referred to as being unconscious, much as if the higher centers had temporarily stopped functioning under anesthesia.

While incidentally lured close to indiscretion by the intriguing question of animal consciousness, Jones and Porteus referred to subcortical activity as largely unconscious:[34]

> Even the lowliest animal with the simplest kind of structure must have at least some germ of consciousness but this is almost certain to be no more than a sense of aliveness, or flashes of what we may call awareness. But without a cortex and cortical memory there could hardly be any continuity or connection between these flashes, nor stream of activity or flow of consciousness.

A statement by Freud on consciousness indicates that he believed that there is a "seat of awareness" which perceives some mental processes but not others. He said[35] that consciousness appears to be

[34] F. W. Jones and S. D. Porteus, *The Matrix of the Mind*, Honolulu: University of Hawaii Press Assn., 1928, 414-5. By permission of the University of Hawaii Press Association.

[35] S. Freud, *The Basic Writings of Sigmund Freud* (*The Interpretation of Dreams*),

like a sensory organ perceiving a content that comes from another source. This may be interpreted in neurological terms as meaning that the neural system mediating consciousness has a higher threshold than lower centers controlling other activities, producing the "content proceeding from another source."

A *criterion* of *unconsciousness* in this sense (*e*) is perhaps presented by the electroencephalogram. There is some evidence[36] that differences in cortical activity, as between waking and sleeping, are reflected in the "brain waves."

Another *criterion* of unconsciousness in the sense of this Definition 6 is surprise. In later chapters it is demonstrated that whenever stimuli which were available to someone but had not been reaching the highest integrative level of his nervous system, and hence were not sensed by him, suddenly reach that level, he shows surprise behavior. This indicates that up to then he had been *unconscious*, by Definition 6, of these stimuli. This is a most useful criterion.

DEFINITION 7

Unconscious = (applied to an individual) UNNOTICING or UNATTENDING; (applied to his actions, ideas, emotions, needs, drives, etc.) UNNOTICED or UNATTENDED.

You have been watching an exciting baseball game intently when suddenly you notice that a large thunderhead has crept up from nowhere and a storm is threatened in what had been a cloudless day. The cloud is now well within your range of vision, the shadows of trees have disappeared, it is noticeably darker, and the thunder rumbles in the distance, but until the inning was over these facts were in the periphery of your attention—in the sense of this present definition you were unconscious of them. Pillsbury, writing on attention in 1908, showed that some writers then equated consciousness and attention (and hence unconsciousness and inattention):[37]

> The . . . last theory of attention which we must consider is repre-

[36] *E.g.*, H. Davis and P. A. Davis, Action potentials of the brain, *Arch. Neurol. and Psychiat.*, 36, 1936, 1214-24.

[37] W. B. Pillsbury, *Attention*, New York: Macmillan, 1908, 292. By permission of The Macmillan Company, publishers.

> sented by Kohn, and is to the effect that attention and consciousness are identical. This is not far different from the conclusion that we have reached, in so far as it must be admitted that attention is involved in all consciousness, and that degree of attention and degree of consciousness amount to the same thing.

This position is by no means a doctrine of the past, for it or a similar belief is still propounded. For instance Boring wrote in 1933:[38] "Consciousness is attentive; attention is selective; consciousness is selective. Attention and consciousness are almost synonyms, and selection is the fundamental principle of both."

When *unconscious* is used in the sense of *unattended*, one's actions, ideas, emotions, needs, drives, etc., are *unconscious* not because one cannot think of them since they are kept from consciousness, as psychoanalysts insist, but simply because one is thinking of something else. This is an important theoretical difference.

As to *criteria* for Definition 7, there are several indices of loss or absence of attention. For instance there are motor concomitants of attention. Experimentation has shown that in attention there is a widespread series of physiological changes, adjustments of receptive mechanisms, postural changes, diffuse muscular strains, and alterations in respiration, circulation, blood sugar, epinephrin excretion, etc. These all are characteristically different in inattention. Furthermore loss of attention often is accompanied by loss of adequate reaction to weak stimulation, and some motions take on automatic character. The subjective aspects of inattention, moreover, may be discovered by introspection. The various applications of these criteria are considered in Chapter VII.

Another *criterion* which suggests inferentially that behavior was performed unconsciously (in the sense of this definition) is to ask someone, before he would normally forget it, what he has just done. Freud referred to a case of this sort, and employed this criterion as it is frequently used in everyday life:[39]

[38] E. G. Boring, *The Physical Dimensions of Consciousness*, New York: Century, 1933, 231-2. By permission of the author and of D. Appleton-Century Company.

[39] S. Freud, *The Basic Writings of Sigmund Freud (Psychopathology of Everyday Life)*, 93-4. By permission of Random House, Inc.

It is a familiar fact that in reading aloud, the attention of the reader often wanders from the text and is directed toward his own thoughts. The results of this deviation of attention are often such that when interrupted and questioned, he cannot even state what he has read. In other words, he has read automatically, although the reading was nearly always correct.

DEFINITION 8

Unconscious = (applied to an individual) INSIGHTLESS, lacking insight in the sense used by the Gestalt school of psychologists; (applied to his actions, ideas, etc.) NOT INVOLVING INSIGHT.

Thorndike and Rock did some experiments on learning a task without awareness of what is being learned or intent to learn it.[40] In this work they suggested that learning is unconscious if improvement in learning, instead of manifesting itself suddenly (which certain Gestalt psychologists[41] said indicates insight into the nature of part or all of the task), rather occurs gradually (indicating no insight). In their experiment, because the learning curves rose only gradually, Thorndike and Rock assumed that the subjects were not aware of the task, on the ground that with insight the curves would have risen immediately to one hundred per cent correctness.

Others have suggested that insight and consciousness are the same, and this position has been vigorously opposed, as is demonstrated in Chapter VIII.

The *criterion* of unconsciousness arising from this definition is obvious—if the curve of improvement in learning rises gradually without a sudden rapid acceleration, the learner is unconscious of the nature of the task.

DEFINITION 9

Unconscious = (applied to an individual) UNREMEMBERING; (applied to his actions, emotions, drives, needs, etc.) UNREMEMBERED.

Almost all who are willing to use the word *unconscious* will agree that what has been forgotten should be characterized by that term.

[40] E. L. Thorndike and R. T. Rock, Jr., Learning without awareness of what is being learned or intent to learn it, *J. Exper. Psychol.*, 17, 1934, 1-19.

[41] *E.g.*, W. Kohler, *The Mentality of Apes*, New York: Harcourt, Brace, 1925, 198 and elsewhere.

Seven sorts of forgetting have been suggested: (*a*) Extinction or lack of formation of conditioned responses. (*b*) "Simple forgetting" —the wearing away of memories with time so that finally they cannot come to consciousness. (*c*) Alterative forgetting—incorrect remembering. (*d*) Retroactive inhibition—new material preventing the reproduction of older memories. (*e*) Dissociation—because there are two separate systems in the personality, neither remembers what the other does. (*f*) Suppression. (*g*) Repression.

Alexander differentiated the last two kinds of forgetting as follows:[42]

> In the exclusion from consciousness of certain tendencies there is, in addition to unconscious repression, a conscious and voluntary selective process called "suppression," which eliminates from the focus of interest everything which is even loosely connected with unconscious material. Suppression also eliminates all kinds of irrelevant material which would distract the attention from the topic which is at the focus of interest at any given moment.

From the objective point of view suppression and repression are the same—the individual does not communicate the material which he suppresses any more than that which is repressed. Subjectively, however, what is suppressed is not unconscious in the sense of this Definition 9 but rather in the sense of Definition 7 (UNNOTICED or UNATTENDED). Whether it should be classed as a kind of forgetting is therefore questionable.

Firmly established conditioned responses are certainly a kind of remembering. Therefore when conditioning might be set up but is not, or when conditioning which is developed later becomes extinct, we have an example of forgetting. Lack of conditioned responses, which has already been seen to be a case of unconsciousness in terms of Definition 4 (UNDISCRIMINATING), is thus also a case in terms of the present Definition 9.

The *criterion* differentiating consciousness from unconsciousness in this sense is the practical question: Can the material be reproduced? Can the individual under consideration tell of something

[42] F. Alexander, *The Medical Value of Psychoanalysis*, New York: Norton, 1936, 95. By permission of Norton & Company, Inc.

which happened in his past experience? If he is unable to tell of it, does he or can he perform acts obviously based upon it? If not, he is unconscious of it in this sense. The application of this criterion is often exceedingly difficult, and a full discussion of it is presented in Chapter IX.

DEFINITION 10

Unconscious = (applied to an individual) ACTING INSTINCTIVELY, behaving on an unlearned basis; (applied to his actions, ideas, emotions, needs, drives, etc.) UNLEARNED OR INHERITED.

The phrases "visceral unconscious" and "instinctual unconscious," to be found in psychological writings, refer to the doctrine that the conditions motivating inherited action patterns, instinctive behavior which could not be learned and therefore must be based on the bodily structure, are unrecognized. Biochemistry is continually proving that there are needs, drives, and physiological disequilibria of the human organism of which we know nothing, but which nevertheless are constantly satisfied, as they must be for life to continue.

This instinctive aspect is the most important characteristic of the unconscious forces of psychoanalytic theory. Emerson stated this well when he said[43] that the unconscious is in large measure cravings, instincts, impulses, and reflex or physiochemical reactions. As such, he added, it is not open to social training.

Unconscious and *instinctive* are often used loosely to mean the same thing. For example,[44] the context makes it apparent that Münsterberg meant *unconsciously* (UNATTENDED) when he wrote *instinctively* in the following passage:[45] "The words of foreign origin are instinctively replaced by words of German root." Ellwood expressly equated the two words:[46] "We should be substantially correct if we defined society as any group of individuals who either unconsciously (instinctively) or consciously (reflectively) coöperate."

[43] L. E. Emerson, The subconscious in its relation to the conscious, preconscious and unconscious, *Psychoanalyt. Rev.*, 6, 1919, 60.

[44] These examples are from L. L. Bernard, *op. cit.*, 128-9.

[45] H. Münsterberg, *American Patriotism*, New York: Moffat, Yard, 1913, 88-9.

[46] C. A. Ellwood, *Sociology in Its Psychological Aspects*, New York: Appleton, 1912, 13-4. By permission of the author and of D. Appleton-Century Company.

Finally, Fabre, the student of instinct in insects, defined instinct as:[47] "The unconscious impulse that guides the animal in the marvelous accomplishments of its industry."

DEFINITION 11

Unconscious = (applied to an individual) UNRECOGNIZING; (applied to his emotions, needs, drives, etc.) UNRECOGNIZED.

Sometimes this usage implies that the existence of the process is not known and at other times that the existence is recognized but the character of the process is not understood. Consider, for instance, a statement by Murray:[48] "In the examples cited . . . none of the variables operating unconsciously were considered to be enduringly inaccessible to consciousness. The very next moment the S [*i.e.,* subject] might have become aware of one or more of them."

The variables referred to by Murray are needs, the dynamic determiners of behavior in his theoretical system, which are satisfied only by performing certain sorts of acts. It is not clear from this context whether Murray meant that the subject in question did not know that these needs existed (was *unconscious* of them either in the sense of Definition 16—UNAWARE OF DISCRIMINATION—or in the sense of Definition 6*e*—STIMULI NOT REACHING THE "SEAT OF AWARENESS" OF THE NERVOUS SYSTEM), or whether he meant that the subject knew of the needs but was unaware of their nature or of what would satisfy them. It is important that such distinctions be made.

Many needs which are unconscious in the sense of Definition 10 (UNLEARNED OR INHERITED) are unconscious also in the present usage, but the two significances are commonly rolled into one word.

A *criterion* of unconsciousness in this sense is available. If an individual whose behavior indicates a need of a recognizable sort has means of satisfying the need but does not take advantage of them, he is often said to be unaware of the nature of the need or of what would satisfy it.

[47] J.-H. Fabre, *Souvenirs entomologiques,* Paris: Delagrave, 1919, IV, 65-6. (Author's translation.)

[48] H. A. Murray *et al., Explorations in Personality,* New York: Oxford University Press, 1938, 52. By permission of Oxford University Press, New York.

DEFINITION 12

Unconscious = (applied to an individual) ACTING INVOLUNTARILY; (applied to his actions, ideas, emotions, etc.) INVOLUNTARY.

Outlining psychoanalytic doctrine, Brill[49] said that Freud believed that what is unconscious cannot be voluntarily recalled. Academic psychologists have never been certain what *voluntary* means, and have come to neglect studying the will almost entirely. This in large measure has been because they have assumed determinism and so eschewed the investigation of what appears to be "free will." As *unconscious* and *involuntary* came to be used frequently as synonyms[50] the impropriety of the notion of volition did much indirectly to throw the concept of unconsciousness into disrepute.

The difficulty of finding when a person is or is not acting voluntarily, even though introspective evidence be accepted, is so great that such a procedure would not be an adequate *criterion* of unconsciousness in the present sense.

Another *criterion*, however, has been suggested.[51] Reference has been made to behavior mediated by parts of the autonomic and central nervous systems or of the endocrine system which are not subject to "voluntary" control. If it can be shown that this behavior is so regulated, it is thus proved *unconscious* in the present sense of Definition 12. This criterion is considered in Chapter XI.

DEFINITION 13

Unconscious = (applied to an individual) UNABLE TO COMMUNICATE; (applied to his actions, ideas, emotions, needs, drives, etc.) INCOMMUNICABLE.

It was Watson who originally equated what is unconscious with what is unverbalized.[52] The most frequent use of this sense of *unconscious* is not as Watson employed it, referring merely to what is not verbalized, but rather referring to what is incapable of ver-

[49] A. A. Brill, introduction to S. Freud, *The Basic Writings of Sigmund Freud*, 13.

[50] *Cf.* J. Agerberg, Consciousness as a physiological function, *Acta Psychiat. et Neurol.*, 4, 1929, 122.

[51] *Cf.* C. V. Hudgins, Conditioning and the voluntary control of the pupillary light reflex, *J. Gen. Psychol.*, 8, 1933, 3-51.

[52] J. B. Watson, The myth of the unconscious, *Harper's*, 155, 1927, 503.

balization, or of any sort of communication. Verbalization is often mentioned as an indication of consciousness, but this is simply because use of words is the most obvious sort of evidence. Any sort of communication, as by gesture or facial expression, should also be taken as indication of consciousness. Perhaps one can find traces of the doctrine that man, who alone uses words, is the only conscious animal, a doctrine appearing unnoticed in the frequent references to words as indices of consciousness.

Sears explained clearly how the sense of *unconscious* of this present Definition 13 is important, but made the mistake of using *unverbalizable* instead of *incommunicable*:[53]

> The term "verbal activity" is used instead of Freud's "consciousness" because for experimental purposes there must be an objectively measurable response, the lack of which will serve as one of the necessary criteria of repression. It is apparent, of course, that the meaningful content of verbal activity may pass through several developmental (*preverbal*) forms before being finally translated into language. Some of these, like the image, are definitely symbolic and others, more primitive, like the generalized attitude, are not. . . . There are, of course, many factors which may interfere with the expression of conscious images, attitudes, or wishes in words. A man may frankly wish that he had a different profession but under a few conditions only will he translate this wish into verbal terms that an observer could measure. Such factors as alcoholic intoxication, extreme anxiety, sympathetic intimacy with the recipient of the information, or some other strong social polarization might be the only influences which would lead to this translation. It is clear that in order for the above description to be truly reflective of the Freudian position there must be a one-to-one relationship between the unexpressed content (verbal or preverbal) and the expressed (measurable) content of the verbal activity itself.

Throughout our discussions, *unconscious,* when used in this sense, will mean that the total condition is such that, for one or more of many sorts of reasons, the objectively observed fact is that the individual involved does not communicate the item of knowledge under consideration.

[53] R. R. Sears, *op. cit.,* 246. By permission of the *Psychological Bulletin.*

The *criterion* of unconsciousness in the sense of the present definition, observed lack of communication, is widely applied, as is shown in Chapter XII. Various modifications and subdivisions of it have been employed.

(*a*) The most frequent, used experimentally[54] and in everyday life, has been simply the asking of the subject if he is aware of a stimulus. If he responds affirmatively, he is conscious of it; if negatively, he is unconscious of it.

(*b*) A second modification of this criterion is simply the recording of what the individual says, without asking him questions. If he verbalizes something, he is aware of that; otherwise he is not. For example, when a student takes an examination he is graded solely on the basis of what he writes down. It is presumed that if he does not write something he does not know it.

(*c*) A third modification of this communication criterion is that behavior patterns or certain aspects of them are unconscious if they cannot be described or characterized adequately by the individual performing them. Sapir has suggested using this modification of the criterion in experimental investigations of forms of social behavior:[55]

> If we can show that normal human beings, both in confessedly social behavior and often in supposedly individual behavior, are reacting in accordance with deep-seated cultural patterns, and if, further, we can show that these patterns are not so much known as felt, not so much capable of conscious description as of naïve practice, then we have the right to speak of the "unconscious patterning of behavior in society." The unconscious nature of this patterning consists not in some mysterious function of a racial or social mind reflected in the minds of the individual members of society, but merely in a typical awareness on the part of the individual of outlines and demarcations and significances of conduct which he is all the time implicitly following.

In our discussion of Definition 7 (*unconscious* = UNNOTICING or UNATTENDING), one criterion mentioned was asking an individual

[54] *E.g.*, H. Cason, The conditioned eyelid reaction, *J. Exper. Psychol.*, 5, 1922, 192.

[55] E. Sapir, in C. M. Child *et al.*, *The Unconscious: A Symposium*, New York: Knopf, 1929, 121-2. By permission of F. S. Crofts and Company.

what he had just done; for example, what he had just read aloud from a book. If he could not remember what he had read, it would be assumed that he had been unconscious (UNATTENDING) of it. Such a procedure implies that one can communicate all that one is conscious of, and is really much like the third modification (*c*) of the criterion which has just been considered.

DEFINITION 14

Unconscious = (applied to an individual) IGNORING; (applied to his actions, ideas, needs, emotions, etc.) IGNORED.

Sometimes an individual will act as if ignorant of facts of which he is really aware. He may or may not be able to recognize and be willing to admit, under circumstances like a psychoanalysis, that he really knows the facts. The political orator, for instance, may thank his listeners for voting for him at the last election, apparently ignorant that the precinct had been almost unanimous for his opponent. He is acting realistically, employing a good vote-getting technique, and it might be difficult to get him to admit that he knew the true facts about the last election. Broad wrote on this subject:[56]

> A method which we very commonly use is to put a ring-fence around a certain region, to label it as dangerous, and to avert our attention from the whole of it. All patriots do this with the whole subject of the virtues of their enemies and the faults of their fellow-countrymen; many scientists put such a fence round all the subjects which are investigated by Psychical Researchers; and the minds of most clergymen appear to be full of regions guarded with barbed wire and a notice that "Trespassers will be Prosecuted." Once this has been done it becomes perfectly easy to assert with complete good faith that we are not deliberately turning our attention away from any assigned desire or emotion which falls within such a region. We can truthfully say that we never thought for a moment of this particular experience, and therefore cannot have *deliberately* ignored it; just as a thief might truly say that he had never touched a certain necklace if he had merely pocketed the case which in fact contains it.

The boundary between unconscious (IGNORED) facts and uncon-

[56] C. D. Broad, *op. cit.*, 368-9. By permission of Harcourt, Brace and Company, Inc.

scious (UNREMEMBERED) facts is blurred, and many psychological writings make no distinction between them. Certainly in specific instances it is difficult to tell whether a fact was ignored, as Broad says "deliberately," or whether it was forgotten. No differentiating criterion except introspection is available.

DEFINITION 15

Unconscious has come to have a specific PSYCHOANALYTIC MEANING. Freud said:[57]

> Unconsciousness seemed to us at first only an enigmatical characteristic of a definite psychical act. Now it means more for us. It is a sign that this act partakes of the nature of a certain psychical category known to us by other and more important characters, and that it belongs to a system of psychical activity which is deserving of our fullest attention. The index-value of the unconscious has far outgrown its importance as a property. The system revealed by the sign that the single acts forming parts of it are unconscious we designate by the name "The Unconscious," for want of a better and less ambiguous term. In German, I propose to denote this system by the letters *Ubw*, an abbreviation of the German word "Unbewusst." And this is the . . . most significant sense which the term "unconscious" has acquired in psycho-analysis.

Originally unconscious processes were to Freud those unavailable to consciousness, which he likened to an "organ of perception." Concerning unconscious processes in this basic sense Freud made several propositions, and these are all represented by the particular Freudian meaning of *unconscious*, which in German he abbreviated *Ubw*, and which in English is abbreviated *Ucs.* These propositions concerning unconscious processes are: (*a*) that they are dynamically repressed away from consciousness, the "organ of perception";[58] (*b*) that they can be made available to consciousness only by special techniques such as hypnosis and psychoanalysis;[59] and (*c*) that they are not under voluntary control.[60]

[57] S. Freud, A note on the unconscious in psycho-analysis, *Proceedings Soc. Psychical Research*, 26, 1912, 318. By permission of the Society for Psychical Research.
[58] *Ibid.*, 315.
[59] A. A. Brill, *loc. cit.*
[60] *Ibid.*

Freud followed the most precise technique for the use of words in making a special abbreviation which would characterize his particular meaning. He was entirely justified in having one word stand for a series of characteristics as he did. He did not, however, always demonstrate when he used the term that all the characteristics which he included in the term were present. Unless this is amply evidenced, such a compound meaning constitutes a snare.

It is frequently difficult in psychoanalytic writings to determine whether *unconscious* is used in Freud's sense or with some one of the other meanings. Following the excellent precedent of using the abbreviation *Ucs.* for the psychoanalytic meaning would obviate this ambiguity.

DEFINITION 16

Unconscious = (applied to an individual) UNAWARE OF DISCRIMINATION; (applied to his actions, ideas, emotions, needs, drives, etc.), UNAVAILABLE TO AWARENESS.

As Definition 4 (UNDISCRIMINATING) refers to the basic sense of *unconscious* for those who accept only behavioral evidence, so this is the golden meaning of the word for those who admit the validity of introspective testimony. The individual is unconscious in this sense unless he not only discriminates stimuli but also reacts discriminatingly to his discrimination. As Krikorian has said:[61] "To be conscious means to respond cognitively to a stimulus which is itself a response."

We have seen that Freud considers consciousness an organ of perception,[62] and one is unconscious in the sense of this Definition 16 of whatever that organ does not perceive. On the other hand, psychologists of the objective schools have stated repeatedly that behavior is no different whether one is conscious or unconscious in this sense. On that front rages the main battle of consciousness.

A *criterion* commonly accepted as indicating that a person is unaware of some of his discriminations is that if he recognized what

[61] Y. H. Krikorian, An empirical definition of consciousness, *J. Phil.*, 35, 1938, 160. By permission of the *Journal of Philosophy.*

[62] A. A. Brill, *loc. cit.*

he is doing he would not act as he is acting. Experiments in which this criterion of unconsciousness was employed are mentioned in Chapter XI.

THE OVERBURDENING OF UNCONSCIOUS

The word *unconscious* has been worked overtime to convey all these meanings. For clarity's sake it is essential that these diverse significances be kept separate. Watson has said[63] of the layman that "if he lost his unconscious, [he] would feel as disturbed about it as did Peter Schlemihl when his faithful shadow departed in the keeping of the devil." Such anxiety reactions would also characterize most psychologists, clinical and academic alike, but there is no unanimity as to which sort of unconsciousness is so indispensable. In future chapters the clinical and experimental evidence throwing light on each sort are reviewed.

[63] J. B. Watson, *op. cit.*, 502.

Chapter II

CASES OF UNCONSCIOUSNESS

Hooke in his preface to *Micrographia* stated what he believed to be the proper way to do scientific work:

> So many are the *links*, upon which the true Philosophy depends, of which, if any one be *loose*, or *weak*, the whole *chain* is in danger of being dissolv'd; it is to *begin* with the Hands and Eyes, and to *proceed* on through the Memory, to be *continued* by the Reason; nor is it to stop there, but to *come about* to the Hands and Eyes again, and so, by a *continual passage round* from one Faculty to another, it is to be maintained in life and strength, as much as the body of man is by the circulation of the blood through the several parts of the body, the Arms, the Fat, the Lungs, the Heart, and the Head.

In like manner we shall conduct our considerations. First let us observe the phenomena—cases of unconscious behavior; thereafter we shall investigate theory about such phenomena; and last we shall evaluate these cases in the light of that theory.

Many of the sorts of unconsciousness distinguished in Chapter I are illustrated in the cases of the present chapter. Certain types of unconsciousness are pictured in more than one case, and frequently more than one type can be found in a single case. The reader may be interested in deciding for himself as he reads the cases in what senses the individuals with which they deal were unconscious. At the end of this chapter (p. 74) is a table indicating some of the senses of *unconscious* illustrated by the cases.

CASE I

"A number of persons of importance, magistrates and professors, had assembled in the main hall of the Salpêtrière museum to witness a great séance of criminal suggestions. Witt., the principal subject, thrown into the somnambulist state, had under the influence of suggestion displayed the most sanguinary instincts. At a word or a sign, she had stabbed, shot, and poisoned [with paper swords, blank pistols, and false poison]; the room was littered with corpses. . . . The notables had withdrawn, greatly impressed, leaving only a few students with the subject, who was still in the somnambulist state. The students, having a fancy to bring the séance to a close by a less blood-curdling experiment, made a very simple suggestion to Witt. They told her that she was now quite alone in the hall. She was to strip and take a bath. Witt., who had murdered all the magistrates without turning a hair, was seized with shame at the thought of undressing. Rather than accede to the suggestion, she had a violent fit of hysterics."[1]

[1] P. Janet, *Psychological Healing,* New York: Macmillan, 1925, I, 184. He retells the incident from Gilles de la Tourette, *L'hypnotisme et les états analogues au point de vue médico-légal,* 1887, 203. By permission of Allen & Unwin, Ltd.

CASE II

Sam W., a sixteen-year-old boy, was admitted to the hospital because of spells of walking and talking in his sleep. He got out of bed one night, took a knife from the kitchen, began what he said was a hunt for the dog, and fell down stairs. He was carried to bed. The next morning he was asked: "Did you dream about going after the dog with a knife last night?" He answered, "Yes, how did you know?" He was then told the circumstances. This was the way he usually learned that he had really acted out what he had dreamed.

Another night while asleep he took a jack-knife from his pocket and carved his initials on his arm. (The scar "S.W." is still there.) The boy sleeping in the room with him reported this, but said he was afraid to stop him for fear of being stabbed.

On another occasion his knife had been taken from him and hidden, but he rose and found it in his sleep. Then he stood over his roommate's bed with knife in hand, and finally scratched the boy's head with the knife, put it down, and went back to bed.[2]

[2] E. Guttmann and C. E. Winterstein, Disturbances of consciousness after head injuries; Used by the courtesy of Dr. Stanley Cobb.

CASE III

"[A boxer] was knocked out in the first minute of the first round; his recollection began only 36 hours later, when he found himself sitting in a train and wondering where he was traveling. His behaviour was apparently unexceptional to the lay observers. When examined here he showed a few nystagmoid jerks, slurred speech, deviation of the tongue to the left. All deep reflexes were very active, the left ankle-jerk more so than the right. There was slight ataxia of his left arm, and marked unsteadiness in standing and walking. The left leg was slightly dragged."[3]

[3] E. Guttmann and C. E. Winterstein, Disturbances of consciousness after head injuries: observations on boxers, *J. Ment. Sci.*, 84, 1938, 348-9.

CASE IV

"This patient, a young girl, began as follows: 'You remember that my sister has now only one boy, Charles. She lost the elder one, Otto, while I was still living with her. Otto was my favourite; it was I who really brought him up. I like the other little fellow, too, but, of course, not nearly as much as his dead brother. Now I dreamt last night that I *saw Charles lying dead before me. He was lying in his little coffin, his hands folded; there were candles all about; and, in short, it was just as it was at the time of little Otto's death, which gave me such a shock*. Now tell me, what does this mean? You know me—am I really so bad as to wish that my sister should lose the only child she has left? Or does the dream mean that I wish that Charles had died rather than Otto, whom I liked so much better?'

"I assured her that this latter interpretation was impossible. After some reflection, I was able to give her the interpretation of the dream, which she subsequently confirmed. I was able to do so because the whole previous history of the dreamer was known to me.

"Having become an orphan at an early age, the girl had been brought up in the home of a much older sister, and had met, among the friends and visitors who frequented the house, a man who made a lasting impression upon her affections. It looked for a time as though these barely explicit relations would end in marriage, but this happy culmination was frustrated by the sister, whose motives were never completely explained. After the rupture the man whom my patient loved avoided the house; she herself attained her independence some time after the death of little Otto, to whom, meanwhile, her affections had turned. But she did not succeed in freeing herself from the dependence due to her affection for her sister's friend. Her pride bade her avoid him, but she found it impossible to transfer her love to the other suitors who successively presented themselves. Whenever the man she loved, who was a member of the literary profession, announced a lecture anywhere, she was certain to be found among the audience; and she seized every other

opportunity of seeing him unobserved. I remembered that on the previous day she had told me that the Professor was going to a certain concert, and that she too was going, in order to enjoy the sight of him. This was on the day before the dream; and the concert was to be given on the day on which she told me the dream. I could now easily see the correct interpretation, and I asked her whether she could think of any particular event which had occurred after Otto's death. She replied immediately: 'Of course; the Professor returned then, after a long absence, and I saw him once more beside little Otto's coffin.' It was just as I had expected. I interpreted the dream as follows: 'If now the other boy were to die, the same thing would happen again. You would spend the day with your sister; the Professor would certainly come to offer his condolences, and you would see him once more under the same circumstances as before. The dream signifies nothing more than this wish of yours to see him again—a wish against which you are fighting inwardly. I know that you have the ticket for to-day's concert in your bag. Your dream is a dream of impatience; it has anticipated by several hours the meeting which is to take place to-day.' "[4]

[4] S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill, New York: Random House, 1938 (*The Interpretation of Dreams*), 229-30. By permission of Random House, Inc.

CASE V

L. P., a student in law school, visited a psychiatrist because he could not study. It was learned that he was unable to concentrate on the words in his books because figures appeared on the pages before him. These were the characters in fantasies about himself which kept running through his mind. In one common day-dream he had become a multi-millionaire and had offered his *alma mater* a million dollars to found a chair in communism. That conservative institution would have liked to have had the money, but was unwilling to have a professorship in the subject he desired. He therefore used his money to found a competing university, one of whose main functions was the teaching of communism.

In another of his fantasies he saw himself as the only man remaining alive in the world. He was surrounded by a bevy of beautiful girls. He and his entourage traveled from one luxurious vacation spot to another. Wherever they went men and women sprang from the dead to serve and wait upon them, and then returned to their graves after they departed. Everything was under the sway of his absolute will.[5]

[5] From a case history of Prof. Henry A. Murray, and used with his permission.

CASE VI

"A patient of mine had received a gun-shot injury, which had disorganized the elbow joint and completely destroyed the ulnar nerve. For five months we hoped to be able to save the limb, but were at last compelled to amputate through the lower third of the arm. From the time he was wounded, there were the usual changes, both motor and sensory, associated with complete ulnar paralysis; but the little finger alone was devoid of all forms of sensibility, superficial and deep. So long as he retained his limb, this finger seemed to him a dead object attached to the hand. But the phantom hand, which appeared after amputation, had four digits only. During the five months of total insensibility, the schemata associated with the little finger, no longer reinforced from the periphery, had gradually died away and, when the actual hand was removed, this digit was absent from consciousness. A portion of the body, cut off from the central nervous system, but attached to structures endowed with sensibility and movement, may continue to exist as a 'dead' part of ourselves. Like a dental plate in the mouth, it occupies a certain place in our spacial conceptions. But, as soon as the structures on which it is based are removed, it disappears from consciousness, whilst the normal parts of the amputated limb are represented in phantom form."[6]

[6] H. Head, The conception of nervous and mental energy (II), *Brit. J. Psychol.*, 14, 1923, 136-7.

CASE VII

"Some years ago when studying the flight of soaring birds, by practice my eye became trained to see minute differences in wing adjustments that would be quite invisible to the untrained observer. It seems to me probable that my training was partly connected with my habit of writing down at the time whatever was observed, for it sometimes happened that having seen something, and being aware that it was worth recording and on turning at once to my note-book, I had great difficulty in calling to consciousness exactly what it was that had been seen. About one adjustment that was used for checking speed, it is recorded in my book that though I learnt to recognise when a bird began to use it, there was no change in the appearance of the bird sufficient for me to express in words. Years afterwards the nature of the adjustment was discovered. It produced a change in outline of the wing-tip that was too small to be recognised by me consciously, but my subconscious mind apparently was aware of the difference and enabled me to know that the bird had changed its mode of flight."[7]

[7] H. Hankin, *Common Sense,* New York: Dutton, 1926, 27-8. By permission of E. P. Dutton & Company, Inc., and of Kegan Paul, Trench, Trubner and Company, Ltd.

CASE VIII

Ellen J., a twenty-year-old girl, was in the room with her father when her mother came in, carrying a glass of tomato juice and two aspirin tablets on a tray. These were for the father, who was taking them regularly, several times a day. The mother stopped in front of her daughter and asked her a question about her new job, in which both were much interested. Ellen gave a long answer, in the course of which she and her mother became deeply absorbed in what she was saying. During this reply, Ellen took the tomato juice and aspirin from her mother and swallowed them. When she had finished speaking, her surprised mother asked what had become of her father's tomato juice and aspirin. The girl was equally astonished to find what she had done, and at first could give no reason for it. Finally she decided that she must have assumed that the aspirins were vitamin B_1 pills, and that her mother, who had great faith in the powers of vitamins, wanted her to take them. Because of her absorption and despite the different appearance of the pills and the inappropriateness of the medication, she swallowed them automatically without remembering the act.[8]

[8] From the case records and by courtesy of Dr. Stanley Cobb.

CASE IX

"For a fortnight, I had been trying to prove that no function could exist analogous to what I have since called the fuchsian function. I was very ignorant at that time; every day I sat down at my table; I passed an hour or two there: I tried a great number of combinations, but I did not reach any result. One evening, I drank some black coffee, which I was not accustomed to do; I could not sleep; ideas crowded in on me; they seemed to me to collide with one another, until two of them hooked together, as it were, to form a stable combination. In the morning I had established the existence of one class of fuchsian functions, that derived from the hypergeometric series; I had nothing to do but to check the result, which took me a few hours. . . .

"At this time I left Caen where I was living at the time, to take part in a course of Geology. The journey made me forget my mathematical work; when we arrived at Coutances we got into an omnibus to make some excursion or other; at the moment of putting my foot on the step, the idea occurred to me, without anything in my immediately preceding thoughts having prepared me for it, that the transformations which I have used to define fuchsian functions were identical with those of non-euclidian geometry. I did not verify this: I had no time to do so, since no sooner was I seated in the omnibus than I took up the conversation I had begun; but I was entirely certain of the result. On returning to Caen I verified it at leisure, in order to satisfy my conscience.

"I then set to work to study arithmetical questions without any apparent result of importance, and without suspecting that there would be the least connection with my previous researches. Disgusted with my failure, I went for a few days' holiday to the seaside and thought of quite other matters. One day, while walking on the cliffs, the idea occurred to me, *again with the same characteristics of brevity, suddenness and certitude* (I underline these words) that arithmetical transformations of indefinite ternary quadratic form

were identical with those of non-euclidian geometry. Here was a new problem. At first all my efforts only served to teach me the difficulty more fully. This part of the work was entirely *conscious.* It was again followed by unconscious work. . . .

"What will strike you at first are these appearances of sudden illumination which are the manifest tokens of a long unconscious labour which has preceded them; the part played by this unconscious labour in mathematical invention appears incontestible to me, and traces will be found of it in other cases where it is less evident. Often, when one is working at a difficult question, one produces nothing of any use on the first occasion of attacking the problem; later, one may take a rest of greater or less duration, and sit down at the table again. For the first half hour one may continue to get no result, and then quite suddenly the decisive idea is presented to the mind. One could say that conscious labour had been more fruitful because it has been interrupted and because the rest had restored to the mind its power and freshness. It is more probable that the period of rest is filled by unconscious labour, and that the result of this labour is afterwards revealed quite suddenly to the geometer, as in the cases that I have cited; only that the revelation, instead of appearing during a walk or a journey, has been produced during a period of conscious work, but independently of this work, which plays at the most the part of a releasing force, acting as a stimulus which excites the results already attained during the rest period, but still buried in the unconscious, to take a conscious form."[9]

[9] From H. Poincaré, *Science et méthode,* 56-8, as quoted in J.-M. Montmasson, *Invention and the Unconscious,* trans. H. S. Hatfield, London: Kegan Paul, Trench, Trubner, 1931, 80-2.

CASE X

Lowes, as a literary detective, has ferreted out the sources from which came the words and phrases which Coleridge combined into his inspired verses. An illustration of such a search and its results may be found in what Lowes names, after the fashion of Conan Doyle, *The Adventure of the Water-Snakes.*

In *The Rime of the Ancient Mariner* Coleridge wrote:

"Beyond the shadow of the ship,
I watched the water-snakes:
They moved in tracks of shining white,
And when they reared, the elfish light
Fell off in hoary flakes.

"Within the shadow of the ship
I watched their rich attire:
Blue, glossy green, and velvet black,
They coiled and swam; and every track
Was a flash of golden fire."

In his search Lowes had certain clues: he knew what books Coleridge had been reading; he knew that Coleridge also read every book mentioned in the texts and footnotes of whatever he read; and finally he had Coleridge's notebook in which the poet jotted down phrases and passages for use in his writings.

By a chain of reasoning worthy of his prototype, Sherlock Holmes, Lowes deduced that Coleridge had read the following observations of Father Bourzes, on *Luminous Appearances in the Wakes of Ships in the Sea* (italics throughout are Lowes's):

"Not only the Wake of a Ship produces this Light, but Fishes also in swimming leave behind 'em *a luminous Track*; which is so bright that one may distinguish the Largeness of the Fish, and know of what Species it is. *I have sometimes seen a great many Fishes playing in the Sea, which have made a kind of artificial Fire in the Water, that was very pleasant to look on.*"

Here is an event much like the mariner's experience in the poem, and it contains, besides, two words found in the *Rime*—"track" and "fire." Searching farther Lowes learned that Coleridge had read the narrative of Cook's last voyage which said in part:

"*During a calm,* on the morning of the 2d, some parts of the sea seemed *covered with a kind of slime*; and some small sea animals were *swimming about.* The most conspicuous of which were of the gelatinous . . . kind, almost globular; and another sort smaller, *that had a white, or shining appearance,* and were very numerous. . . . Sometimes they . . . assum[ed] various tints of *blue* . . . which were frequently mixed with a ruby, or opaline *redness*; and glowed with a strength sufficient to illuminate the vessel and water. . . . But, with candle light, the colour was, chiefly, a beautiful, pale *green*, tinged with *a burnished gloss*; and, in the dark, it had a faint appearance of *glowing fire.* They proved to be . . . probably, an animal which has a share in producing some sorts of *that lucid appearance, often observed near ships at sea, in the night.*"

That these two passages should become associated in Coleridge's mind because of their similarities is understandable; and, moreover, it is not surprising that the first phrase, "During a calm," should connect this latter quotation with the fate of the becalmed ancient mariner. In this paragraph we have one origin of another part of the poem:

> "Yea, slimy things did crawl with legs
> Upon the slimy sea."

But closer to the present quest is the fact that here also is mentioned "shining white," by which Coleridge described the tracks of the snakes; here again is "fire"; and most interesting of all, the colors of the water snakes—"blue" and "glossy green"—all except "velvet black."

Lowes followed the spoor of the missing color and soon found the following description in Bartram, one of Coleridge's favorite authors:

"The whole fish is of a pale gold (or *burnished* brass) colour

. . . the scales are . . . powdered with *red*, russet, silver, *blue* and *green* specks, [and at the gills is] a little spatula . . . encircled with silver, and *velvet black*."

The elusive adjective is found in a passage with many similarities to the one from Cook's voyages—"burnished brass" and "burnished gloss," red, blue, and green animals, in both. In this manner Lowes uncovers what he believes to be the sources of each minute detail of the stanzas. The snakes come from *Purchas his Pilgrimage*; they turned into water-snakes on account of the effect of Dampier's *New Voyage round the World* or *The History of the Bucaniers of America*; and they "reared" because of a statement in Leemius's *De Lapponibus*. Finally from Falconer's *The Shipwreck* comes the symmetry in the first lines of our pair of stanzas, and the word "hoary" for good measure.[10]

[10] Based on J. L. Lowes, *The Road to Xanadu*, Boston: Houghton Mifflin, 1927, 38 ff.

CASE XI

"The first instance to be described is the power of rapid diagnosis possessed by many medical men. It frequently happens that doctors distinguished for their power of rapid and accurate diagnosis are unable to give reasons for the opinions they form. For instance, a medical man gave me a detailed account of a doctor, at a hospital where my informant had been a student, who had a power of this kind that was little short of marvellous. A child arrived one day at the hospital very ill. Several members of the staff examined the child carefully, but were unable to discover what was the matter with it. Afterwards the doctor in question came to the hospital, and, not knowing of this failure in diagnosis happened to walk through the ward where the child was lying. While walking slowly past the child's bed, but without stopping, he remarked, 'That child has pus in his abdomen.' This rapid diagnosis was afterwards found to be correct. It is easy to say that this was a lucky guess. But the doctor in question so frequently made lucky guesses of this nature that it was impossible to ascribe them to chance. My informant, who was then at the head of a large hospital, had similar power. He told me that he is sometimes unable to tell the students the reasons for his diagnosis, despite his attempts to call his reasons to mind. The case of another physician has been related to me whose habit of intuitive diagnosis went so far that he was useless as a teacher. Frequently when asked why he had made a particular diagnosis he had to reply, 'I am sure I don't know.' "[11]

[11] H. Hankin, *op. cit.*, 21-2. By permission of E. P. Dutton & Company, Inc., and of Kegan Paul, Trench, Trubner and Company, Ltd.

CASE XII

D. P. married when she was in her early twenties, and her husband was about the same age. They lived a life of luxury until his sudden death in 1923. After his death she had an income of $2500 to $3000 a month. She began playing the stock market, and lost most of her money. She had difficulty with her father-in-law, who was giving her the income, and finally he cut it off. She sold her car and jewelry and lived with friends.

Then she began going with her present husband, whom she had known several years. They were married six years ago, rather suddenly, but she thought they were in love at the time. His business required him to travel a good deal. Three months after marriage he developed tuberculosis and went west for his health. She remained working in a store in the Middle West and then got a job in a store in Boston. Her husband got better and wired her to come west. She gave up her job and went out to take care of him, but he became morose and finally disappeared with his baggage, leaving a letter, telling her to go back to the East, and $75.

She spent that winter with friends in New Hampshire, then came to Boston with little money, to look for work. She had no references, was dissatisfied with positions she was offered, and so did not get a job. After a week she became discouraged, depressed, and lonesome. She could not sleep, and worried about running out of money, but was too proud to fall back on friends again. She developed loss of memory, though it is not clear when this occurred. A week before she left her rooming house she was quite upset, smoked incessantly, could not sleep, heard ringing sounds, and was confused. Finally one morning she started out in a dazed condition, wandered about the streets not knowing where she was. At last she arrived at a hotel where she had once worked, and went to the ladies' second-floor dressing room. Suicidal thoughts passed through her mind, and she spent the night trying to decide whether or not to jump out of the dressing-room window. In the early morning she was found and brought to the hospital.

On examination it was discovered that the patient was well oriented, but had no memory of the days just past and did not know her own name. She cried frequently. Over a period of a month her memory returned little by little, her depression disappeared, and she recognized that her loss of memory was in part the result of her discouragement and panic about her financial condition.[12]

[12] From psychiatric records of Massachusetts General Hospital, Boston, Massachusetts. Used by the courtesy of Dr. Stanley Cobb.

CASE XIII

"Let us take up the case of that young girl, Irène, who acts during her somnambulism the scene of her mother's death with such apparent precision. Let us watch her during the intervals of her fits, during the period in which she seems to be normal; we shall soon notice that even at that time she is different from what she was before. Her relatives, when she was conveyed to the hospital, said to us: 'She has grown callous and insensible, she has soon forgotten her mother's death, and does not seem to remember her illness.' That remark seems amazing; it is, however, true that this young girl is unable to tell us what brought about her illness, for the good reason that she has quite forgotten the dramatic event that happened three months ago. 'I know very well my mother must be dead,' she says, 'since I have been told so several times, since I see her no more, and since I am in mourning; but I really feel astonished at it. When did she die? What did she die from? Was I not by her to take care of her? There is something I do not understand. Why, loving her as I did, do I not feel more sorrow for her death? I can't grieve; I feel as if her absence was nothing to me, as if she were travelling, and would soon come back.' The same thing happens if you put to her questions about any of the events that happened during those three months before her mother's death. If you ask her about the illness, the mishaps, the nightly staying up, anxieties about money, the quarrels with her drunken father,—all these things have quite vanished from her mind. If we had had time to dwell upon that case, we should have seen these many curious instances: the filial love, the feeling of affection she had felt for her mother, have quite vanished. It looks as if there was a gap as well in the feelings as in the memory. But I shall insist only on one point: the loss of memory bears not only, as is generally believed, on the period of somnambulism, on the scene of delirium; the loss of memory bears also on the event that has given birth to that delirium, on all the facts that are connected with it, on the feelings that are related to it."[18]

[18] P. Janet, *The Major Symptoms of Hysteria*, New York: Macmillan, 1907, 37-8.

CASE XIV

"Miss Christine L. Beauchamp, the subject of this study, is a person in whom several personalities have become developed; that is to say, she may change her personality from time to time, often from hour to hour, and with each change her character becomes transformed and her memories altered. In addition to the real, original or normal self, the self that was born and which she was intended by nature to be, she may be any one of three different persons. I say three different, because, although making use of the same body, each, nevertheless, has a distinctly different character; a difference manifested by different trains of thought, by different views, beliefs, ideals, and temperament, and by different acquisitions, tastes, habits, experiences, and memories. Each varies in these respects from the other two, and from the original Miss Beauchamp. Two of these personalities have no knowledge of each other or of the third, excepting such information as may be obtained by inference or second hand, so that in the memory of each of these two there are blanks which correspond to the times when the others are in the flesh. Of a sudden one or the other wakes up to find herself, she knows not where, and ignorant of what she has said or done a moment before. . . .

"The home life was probably the most trying to B I [one of the personalities] and B IV [another personality]. To begin with, dressing was a labor. It was apt to mean two or more baths, for IV would never believe she had had one unless she took it herself. This may seem a trivial matter, but what answer was she to make to the other inmates of the house when she was reminded that she had just taken one bath? Then the afternoon bath was likely to be similarly duplicated and similarly commented upon. She did manage to give apparently satisfactory answers and avert suspicion, but it was trying. B I, too, was often in the same predicament. Then, after the bath, came dressing. Suppose it was B I who began, and suppose Sally [another and always mischievous personality] had not hidden some

of the most important articles. When nearly dressed, B IV as likely as not would come and then off would come everything, to be replaced by clothes of B IV's liking, and the hair would be done all over again another way. Lucky it was if B I did not come again before finishing, and all did not have to be done over again for a third time. Then came the family breakfast involving new difficulties; and then the family papers, exercises, and letters had to be found. Where were they? Had Sally destroyed them, or IV, or B I? (for somebody always objected to something) and so on. Before the day began it was three hours' hard work, requiring unending patience and much strength."[14]

[14] M. Prince, *The Dissociation of a Personality*, New York: Longmans, Green, 1906, 1, 2, 419. By permission of Longmans, Green and Company

CASE XV

"H. M., an intelligent man aged 32, a railroad fireman, had complained of epileptic seizures for three years before admission to the hospital. The cause of these seizures was found to be a small glioma of benign type deep in the frontal lobe near the midline and anterior to the motor gyrus. . . . In April 1935 the right hemisphere was exposed by osteoplastic craniotomy, and careful experiments with stimulation were carried out. . . .

"The positive results of stimulation were as follows: When point *13* [an arbitrary number for a point on the surface of the brain hemisphere] was touched with the electrode the patient reported a sensation in the little finger of the left hand. Extension of this finger was observed. This was repeated twice without warning with the same result. At *1*, a feeling of 'electricity' was produced in the left middle finger. No movement was associated with the sensation. At 2 a feeling of 'electricity' was produced in the left index finger; at *11*, there were flexion of the left arm and forearm and extension of the fingers. Stimulation of the last point was repeated, with the same result. . . .

"On the precentral gyrus, at point 5, which lies between two areas from which were produced movements of the upper extremity and of the face, respectively, stimulation resulted in vocalization. Because this was the first example of such vocalization, stimulation of this point was repeated thirty-one times, without causing undue fatigue.

"At the first response the patient emitted a somewhat groaning 'Oh.' After stimulation stopped, he said: 'I do not know why I made that noise.' This was repeated four times, with the same result. The intensity of thyratron stimulation was 28, the frequency of the stimulus being between 60 and 70 per second. When the patient was asked why he continued to make this noise, he said: 'I don't know. Something made me speak, and I felt something touch up there.' This sensation of touch may have been due to pressure on the unanesthetized scalp. The next time stimulation was done he said: 'You must have made me do that.' The same strength of

stimulus produced numerous sensory results in the other areas of the cortex, but no other motor response.

"At the seventh stimulation Dr. Colin Russel observed the patient carefully during the vocalization. He remarked that the mouth opened widely, without any expression of fear or emotion during crying. At the eighth stimulation the patient vocalized loudly; when he was asked afterward whether he had felt anything, he said: 'Felt anything! Sure, it felt as though you were pulling the voice out of me!' The longer the stimulation was continued the louder the tone and the higher the pitch seemed to become. I prolonged the fourteenth stimulation to study the effect. In this instance, vocalization continued for six seconds and ended in a tremolo (probably when the breath gave out). On one occasion the patient vocalized, then drew a deep breath and continued to cry.

"At the eighteenth trial area *12*, about 6 mm. below area *5*, was stimulated, a somewhat stronger stimulus being used. Stimulation of both areas was repeated on the twentieth trial, and it was noted that the tone of the voice was higher at area *5* than at area *12*; the effort, however, seemed greater when *5* was stimulated, which may account for the higher tone.

"On the twenty-second stimulation the patient was informed that he was to try not to call out when the stimulus was applied. He said he would try. I warned him when I was going to apply the electrode, but the vocalization began almost immediately after stimulation and continued until the electrode was withdrawn. I then said to the patient, 'I win'; he replied, 'You did,' and laughed. He added: 'I guess I would have won if I had been on that side of my head.'

"In general, the patient was unable to stop the cry or to influence it in any way. He was as surprised at the first sound of his own voice as we were, and he dissociated himself from this artificial employment of his cortex at once. He knew he had not willed it."[15]

[15] W. Penfield, The cerebral cortex in man, I, *Arch. Neurol. and Psychiat.*, 40, 1938, 421-3. By permission of the *Archives of Neurology and Psychiatry.*

CASE XVI

Major X, aged 42. "A case of Syntactical Aphasia, due to a wound over the first temporal gyrus and the Sylvian fissure, produced by a fragment of shell casing.

"He developed seizures in which he ceased to talk and his right arm fell powerless on the bed; he was never convulsed, did not appear to lose consciousness, but could not speak and was powerless to think. These attacks were preceded by a 'tingling feeling' down the right side, accompanied by an hallucination of taste and smell and a peculiar mental state. . . .

"From the first his speech was jargon. He knew what he wanted to say, but his words poured out in phrases which had no grammatical structure and were in most cases incomprehensible. He could not repeat a sentence said to him and, when he attempted to read aloud, uttered pure jargon. He was unable to find names for common objects and yet his correct choice to printed commands showed that he was familiar with their usual nomenclature. Comprehension of spoken words was obviously defective and he was liable to be puzzled by any but the simplest oral commands. In general conversation he frequently failed to understand what was said and to carry on a subject started by himself. Spontaneous thought was rapid and his intelligence of a high order, but his power of symbolic formulation and expression was hampered by defects of internal speech. He undoubtedly comprehended what he read to himself, even in French, but any attempt to reproduce it aloud resulted in jargon. Single words were for the most part more easily written than spoken and, when at a loss, he could frequently write something which conveyed his meaning. But he was unable to read what he had written, and this, together with his difficulty in forming phrases, made it impossible to compose a letter or coherent account of something he wished to convey. He could copy perfectly but wrote badly to dictation, because of the rapidity with which he forgot what had been said to him. He added and subtracted without

difficulty and enjoyed solving financial problems. He could not name a single coin, but recognised their relative value. He played the piano, read the notes correctly and evidently recognised the constitution of a chord and the changes of key."[16]

[16] H. Head, *Aphasia and Kindred Disorders of Speech*, New York: Macmillan, 1926, II, 215. By permission of The Macmillan Company, publishers.

CASE XVII

"A young officer, home on a short leave of absence, asked me to see his mother-in-law who, in spite of the happiest circumstances, was embittering her own and her people's existence by a senseless idea. I am introduced to a well preserved lady of fifty-three with pleasant, simple manners, who gives the following account without any hesitation: She is most happily married and lives in the country with her husband, who operates a large factory. She cannot say enough for the kind thoughtfulness of her husband. They had married for love thirty years ago, and since then there had never been a shadow, a quarrel or cause for jealousy. Now, even though her two children are well married, the husband and father does not yet want to retire, from a feeling of duty. A year ago there happened the incredible thing, incomprehensible to herself as well. She gave complete credence to an anonymous letter which accused her excellent husband of having an affair with a young girl—and since then her happiness is destroyed. The more detailed circumstances were somewhat as follows: She had a chambermaid with whom she had perhaps too often discussed intimate matters. This girl pursued another young woman with positively malicious enmity because the latter had progressed so much further in life, despite the fact that she was of no better origin. Instead of going into domestic service, the girl had obtained a business training, had entered the factory and in consequence of the shorthandedness due to the drafting of the clerks into the army had advanced to a good position. She now lives in the factory itself, meets all the gentlemen socially, and is even addressed as 'Miss.' The girl who had remained behind in life was of course ready to speak all possible evil of her one-time schoolmate. One day our patient and her chambermaid were talking of an old gentleman who had been visiting at the house, and of whom it was known that he did not live with his wife, but kept another woman as his mistress. She does not know how it happened that she suddenly remarked, 'That would be the most awful thing that could happen to me, if I should ever hear that my good

husband also had a mistress.' The next day she received an anonymous letter through the mail which, in a disguised handwriting, carried this very communication which she had conjured up. She concluded—it seems justifiably—that the letter was the handiwork of her malignant chambermaid, for the letter named as the husband's mistress the self-same woman whom the maid persecuted with her hatred. Our patient, in spite of the fact that she immediately saw through the intrigue and had seen enough in her town to know how little credence such cowardly denunciations deserve, was nevertheless at once prostrated by the letter. She became dreadfully excited and promptly sent for her husband in order to heap the bitterest reproaches upon him. Her husband laughingly denied the accusation and did the best that could be done. He called in the family physician, who was as well the doctor in attendance at the factory, and the latter added his efforts to quiet the unhappy woman. Their further procedure was also entirely reasonable. The chambermaid was dismissed, but the pretended rival was not. Since then, the patient claims she has repeatedly so far calmed herself as no longer to believe the contents of the anonymous letter, but this relief was neither thoroughgoing nor lasting. It was enough to hear the name of the young lady spoken or to meet her on the street in order to precipitate a new attack of suspicion, pain and reproach.

"This, now, is the case history of this good woman. It does not need much psychiatric experience to understand that her portrayal of her own case was, if anything, rather too mild in contrast to other nervous patients. The picture, we say, was dissimulated; in reality she had never overcome her belief in the accusation of the anonymous letter. . . .

"The idea with which this woman torments herself cannot in itself be called nonsensical, for it does happen that elderly married men have affairs with young girls. But there is something else about it that is nonsensical and incredible. The patient has no reason beyond the declaration in the anonymous letter to believe that her tender and faithful husband belongs to this sort of married men, otherwise not uncommon. She knows that this letter in itself carries

no proof; she can satisfactorily explain its origin; therefore she ought to be able to persuade herself that she has no reason to be jealous. Indeed she does this, but in spite of it she suffers every bit as much as she would if she acknowledged this jealousy as fully justified. We are agreed to call ideas of this sort, which are inaccessible to arguments based on logic or on facts, *'obsessions.'* Thus the good lady suffers from an *'obsession of jealousy'* that is surely a distinctive characterization for this pathological case. . . .

"May I ask you first to note the apparently insignificant fact that the patient actually provoked the anonymous letter which now supports her delusion. The day before, she announces to the intriguing chambermaid that if her husband were to have an affair with a young girl it would be the worst misfortune that could befall her. By so doing she really gave the maid the idea of sending her the anonymous letter. The obsession thus attains a certain independence from the letter; it existed in the patient beforehand—perhaps as a dread; or was it a wish? Consider, moreover, these additional details yielded by an analysis of only two hours. The patient was indeed most helpful when, after telling her story, she was urged to communicate her further thoughts, ideas and recollections. She declared that nothing came to her mind, that she had already told everything. After two hours the undertaking had really to be given up because she announced that she already felt cured and was sure that the morbid idea would not return. Of course, she said this because of this resistance and her fear of continuing the analysis. In these two hours, however, she had let fall certain remarks which made possible definite interpretation, indeed made it incontestable; and this interpretation throws a clear light on the origin of her obsession of jealousy. Namely, she herself was very much infatuated with a certain young man, the very same son-in-law upon whose urging she had come to consult me professionally. She knew nothing of this infatuation, or at least only a very little. Because of the existing relationship, it was very easy for this infatuation to masquerade under the guise of harmless tenderness. With all our further experience it is not difficult to feel our way toward

an understanding of the psychic life of this honest woman and good mother. Such an infatuation, a monstrous, impossible thing, could not be allowed to become conscious. But it continued to exist and unconsciously exerted a heavy pressure. Something had to happen, some sort of relief had to be found and the mechanism of displacement which so constantly takes part in the origin of obsessional jealousy offered the most immediate mitigation. If not only she, old woman that she was, was in love with a young man but if also her old husband had an affair with a young girl, then she would be freed from the voice of her conscience which accused her of infidelity. The phantasy of her husband's infidelity was thus like a cooling salve on her burning wound. Of her own love she never became conscious, but the reflection of it, which would bring her such advantages, now became compulsive, obsessional and conscious. Naturally all arguments directed against the obsession were of no avail since they were directed only to the reflection, and not to the original force to which it owed its strength and which, unimpeachable, lay buried in the unconscious."[17]

[17] S. Freud, *A General Introduction to Psychoanalysis*, New York: Liveright, 1920, 213-8.

MEANINGS OF UNCONSCIOUS ILLUSTRATED BY THE CASES OF CHAPTER II

Case I — UNRESPONSIVE TO STIMULATION, HYPNOTIZED
Case II — UNRESPONSIVE TO STIMULATION, ASLEEP
Case III — UNRESPONSIVE TO STIMULATION, KNOCKED OUT
Case IV — UNRESPONSIVE TO STIMULATION, DREAMING; also PSYCHOANALYTIC MEANING
Case V — UNRESPONSIVE TO STIMULATION, DAY-DREAMING
Case VI — UNSENSING, SENSORY TRACT INCAPABLE OF CONVEYING STIMULI
Case VII — UNSENSING, SUBLIMINAL STIMULI AFFECTING ORGANISM
Case VIII — UNNOTICING or UNATTENDING
Case IX — INSIGHTLESS
Case X — INSIGHTLESS
Case XI — INSIGHTLESS
Case XII — UNREMEMBERING
Case XIII — UNREMEMBERING
Case XIV — UNABLE TO COMMUNICATE
Case XV — ACTING INVOLUNTARILY
Case XVI — UNABLE TO COMMUNICATE
Case XVII — PSYCHOANALYTIC MEANING

Chapter III

THE APPROACH TO UNCONSCIOUSNESS

The manner of approaching the questions of unconsciousness determines what their answers will be. We cannot proceed to the facts without first considering what are the most suitable methods for studying them.

The findings of both experimental and clinical procedures will be consulted in our discussions in succeeding chapters. Besides the usual problems of methodology which always arise when these techniques are employed in dealing with any question, there are four particular problems that insistently require attention in a treatment of unconsciousness. These are: (*a*) May *unconscious* properly mean more than one thing at the same time? (*b*) May unconsciousness be spoken of as an existing entity? (*c*) What is the validity of introspection as a tool in the study of unconsciousness? And (*d*) how can case histories be collated to give useful insight into the various sorts of unconsciousness?

THE PROPRIETY OF MULTIPLE MEANINGS

The first principle of definition of words is to allow one word only one meaning. Ambiguity may be poetical but it certainly is not scientific. A collective noun, however, may properly stand for more than one thing if it is clear what is the differentiating characteristic of all members of the class to which the collective noun refers. So by *unconscious states* one might refer to a whole series of conditions from absent-minded inattention through sleep to deep anesthesia. Suppose it were generally agreed that *unconsciousness* is the name for all states in which one does not talk or answer questions. Under those conditions the differentiating characteristic of these states is known, and the collective usage is proper. If it is not clear how these "unconscious" states are dissimilar to "conscious"

states like snapping to attention, the criterion for distinguishing must be explained. If no criterion infallibly serves to differentiate "conscious" and "unconscious" states, a distinction cannot be made and the collective usage is of no significance.

By a verbal legerdemain collective nouns, including *the unconscious*, have been juggled to make it seem that propositions have been proved true when they have not. Let us consider an example. It is entirely permissible to employ one frequently used definition of *the unconscious*—the body of ideas which the individual cannot put into words except under specific conditions like hypnosis or psychoanalysis. Then we know accurately which ideas are unconscious and which are not. Or, alternatively, since definitions are arbitrary, one might say that *the unconscious* is made up of all ideas that have been repressed because they were unpleasant. Here, too, the defining characteristic is clear. It is also logically permissible to combine these two definitions and to say that *the unconscious* is made up of ideas which are repressed because they are unpleasant and which also cannot be put into words except under specific conditions like hypnosis or psychoanalysis. It would be unscientific, however, if this last definition were the accepted one, to say that an idea is unconscious if we know only that it is repressed because it is unpleasant but do not know whether it can be put into words only under specific conditions like hypnosis or psychoanalysis.

This is not a fictional example, for Definition 15 of Chapter I states (p. 42) that unconscious (PSYCHOANALYTIC MEANING) processes are (*a*) dynamically repressed away from consciousness, the "organ of perception"; (*b*) available to consciousness only by special techniques such as hypnosis and psychoanalysis; and (*c*) not under voluntary control. The Freudian doctrine is that all unconscious processes have this triple character. It is common practice for psychoanalysts, however, to call an idea or instinct unconscious if it has one of these characteristics, and they do not submit any proof that the other two characteristics are also concurrently present. This procedure is unsatisfactory for one of two reasons: because *unconscious* is used differently from the way it was defined [*i.e.,* to refer to only one of the three characteristics (*a*), (*b*), and (*c*)], or because

the statement that something is unconscious lacks adequate substantiation, if the psychoanalytic meaning is intended. It is an open question whether the Freudian doctrine that the three characteristics (*a*), (*b*), and (*c*) are always found in unconscious (PSYCHOANALYTIC MEANING) processes has ever been defended by an argument not involving this confused procedure.

The noun representing such a compound of several ideas is scientifically entirely respectable, but it is a dangerous lure to such confusion.

THE REIFICATION OF UNCONSCIOUSNESS

An even greater danger in collective nouns is that as they are used they tend gradually to be considered abstract nouns, which frequently have the unhappy characteristic of giving the impression that a fiction really exists.

If the super-ego of Freudian theory, for instance, is defined as the sum of all the prohibitions which society places upon the individual, it is a collective rather than an abstract noun, and is of unquestionable scientific usefulness, being a shorthand representation in a single phrase of many social restrictions. It is in this sense that most clinicians interpret the term, but some improperly go farther and use *super-ego* as an abstract noun, the name for a force or faculty in the personality. Whenever a collective noun representing the sum of a class of demonstrable entities undergoes metamorphosis into an abstract noun representing some power or potentiality without empirical reference, it becomes a myth.

Abstractions are often mothered by necessity without the assistance of any empirical evidence. Whenever an event occurs which cannot be explained, even scientists often succumb to the temptation to explain it by a polysyllabic abstraction, a metaphor, or a fairy tale. LeDantec has observed[1] that, when faced with a natural phenomenon, men frequently invent a "phenomenine" to explain it. In recent years psychologists in general have become increasingly aware of

[1] F. LeDantec, *Le problème de la mort et la conscience universelle*, Paris: Flammarion, 1917, 12.

the dangers of misusing such explanatory abstractions. Ideally such terms might perhaps serve to indicate the presence of an unsolved problem, but actually soon after the words are introduced they usually are employed as if they were names of actual entities of proven existence instead of fictional, metaphorical hypotheses about what might turn out to be the facts.

The "unconscious mind," as it is often interpreted, has become one of the most notorious "phenomenines" used to explain sundry perplexing phenomena of human behavior. It has been observed that:[2]

> The notion of the unconscious is the most prolific metaphor that has as yet arisen in psychology. Nothing could be more stimulating to the imagination than the realm of the unconscious as the *Nibelheim* where the dark current of the repressed libido flows. Is it not from here that the mists rise and becloud the horizon of the conscious? They would indeed shroud it in eternal darkness, if it were not for the salvation by the psycho-analytic Siegfried.

Ogden insisted[3] that such figures of speech are too stimulating to the imagination, and that *the unconscious* and notions connected with it, like the *censor* and the *repressed complex*, are a highly dangerous series of metaphors. He believed that as psychology advances such picturesque language will vanish, as did the metaphor of *force* from all exact formulations of physics.

Though undoubtedly many who use the phrase *the unconscious mind* do not mean by it any mental substance, power, or faculty, it often is carelessly employed with some such meaning. Therefore in order to evade such implications the author in this book will not on his own authority refer to *the unconscious mind* or *the unconscious*, but only to *unconsciousness*.

INTROSPECTION IN THE STUDY OF UNCONSCIOUSNESS

An ideal scientific definition must be either ostensive or made in terms of other ostensively defined words. Webster's dictionary says

[2] H. K. Haeberlin, The concept of the unconscious, *J. Philos., Psychol., and Sci. Methods*, 14, 1917, 544. By permission of the *Journal of Philosophy*.

[3] C. K. Ogden, in a preface to E. v. Hartmann, *Philosophy of the Unconscious*, New York: Harcourt, Brace, 1931, xv.

an ostensive definition is: "A definition accomplished by exhibiting and characterizing the thing to be defined, or by pointing out and characterizing the cases or instances to be covered." Perhaps some fields, such as numismatics, can achieve this ideal, but it is not possible in the psychological sciences.

Nevertheless we are told today by certain academic psychologists, calling themselves operationists and behaviorists, that the only truly scientific psychology is that which can fulfill this ideal. This doctrine has blossomed into an attack upon subjective report of events which are not objectively demonstrable, and at present probably the majority of academic psychologists seriously question the validity of the data of introspection.[4]

With this view psychological clinicians almost unanimously disagree for two reasons: (*a*) because almost all psychotherapy is dependent upon introspections of the patient; and (*b*) because the medical tradition which ever lurks in the background of the psychoanalysts and psychiatrists, though distinguishing when possible between objective signs and the less reliable subjective symptoms, nevertheless has largely depended on those symptoms in diagnosis.

When the subject matter is such that they are available, ostensive definitions, pointing to the object which the word symbolizes, are desirable because they lead to clear common understanding. However it is possible to refer to one's subjective experiences under certain objective conditions, and, if others have had experiences in like circumstances, they may be assumed to be the same. This reference to experience under identical conditions is the introspective analogue of the ostensive definition.

For example, suppose that I say I have a *tingling* feeling when rubbing my fingers over sandpaper. You do the same thing, admit that you have a feeling, and agree to call it *tingling*. Then I say that I have a *tingling* feeling in the back of my neck when parachute-jumping, before pulling the ripcord. This is a meaningful statement; it is public in reference, for others can corroborate it. In the

[4] On the basis of his survey of academic publications, Allport confirms this. *Cf.* G. W. Allport, The psychologist's frame of reference, *Psychol. Bull.*, 37, 1940, 12.

future it may be valuable in explaining something about the nervous system that mediates those feelings.

Again, suppose that individuals who take the drug mescal agree that they see something soon afterward and agree to call it a *kaleidoscope of color.* A *kaleidoscope of color,* then, is what you see when you have taken mescal. This is almost an ostensive definition. Why should not this phrase referring to a subjective event have as much validity as the name for some objective observation which can be pointed to? If 99.3 per cent of all persons who take mescal report that they see the colors first within fifteen minutes, why should this not be a scientific fact? If all these 99.3 per cent report seeing green (defined as the color of grass and leaves) first, while the other 0.7 per cent, who took more than fifteen minutes to see the colors, report violet first, would this not prove something? Procedures which exclude such data are as unsalutary to psychological investigation as are overstrict rules of admission of legal evidence to the obtaining of justice.

What arguments have led many experimental psychologists to deny themselves introspection, the most useful instrument of the clinicians? The first criticism of this technique has been its ineffectiveness in the past. There is no doubt that opposition to introspection developed with the rise of the behaviorism of Watson because of certain battles which had occurred in the traditional school. There were arguments to which there seemed to be no possible answer. An excellent example was the dispute between the Würzburg school, which believed that thinking could be carried on without images, and their many opponents, who held that all thought must be imageful. One group said: "I have images whenever I think, and I never think without them." The Würzburg response was: "I sometimes think without images." These were private matters of the introspectors, and there seemed to be no way of checking either sort of statement.

It was usual for the experiments of the old introspectionists to be done only upon trained subjects, who were unavoidably subject to some influence of suggestion to make their observations in the light

of the doctrines of their school. For example, Perky, who reported in 1910 an experiment from Titchener's laboratory, which was of the introspectionist tradition,[5] believed it might be a defect in her procedure that she used inexperienced subjects. She expected to be criticized for what would today be considered the only carefully controlled procedure, because naïve subjects are less likely to have preconceived ideas of how the experiment should come out.

The decline of introspectionism is thus in large part explained by the overstrong motivation of its subjects to perceive what their theory demanded, and by the consequent anarchy of disagreement. We find today a like situation among many clinicians who employ the introspective technique—for instance, the various cliques of depth psychology. Consequently we are beginning to hear the cry of the newborn clinical behaviorists—give us objective evidence rather than subjective opinion.

The main dissatisfaction with introspection has not been theoretical, although many such arguments have been made against it. The primary criticism has been the great variability of the results of the method. If data of high agreement and small probable error (statistically determined) could be obtained by it, it would be in less disrepute. Indeed there has been little complaint when introspection has been used in simple tasks, like the determination of a limen (the point at which a stimulus is just sensed). However, when it has been employed in more complex tasks, like the description of the subjective experiences in solving a puzzle, it has borne the blame for the large differences between individual subjects. Whenever introspective methods bring agreement (as about the existence of after-images) they are willingly accepted by all, but when they cause dispute (for instance, concerning the hues of colors seen by normal and color-blind subjects) they have often been found wanting and cast aside.

The most insistently presented argument against introspection today, championed by the operationists especially, is that science is a public endeavor and that subjective experience is private, uncon-

[5] C. W. Perky, An experimental study of imagination, *Amer. J. Psychol.*, 21, 1910, 432.

firmable by others, and hence unscientific. As early as 1927 Piéron expounded such an argument:[6]

> Science represents really a body of communicable experience. And, therefore, because of its eminently social character, not only is it unable to use anything of a unique and incommunicable character, but it is not interested in anything which cannot be translated objectively into some perceptible form, which cannot become the object of a collective experience, or constitute the source of social interactions.

It is true, nevertheless, that from the verbal and other behavior of a human being it is possible to deduce accurately facts concerning his private experience. An illustrative parable may be drawn from a mythical automobile whose hood cannot be opened, and whose mechanism therefore cannot be investigated, *i.e.*, is private. The driver knows nothing about the operation of the motor. On the dashboard is an oil-flow gauge. The driver discovers that the rate of flow increases on going up hill; decreases on going down; on a level road varies with the speed of the car; and, after the car has gone a thousand miles without the addition of new oil, is greater when the car is traveling forty miles an hour than it was at first. On this information can be based important deductions about the operation of the "private" machinery. In like manner words used in introspection to describe the privacy of the individual can come to have public significance. Such words are *anger*, *image*, *happy*, and even *conscious* and *unconscious*.

If the observer has had the subjective experience to which a word refers, it will be easier for him to understand the words of subjective report, which some academicians have called "meaningless." Nevertheless by extrapolation from similar events it is possible to have insight into subjective experiences of others which one has never had. Men in general believe women experience pain in childbirth. A man who suggested that this is not true and that women in a great conspiracy of the centuries have fostered this belief to gain sympathy for themselves would be suspect of paranoia. Yet

[6] H. Piéron, La psychologie comme science du comportement et le behaviorisme, *J. de Psychol.*, 24, 1927, 95. (Author's translation.)

there is no objective reference for that pain, and, since most scientists are men, the majority of the scientific world has not experienced it. The acceptance of this pain as a fact, therefore, must be based on two sorts of operationally unscientific evidence: (*a*) analogy—when suffering it women behave comparably to the way the men scientists themselves do when they have pain; or (*b*) introspection—they must put faith in the word of women concerning something which is not open to investigation by the public of men.

In accepting any fact the body of scientists must put faith in one or more persons, and similar faith can lead to the penetration of privacy. Every scientist cannot repeat every experiment, but in most things he must believe that the report of a single experimenter or group of them is true unless he finds grounds for questioning it. Psychology must rest corresponding confidence in introspectors in order to gain the important evidence which can come only by this method. Strictly, if anyone is antisocial, his privacy is his own. Practically, introspective report is a way of penetrating privacy, and it depends on trust in colleagues, which, however, may well be seasoned with skepticism.

Two pitfalls are more likely to trap users of the introspective method than those who employ objective extraspection. (*a*) In introspection the temptation is always greater to use abstract nouns which refer to neither subjective nor objective phenomena than it is in extraspection, where the data are all objectively demonstrable. This does not mean this mistake cannot be made in extraspection. (*b*) What Jowett has called[7] "the amount of good hard lying that goes on in the world" is good reason to doubt introspection, especially of neurotics. Frequently the introspector finds his personal reputation or interest better served by giving one report rather than another. Whether because the opportunity is better or the motivation is greater, there has always been more falsification in introspection than in extraspection. Even in objective experimentation,

[7] *Cf.* G. C. Field, F. Aveling, and J. Laird, Is the conception of the unconscious of value in psychology?, *Mind*, 31, 1922, 422.

however, it is possible for the data to be incorrectly observed, recorded, or interpreted.

Despite the doubts about the validity of introspection, it has not disappeared from experimental psychology. Many recent investigations which have employed it are mentioned in later chapters. Lengthy descriptions of subjective states or of the stream of consciousness have passed out of modern psychology, and this change has been of benefit to the science, for such detailed protocols often contained statements which could not be accurately understood even by other introspectionists because of the uncertainty about what the words meant.[8] However, much precise work has been and is still being done by the method of subjective report. As Pratt has noted,[9] if an impartial jury were to examine the research of two outstanding scientists, of whom one devoted a large part of his time to investigating subjective sensations while the other studied objective reflexes—take Helmholtz and Pavlov—the verdict would have to be that the researches of both men are of admitted excellence and accuracy.

Though neurophysiologists supposedly approximate more closely than psychologists the proprieties of scientific technique, they have been willing to accept introspective evidence without question. In determining the functional localization of the cerebral cortex,[10] for instance, it has been the practice to apply electrodes to small areas of the human brain which have been laid open. The patient is then asked what his sensations are and where they seem to be localized, as in the hand or the foot or the knee. The subjective report of this method has not been questioned, perhaps because there has been good agreement among patients.

Methods have been employed in experimental psychology which enter into the privacy of the individual and are not subject to public verification, but which are not strictly introspective. There has been no hue and cry concerning the respectability of these. Many ques-

[8] For example, *cf.* the introspective description of "pre-sensations" in F. R. Bichowsky, The mechanism of consciousness: pre-sensation, *Amer. J. Psychol.*, 36, 1925, 588-9.

[9] C. C. Pratt, *The Logic of Modern Psychology*, New York: Macmillan, 1939, 50-1.

[10] One example of this is the work of W. Penfield illustrated by Case XV of Chapter II.

tionnaires on personal opinions fall into this category. An example is the recent questionnaire on marital happiness developed by Terman and co-workers.[11] In it elaborate precautions were taken to preserve the subjects' anonymity, so that any checks on whether they were telling the truth, which might have been obtained from even such uncertain indices as hesitation, facial expression, and so forth, were lost. No one can measure what percentage of those answering such questionnaires tell the truth; all that anyone can do is hope that only an insignificant number falsify. Especially if sexual questions are asked, as in the test of marital happiness, this hope is by no means sure. Academic psychologists who condemn subjective report, however, have welcomed such questionnaires, even though they constitute an attempt to penetrate private experience. In this acceptance such psychologists do well, for, like introspection, these questionnaires when guardedly used can yield valuable data.

Our investigation of unconscious behavior must employ introspection, for we shall be faced with problems like the following: (*a*) Most citizens of Japan refuse by sign or word to admit doubt that their Mikado is a god. Their behavior in national crises depends not upon what they say but upon what they really think about this political dogma. It would be useful to the premier and to the social psychologists to know their private opinions. Introspection of some sort—a meaningful word or gesture under peculiarly intimate conditions—would be the only way of determining the real attitude of a Japanese on this matter and hence of predicting his behavior. (*b*) A woman does not speak to a former good friend of hers who passes her in a hotel lobby. It is important in understanding the future behavior of this woman toward the other to find out whether she really saw her and refused to acknowledge the fact, or whether she was unaware of her. This information can be gained only by introspection. Any adequate treatment of the difference between

[11] L. M. Terman *et al.*, *Psychological Factors in Marital Happiness*, New York: McGraw-Hill, 1938.

conscious and unconscious behavior in human beings must rely on introspection to make public the privacies of these human beings.

THE COLLATION OF CASE HISTORIES IN THE STUDY OF UNCONSCIOUSNESS

The collation of case histories is a clinical method which, properly carried out, can confirm theories just as adequately as the experimental method. The laboratory's almost idolatrous regard for the controlled experiment is reflected in the following remark:[12]

> But even if one swallow may mean that summer is on the way, a whole flock of case histories cannot prove a theory. . . . Case histories give valuable hints as to what lines of investigation should be followed, but in themselves they are worthless as far as establishing functional dependence is concerned.

A single case cannot determine a general law, just as a single event in a person's life cannot serve as sufficient basis for prediction of his typical reaction in such situations. The comparative analysis of cases, particularly statistical analysis, however, makes the case-history method practicable. Statistical analysis of many cases has proved of great value in medicine. Studies of a thousand juvenile delinquents by Sheldon Glueck and Eleanor Glueck,[13] showing among other things the effect on delinquency of environment and certain kinds of treatment, are examples of successful application of similar analysis to psychology.

It is easy to interpret improperly the data of case histories. Sometimes the conditions of a single case will be such that it can be interpreted in only one way. Usually, though, several cases must be adduced if a theory is to be proved, and each of them must be carefully controlled. To illustrate this let us consider in some detail Freud's famous case of the forgetting of the proper name *Signor-*

[12] C. C. Pratt, *op. cit.*, 163-4. By permission of The Macmillan Company, publishers.

[13] S. and E. T. Glueck, *One Thousand Juvenile Delinquents,* Cambridge: Harvard University Press, 1934; also S. and E. Glueck, *Juvenile Delinquents Grown Up,* New York: Commonwealth Fund, 1940.

elli.[14] It was his own experience which he reported: "I vainly strove to recall the name of the master who made the imposing frescoes of the 'Last Judgment' in the dome of *Orvieto.* Instead of the lost name—*Signorelli*—two other names of artists—*Botticelli* and *Boltraffio*—obtruded themselves, names which my judgment immediately and definitely rejected as being incorrect." He then proceeded to examine the associations which led him to think of these latter names instead of the proper one. After considering the conversation in which the forgetting occurred, he decided that "this forgetting then made itself known *as a disturbance of the newly emerging theme caused by the theme preceding it.*"

This preceding theme of his discussion had concerned the customs of the Turks living in Bosnia and Herzegovina. He had told his companion that when the Turks learn from their doctor that there is no hope for a patient, they answer: "Sir (Herr), what can I say? I know that if he could be saved, you would save him." Freud then chose from these sentences the words *Bosnia*, *Herzegovina*, and *Herr* as intermediates in the association series between *Signorelli* and *Botticelli* and *Boltraffio.* He did not explain why he chose these words, or why these words were important in his mind rather than other words in the conversation, as for instance the word *Turks.*

Freud went on to say that he assumed that the reason the thoughts concerning the customs of the Turks in Bosnia, etc., disturbed him was that he wanted to tell a second story about the Turks which came to his mind. He had refrained from doing this because of the indelicacy of telling it to a comparative stranger. The doctor who had told Freud the first anecdote about the Turks had informed him that they "value sexual pleasure above all else, and at sexual disturbances merge into an utter despair which strangely contrasts with their resignation at the peril of losing their lives." One of this doctor's patients had once told him: "For you know, Sir (Herr), if that ceases, life no longer has any charm."

[14] S. Freud, *The Basic Writings of Sigmund Freud,* ed. A. A. Brill, New York: Random House, 1938 (*Psychopathology of Everyday Life*), 35 ff. By permission of Random House, Inc.

Freud believed that he kept from relating the second story to his companion not only because of its impropriety, but also because it dealt with the theme of death and sexuality, which he repressed from consciousness.

Recently Freud had had a patient who committed suicide because of an incurable sexual disturbance, and Freud had learned about it while he was in Trafoi. He was certain that he did not consciously recollect this event, which dealt with the death and sexuality theme, while he was carrying on the conversation in which the forgetting of the word *Signorelli* occurred. He stated, however, that "the agreement between *Trafoi* and *Boltraffio* forces me to assume that this reminiscence was at that time brought into activity despite all the intentional deviation of my attention." He wrote, "I can no longer conceive the forgetting of the name Signorelli as an accidental occurrence. I must recognize in this process the influence of a *motive.*" He believed the reason he forgot the word against his will was that he desired to forget the anecdote about the Turks, and the connection it had with the forbidden thoughts on death and sexuality.

Though remarking that at first sight there seems to be no connection between the name "Signorelli" and the repressed content about Herzegovina, Bosnia, and the Turks, which had immediately preceded in the conversation, Freud noted that the *Her* in *Herzegovina* and the *Herr* in the Turk's question to the doctor, "Sir (Herr), what can I say, etc.?," may be translated into Italian by the word *signor.* Moreover the *elli* part of Signorelli was repeated in *Botticelli,* and further *Botticelli* and *Boltraffio* both begin with the same sound as *Bosnia.* Finally, just as *Herr,* the first word in the Turk's statement referred to the repressed thoughts of death and sexuality, so Freud believed that *traffio* in *Boltraffio* referred to Trafoi where he had had the recent unpleasant experience related to death and sexuality.

It seemed to Freud that all this proves that when one is unconscious (UNREMEMBERING) of proper names the forgetting can be explained by repression, of which this case is an example. It must

be admitted that the relationships which he traced are striking, but the situation is entirely uncontrolled. We may ask why this is not a case of "simple forgetting of proper names," a mechanism which Freud recognized as well as repression from consciousness.[15] Is it not satisfactory to explain the names Freud mentioned by saying he tried to fill his memory gap by enumerating Italian painters with names somewhat like the one he had forgotten? And could not the words *Bosnia*, *Herzegovina*, and *Herr* have entered his thoughts because he had used them so recently and they were still running through his head? Why do they need to indicate anything about repression?

Though this situation is not decisive, events could occur which would differentiate convincingly between "simple forgetting" and repression. Suppose, for instance, that the word forgotten was one which, unlike *Signorelli*, would according to the classic laws of memory be remembered because of some special emphasis given it —recency, frequency, intensity, or primacy of use. If then the patient forgets the word when it is connected with one particular sort of situation, the suspicion is aroused that it is being repressed. If several events show he always forgets it in like circumstances and remembers it in all others, the evidence would become convincing. For greater certainty it would be desirable that the relationship between the thoughts the patient represses and the words he forgets be more direct than in the Signorelli case.

The interpretation of the connection by sound which Freud made is undoubtedly clever, and such machinations may well occur in a complicated personality; but, as the Signorelli case was related, the explanation of the events by "simple forgetting" is so much more likely than the one Freud gave that it was unwise for him to depend on this case as a foundation stone in his proof that repression occurs.

A much better controlled case is the following, originally reported by Ferenczi, and summarized by Freud.[16] A woman could not

[15] *Ibid.*, 40.
[16] *Ibid.*, 53.

remember the name of the psychiatrist Jung (meaning Young in English). The following names occurred to her instead: Kl——, Wilde, Nietzsche, and Hauptmann. The psychoanalyst conducting the interview did not tell her the name, but asked her to give free associations to each of these names. In connection with each she made references to youth—"she does not age," "occupied with young people," and "youth." One free association reported—"hat" —seemed to have no connection. Only when, finally, her attention was called to the word "youth" did she realize that she was trying to remember the name Jung.

If, as the report implies, these are the protocols of a single session and detail all the conversation and not selected parts which were chosen by the psychoanalyst because they happen to contain the proper words, this is significant evidence of repression. The controlling factors are: (*a*) the psychoanalyst knew the word which the patient had forgotten; (*b*) every free association except one led directly to the word which she could not remember; (*c*) she actually reported that word without realizing it was the proper one; and (*d*) as soon as the psychoanalyst called to her attention the word she had used, she immediately recognized it, thus showing she really remembered it.

It is difficult to obtain evidence of as complicated a mechanism as repression, but it is a greater problem to understand the motive behind it. On this question the case we have just studied throws no light whatsoever, and Freud spoke without sufficient proof when he said:[17] "It is clear that this lady, who had lost her husband at the age of thirty-nine, and had no prospect of marrying a second time, had cause enough to avoid reminiscences recalling youth or old age." It might well be possible to find substantiation for such a deduction in the life of the woman, but there is no hint of it in the data presented to us.

The case history method can be as accurate a way of studying phenomena of unconsciousness, like repression, as is experimentation. Often a single case can give more fundamental understanding

[17] *Ibid.* By permission of Random House, Inc.

of such processes than any artificially arranged experiment. The same careful critique must be applied to it, however, as the laboratory techniques have undergone.

CONCLUSIONS

Four principles of procedure have been outlined in this chapter which will be adhered to in the following pages. (*a*) Whether *unconscious* bears a single or a compound meaning, the sense in which it is used must always be specified, and it must be demonstrable that the criteria for that sort of unconsciousness are fulfilled. It is unfair to change meanings of the word in midstream without due warning. (*b*) The fact that one can speak of unconsciousness does not mean that "the unconscious" or "the unconscious mind" is an existing entity. To avoid such reification we shall not use these last two controversial phrases. (*c*) Introspective findings may be as valid as those of objective observation, and both sorts are essential to a full knowledge of unconscious processes. And (*d*) the study of numerous controlled case histories can lead to as correct and satisfactory understanding of unconsciousness as can experimentation.

CHAPTER IV

NEUROPHYSIOLOGY OF UNCONSCIOUSNESS

Often debated but still ground for disagreement is the problem of whether unconscious processes are "merely the physiological operation of the nervous system," or whether there are "actual mental images" which are for the time being outside the experience of the individual. Psychoanalysts and depth psychologists in general have consistently maintained that unconscious mental processes and physiological functions must not be equated.[1] These clinicians find strange bedfellows in a group of experimentalists who believe that the present knowledge of neurophysiology does not justify attempts to explain psychological processes in neural terms. This latter group is convinced that all psychological activities are mediated by the nervous system, but they hold that the psychological and physiological methods should be kept separate, and for this reason would not equate unconscious processes with functions of the nervous system. McGeoch spoke for them when he said:[2] "The wisdom of foregoing the speculative delights of the nervous system for the world of experiment . . . is at least defensible."

A large group of psychologists, however, insists that conscious and unconscious processes may be significantly interpreted in terms of our present understanding of the operation of the nervous system. It has frequently been suggested that one part of the nervous system mediates consciousness while another or others mediate unconscious functions. One of the best known neural dichotomies of this sort is that between the cerebral cortex, controlling consciousness, and the thalamus, mediating unconscious (UNLEARNED or INHERITED) processes.[3]

[1] *E.g.*, S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill, New York: Random House (*The Interpretation of Dreams*), 541.

[2] J. A. McGeoch, Forgetting and the law of disuse, *Psychol. Rev.*, 39, 1932, 369.

[3] *Cf.* J. Jastrow, *The House that Freud Built*, New York: Greenberg, 1932, 164.

It has been said[4] that as psychology progresses its explanations must be fitted more and more into a framework of physiology. Let us see what evidence there is which can be the basis for developing a physiological interpretation of the distinction between conscious and unconscious functions.

CONDITIONING AND CONSCIOUSNESS

Three of the definitions of *unconscious* in Chapter I have to do with conditioned responses. It was noted (pp. 27-28) that an individual is often said to be unconscious (UNDISCRIMINATING) when he cannot be conditioned, for he does not learn to respond to the various aspects of his environment in different ways. One of the contributing arguments for this position has been based upon Pavlov's contention that the cortex is necessary for conditioning. Proper functioning of the cortex has been thought by many to be essential for consciousness. By a loose logic consciousness and conditioned responses have been therefore connected.

Since conditioned responses are a kind of memory, a person in which they could not be formed would be unconscious also in another sense (UNREMEMBERING).

A third, less important use of *unconscious* (CONDITIONED) is contradictory to the above two meanings, which make the unconditioned unconscious. This is a case of out-and-out disagreement on the subject of unconsciousness which has resulted from different theoretical presuppositions. Some have held the assumption that mental processes (which to them means consciousness) cannot be equated with neural functions. Thence they have argued[5] that since conditioned responses have often been given a purely neurophysiological explanation, they must be unconscious (NOT MENTAL). This line of reasoning usually is illustrated by reference to automatic actions, like kissing one's wife goodbye in the morning, which has been conditioned to the spatiotemporal pattern of wife and front

[4] C. C. Pratt, *The Logic of Modern Psychology*, New York: Macmillan, 1939, 131-2.

[5] *E.g.*, G. Murphy, L. B. Murphy, and T. M. Newcomb, *Experimental Social Psychology*, New York: Harper, rev. ed., 1937, 181.

door at 8:11 in the morning. They are conditioned responses unaccompanied by subjective awareness of them, and therefore, runs the argument, merely physiological, unconscious. In Chapter VII this general position is considered and an analysis is made of the bifurcation of mental and physical implied in this interpretation of automatic actions.

Is the cerebral cortex necessary for the development of conditioned responses? The answer to this question is most important in determining the localization in the nervous system of conscious (DISCRIMINATING or REMEMBERED) processes, because three senses of *conscious* and *unconscious* have to do with conditioning and because many who have been influenced by Pavlov consider that consciousness is the same as conditioned responses. The following statement by Pavlov orients us in his approach to the matter:[6]

> *Consciousness* appears as a nervous activity of a certain part of the cerebral hemispheres, possessing at the given moment under the present conditions a certain optimal (probably moderate) excitability. . . . In the region of the brain where there is optimal excitability, new conditioned reflexes are easily formed, and differentiation is successfully developed. That area is at the given moment the creative part of the hemispheres. The outlying parts with their decreased irritability are incapable of such performance, and their functions at best concern the previously elaborated reflexes arising in a stereotyped manner in the presence of the corresponding stimuli. The activity of these areas is subjectively described as unconscious, automatic. The area of optimal activity is, of course, not fixed; on the contrary it is perpetually migrating over the whole extent of the hemispheres. . . .
>
> If we could look through the skull into the brain of a consciously thinking person, and if the place of optimal excitability were luminous, then we should see playing over the cerebral surface, a bright spot with fantastic, waving borders constantly fluctuating in size and form, surrounded by a darkness more or less deep, covering the rest of the hemispheres.

This statement shows that Pavlov specifically equated the forma-

[6] I. P. Pavlov, *Lectures on Conditioned Reflexes*, trans. W. H. Gantt, New York: International, 1928, 221-2. By permission of International Publishers.

tion of conditioned responses with consciousness. From this point of view, if the cerebral hemispheres are not excited so that conditioned responses are being formed or can easily be formed, the individual is unconscious (UNAWARE OF DISCRIMINATION). Also, as we have mentioned, Pavlov concluded from experiments,[7] though "with the utmost reserve," that the cortex is essential for forming conditioned responses. His followers have by no means always maintained the reserve of their leader in preaching this doctrine. Certainly then, since he considered that conditioned responses which have already been formed may function even if the individual is unconscious (UNAWARE OF DISCRIMINATION) of them, Pavlov would have to maintain *a fortiori* that no other parts of the nervous system are capable of mediating consciousness. The functions of most of the cerebral cortex at any one time and of all the rest of the nervous system at all times are thus unconscious (UNAVAILABLE TO AWARENESS), as he interpreted the facts.

The following is the chief evidence that supports Pavlov's belief that conditioned responses cannot be formed outside the cortex.

(*a*) A large series of experiments by workers of Pavlov's school was interpreted[8] to show that if the cortical projection area of one of the senses is ablated, conditioned responses dependent on that sense disappear and cannot be made to reappear. Let us consider, for example, a dog which has been conditioned to salivate to a green light (but not to a red light) by the method of feeding him meat thirty seconds after each time the green light is flashed on, but never when the red light shines. Suppose now that we cut out this animal's cortical projection areas for vision, which are in the occipital lobes. After this ablation the dog is still able to distinguish light from dark and to avoid objects which obstruct his path, but he cannot differentiate colors.[9] The researches of Pavlov's students showed that conditioned salivation to the green light in this dog will also disappear and cannot be redeveloped. Normal function of

[7] I. P. Pavlov, *Conditioned Reflexes,* trans. G. V. Anrep, Oxford: Oxford University Press, 1927, 330.

[8] I. P. Pavlov, *Lectures on Conditioned Reflexes,* 193-204.

the cortical projection area for whatever particular sense is involved in the conditioned response was, on account of these findings, presumed to be essential for that response to occur.

(*b*) Work by Allen[10] has led to the conclusion that the integrity of the excitable cortex in at least one hemisphere is required to establish a constant and specific olfactory conditioned response, but this research did not eliminate the thalamus as a possible center for a low order of olfactory conditioning.

(*c*) Zeliony investigated the effect of total decerebration on conditioned responses. In an article published in 1929,[11] dealing with research performed between 1910 and 1916, he reported that he was unable to establish in two decerebrate dogs any reactions which he could be certain were conditioned responses. Although he attempted in one animal for nearly two years and for seven hundred trials to condition salivation to sound, he was unsuccessful.

Despite all these findings, so much evidence has accumulated opposing Pavlov's position that now it is practically certain that the cortex is not needed for conditioning.

(*a*) Foley has reasoned[12] that the cortex is not necessary because embryonic organisms without mature neo-cortices have been conditioned. He asked, moreover, why, if conditioning is a function of the cortex, it is possible to develop conditioned reflexes in lower animals that possess no cortex.[13] The first of these arguments cannot be put aside easily, although it loses a good deal of its cogency because of the difficulty of proving when the embryonic neo-cortex becomes functionally mature. The second argument is invalid because it takes no account of the facts of encephalization—that in the phylogenetic development of the nervous system many func-

[10] W. F. Allen, Relationship of the conditioned olfactory-foreleg response to the motor centers of the brain, *Amer. J. Physiol.*, 121, 1938, 657-68.

[11] G. Zeliony, Effets de l'ablation des hémisphères cérébraux, *Rev. de Méd.*, 46, 1929, 191-214.

[12] J. P. Foley, Jr., The cortical interpretation of conditioning, *J. Gen. Psychol.*, 9, 1933, 228-34.

[13] This sort of conditioning has been demonstrated by J. Ten Cate, in Konnen die bedingten Reaktionen sich auch ausserhalb der Grosshirnrinde bilden?, *Arch. Néerl. Physiol.*, 19, 1934, 469-80.

tions have shifted from the more primitive centers in the lower animals to newer and higher centers in the higher animals.

(*b*) In 1931, Gemelli and Pastori[14] reported experiments in which hens were taught to peck grain from a box of a certain color. After ablation of at least part of the cortical tissue, these animals still showed a preference for that color, although their accomplishment was inferior to their preoperative achievement. This result has been interpreted as persistence of conditioning after decortication, but the work is of little value because of the uncertainty about the amount of cortex extirpated.

(*c*) Zeliony reversed his opinion that the cortex is necessary for conditioning after work which he did with Poltyrev in 1929.[15] They succeeded in developing what they considered conditioning to sound and discrimination reactions in a dog having most of its cortex ablated. Exactly how much had been removed, however, is uncertain.

(*d*) In careful investigations Culler, Mettler, and co-workers[16] have repeatedly succeeded in conditioning dogs in which only a few shreds of cortex, most probably nonfunctional, were present. Shurrager and Culler[17] have also conditioned dogs with only the spinal cord functioning. The basic findings of this work seem conclusively demonstrated.

(*e*) Ten Cate[18] has also obtained subcortical conditioning in high mammals.

In the light of all this successful conditioning it may be said that consciousness, as defined by the criterion of conditionability, is not

[14] A. Gemelli and G. Pastori, Sulla rieducabilità di animali scerebrati, *Pubbl. Univ. Cattol. d. S. Cuore*, 6, 1931, 565-77 (not viewed).

[15] S. S. Poltyrev and G. P. Zeliony, Der Hund ohne Grosshirn, *Amer. J. Physiol.*, 90, 1929, 475-6.

[16] E. Culler and F. A. Mettler, Conditioned behavior in a decorticate dog, *J. Comp. Psychol.*, 18, 1934, 291-303. Also E. Girden, F. A. Mettler, G. Finch, and E. Culler, Conditioned responses in a decorticate dog to acoustic, thermal, and tactile stimulation, *J. Comp. Psychol.*, 21, 1936, 367-85.

[17] P. S. Shurrager and E. A. Culler, Phenomena allied to conditioning in the spinal dog, *Amer. J. Physiol.*, 123, 1938, 186-7.

[18] J. Ten Cate, *loc. cit.*; also Akustische und optische Reaktionen der Katzen nach teilweisen und totalen Exstirpationen des Neopalliums, *Arch. Néerl. Physiol.*, 19, 1934, 191-264.

necessarily mediated by the cortex. There are, moreover, some hints, not yet conclusive, that it may be possible to develop cortical and subcortical conditioning in the same animal. Girden and Culler found[19] that, despite what is generally regarded as complete loss of function resulting from the administration of curare, an isolated leg muscle of a dog responds with a slight twitch to a shock delivered to that limb. Such responses can be conditioned to a bell, but, after the effects of the drug have worn off, the conditioning is found to have disappeared. It reappears if the animal is again curarized. A conditioned response set up in the normal state, on the other hand, disappears after curarization, but reappears when the effect of the drug wears off.

On the basis of data which indicate, though not conclusively, that curare depresses cortical activity, Girden and Culler developed[20] an hypothesis which they thought best explained their findings. They argued that since the function of the cortex of an animal under curare appears to be depressed, any conditioning which the animal shows must be subcortical. When, after the effects of the curare wear off, the cortex again is dominant, the subcortical conditioning is inhibited. Because conditioning in a normal animal is mainly cortical, such conditioned responses disappear under curare, for it inhibits cortical activity. This hypothesis springs from few facts, although it explains what facts there are adequately. It indicates that a single animal can develop several levels of discrimination, conditioning, or, from Pavlov's point of view, consciousness.

Since it has been demonstrated that certain anesthetic drugs depress or inhibit cortical action, the effect of these agents upon conditioning is a question directly related to the issues we are considering. Several investigators[21] have studied experimentally the effect

[19] E. Girden and E. Culler, Conditioned responses in curarized striate muscle in dogs, *J. Comp. Psychol.*, 23, 1937, 261-74. *Cf.* also E. Culler, J. D. Coakley, P. S. Shurrager, H. W Ades, Differential effects of curare upon higher and lower levels of the central nervous system, *Amer. J. Psychol.*, 52, 1939, 266-73.

[20] E. Girden and E. Culler, *op. cit.*, 273-4.

[21] I. V. Zavadski, *Trans. Soc. Russian Physicians*, St. Petersburg, 1908. P. M. Nikiforovski, *Thesis*, St. Petersburg, 1910, 131-69. L. A. Andreyev, The effect of single and repeated doses of alcohol on conditioned reflexes in the dog, *Arch. Internat. de Pharmacodyn. et Therap.*, 48, 1934, 117-28. H. G. Wolff and W. H. Gantt, Caffeine sodiobenzoate, sodium iso-amylethyl barbiturate, sodium bromide and chloral hydrate effect on the highest

of various drugs on conditioning which has already been set up, and have found that several of them inhibit or disinhibit conditioned responses already developed. The first attempt to condition animals actually under anesthesia, however, was made by Settlage in 1936.[22] He conditioned flexion of the hind leg (caused by electric shock) to sound in twelve cats which were in a light state of depression following upon injections of the barbiturate, sodium amytal. Though the conditioning could be developed at this level, the responses could not be elicited until the effect of the drug had worn off. The lowest level of anesthesia at which Settlage conditioned his cats was apparently not especially deep, for he said[23] that the animals at that level would seek food and eat it, and would spontaneously walk about. They seemed, however, to lie down and assume an attitude of sleep more readily than cats usually do.

Cats have been conditioned by Sterling and the author[24] at a considerably deeper level, using sodium evipal anesthesia. In this work, too, it was impossible to get a response while the drug had effect, but the response developed after the anesthesia was over. The cats during the conditioning were unable to stand or walk, and were at so deep a level that in some cases the normal flexion of the leg to a painful stimulus such as a pinch of the paw was entirely gone.

It is interesting to consider whether the cats in these last two experiments, being *unconscious* from the point of view of Definition 2 (ANESTHETIZED, UNRESPONSIVE TO STIMULATION), were, functionally speaking, temporarily decorticate. Beecher and McDonough's study of electrical waves from the cortex during anesthesia[25] indicated

integrative functions, *Arch. Neurol. and Psychiat.*, 33, 1933, 1030-57. W. H. Gantt, Effect of alcohol on cortical and subcortical activity measured by the conditioned reflex method, *Bull. Johns Hopkins Hosp.*, 56, 1935, 61-83 And S. Dworkin, W. Bourne, and B. B. Raginsky, Changes in conditioned responses brought about by anesthetics and sedatives, *Can. Med. Assoc. J.*, 37, 1937, 136-9.

[22] T. Settlage, The effect of sodium amytal on the formation and elicitation of conditioned reflexes, *J. Comp. Psychol.*, 22, 1936, 339-43.

[23] *Ibid.*, 342.

[24] K. Sterling and J. G. Miller, Conditioning under anesthesia, *Amer. J. Psychol.*, 54, 1941, 92-101.

[25] H. K. Beecher and E. K. McDonough, Cortical action potentials during anesthesia, *J. Neurophysiol.*, 2, 1939, 289-307.

that these animals most likely were not temporarily decorticate. These workers found that, though under deep evipal anesthesia stimuli do not affect cortical potentials, nevertheless these voltages, which represent some sort of cortical action, are still there. The specific conditioning of the eyelids in Sterling and the author's anesthetized cats was not like the diffuse responses of Culler and Mettler's[26] decorticate dog. This fact proves further that, though the animals were under anesthesia, they were not functionally decorticate. We see therefore that animals can be conditioned when they are anesthetized as well as when their cortices are extirpated, but that these two conditions are not functionally equivalent.

In summary, the experimental data dealing with conditioning and consciousness show:

(*a*) That conditioning can take place in other parts of the nervous system than the cortex—even in the spinal cord;

(*b*) That, if conditioned responses are evidences of consciousness, then consciousness is not mediated solely by the cortex;

(*c*) That it may be possible to develop conditioning (consciousness from Pavlov's point of view) at more than one level of the nervous system at the same time;

(*d*) And that the two senses of *unconscious,* UNDISCRIMINATING or UNREMEMBERING, *i.e.,* not showing conditioned responses, and ANESTHETIZED, UNRESPONSIVE TO STIMULATION, are conflicting, for animals are conditionable even when anesthetized.

THE CEREBRUM AND THE LOCALIZATION OF CONSCIOUSNESS

In our consideration of conditioning we have entered well into the problem of the localization in the nervous system of conscious and unconscious (ANY MEANING) processes. There are two general positions taken on this question: (*a*) that consciousness is mediated by some part of the central nervous system (the brain and the spinal cord) and (*b*) that it is localized somewhere in the peripheral nerves and other organs of the body. At present the former theory

[26] E. Culler and F. A. Mettler, *loc. cit.*

is far more widely held, though often for reasons not adequately grounded in evidence.[27] There are good bases, however, for the contention that consciousness is connected with the cortex.

(*a*) There is, for example, such research on electrical stimulation of the cortex in conscious patients as was carried out by Cushing.[28] These patients indicate by verbal report consciousness of a number of kinds of sensations referred to various parts of the body whenever the postcentral area of the cortex is stimulated. In such work it is difficult to exclude the possibility that the neurone stimulated may convey impulses to other centers which may be the real seats of consciousness rather than the cortex.

(*b*) Loucks[29] was able to condition salivary and muscular responses in dogs to electrical stimulation of the cortical sensory areas. From this result one might reason that sensory consciousness is in the cortex, but, as in Cushing's work, one cannot control spread of the impulses to other regions of the brain.

(*c*) Studies of electroencephalograms and cortical potentials also bear on the problem in hand. Gibbs and Davis,[30] for instance, examined the brain waves in unconsciousness (UNRESPONSIVE TO STIMULATION) from sleep, from breathing nitrogen, from overbreathing oxygen, and in epilepsy, and discovered that at the onset of these states there is a decrease in frequency of certain waves and a change in their amplitude. Also studying brain waves and comparing them with subjects' introspections, Travis[31] learned that

[27] *E.g.*, the insistence of O. L. Reiser, in Evolution, consciousness and electricity, *Psyche*, 12, 1931, 75, that consciousness is in the brain; the assumption of J. Agerberg, in Consciousness as a physiological function, *Acta Psychiat. et Neurol.*, 4, 1929, 104, that the cerebral cortex is the organ of consciousness; and the suggestion of J. H. Jackson, in The Croonian lectures on evolution and dissolution of the nervous system, Lecture III, *Brit. Med. J.*, 1884 (I), 703-7, that the frontal and prefrontal regions may serve that function.

[28] H. Cushing, A note upon the faradic stimulation of the postcentral gyrus in conscious patients, *Brain*, 32, 1909, 44-53.

[29] R. B. Loucks, The conditioning of salivary and striped muscle responses to faradization of cortical sensory elements, and the action of sleep upon such mechanisms, *Psychol. Bull.*, 34, 1937, 743-4.

[30] F. A. Gibbs and H. Davis, Changes in the human electroencephalogram associated with loss of consciousness, *Amer. J. Physiol.*, 113, 1935, 49-50.

[31] L. E. Travis, Brain potentials and the temporal course of consciousness, *J. Exper. Psychol.*, 21, 1937, 302-9.

large brain waves occur when the "mind wanders," while irregular small ones are seen during high specificity of thought. The flaw in the electroencephalographic evidence for the relation of the cortex to consciousness is that it is uncertain that the brain waves originate wholly in the cortex.

(*d*) On the basis of histological and anatomical evidence and his own research on strychninization of the cortex, Dusser de Barenne[32] has stated that the "ultimate differentiation within sensation" (which is as close as a physiologist will approach saying "consciousness") is furnished by the cortex and thalamus operating in close interrelationship.

Other investigators have placed the seat of consciousness elsewhere in the cerebrum besides the cortex. Dandy said[33] that an area specifically concerned with consciousness is to be found in the part of the cerebrum supplied by the left anterior cerebral artery. Though the data from his operations together with clinical and pathological findings were sufficient only to hint that this theory might be tenable,[34] he found repeatedly that the left anterior cerebral artery differs from other vessels supplying the brain in that, once it is ligated, consciousness is immediately and irremediably lost. Along with others who localize consciousness or any other function to part of the cerebrum, Dandy must take account of Lashley's experimental proof[35] that, at least in lower animals, there is no strict correspondence in the cerebrum of structure and function, but that in many ways the cerebrum acts as an organized whole.

THE INTERBRAIN AND THE LOCALIZATION OF CONSCIOUSNESS

Several attempts have been made to locate consciousness in tracts of neurones passing up to the cortex from lower levels of the nervous

[32] J. G. Dusser de Barenne, Central levels of sensory integration, *Arch. Neurol. and Psychiat.*, 34, 1935, 774.

[33] W. E. Dandy, Changes in our conception of localization of certain functions in the brain, *Amer. J. Physiol.*, 93, 1930, 643.

[34] *Cf.* R. R. Grinker, *Neurology*, Springfield, Ill : Thomas, 1934, 573.

[35] K. S. Lashley, Basic neural mechanisms in behavior, *Psychol. Rev.*, 37, 1930, 1-24.

system. McDowall said[36] consciousness is "the appreciation of the stream of afferent impulses which pass to the cerebrum"; Carus[37] chose the left striate body as its localization; Dancz[38] referred to one type of consciousness localized in the cortex and to another "vegetative consciousness" in the thalamus; and Campion and Smith[39] also recognized the cortex and thalamus as centers for two separate sorts of consciousness. The data supporting these theories are suggestive rather than convincing.

Penfield located[40] conscious processes in the general region of the hypothalamus near the third ventricle, although he believed also that the frontal cortex plays a secondary role in mediating consciousness. As evidence supporting the hypothalamic localization he marshaled clinical findings on epilepsy. He accepted, first of all, Jackson's explanation of epilepsy,[41] that there is a discharge in the gray matter beginning at one point and radiating outward from that. According to this theory, whether an epileptic patient shows motor or sensory symptoms or signs or becomes unconscious (FAINTING, UNRESPONSIVE TO STIMULATION) depends upon what region of the cortex the discharge reaches. Thus, when he becomes unconscious (FAINTING, UNRESPONSIVE TO STIMULATION), the process has spread to the seat of consciousness. Penfield found[42] that usually the signs and symptoms immediately preceding loss of consciousness in epileptic seizures are autonomic (*e.g.*, blanching), and he assumed that these are caused by the wave of stimulation reaching autonomic functions in the hypothalamus near the third ventricle. Consciousness must be located close to this point, he argued, for it is the next thing affected. In order further to corroborate the hypothalamic localization, he noted cases in which a lesion in that gen-

[36] R. J. S. McDowall, *Clinical Physiology*, New York: Appleton, 1927, 5. By permission of the author and of D. Appleton-Century Company.

[37] P. Carus, The seat of consciousness, *J. Comp. Neurol.*, 4, 1894, 176-92.

[38] M. C. Dancz, Über die Lokalisation der Bewusstseinsstorungen, *Deutsche Ztschr. f. Nervenh.*, 134, 1934, 217-30.

[39] G. C. Campion and G. E. Smith, *The Neural Basis of Thought*, New York: Harcourt, Brace, 1934, 88.

[40] W. Penfield, The cerebral cortex in man, I, *Arch. Neurol. and Psychiat.*, 40, 1938, 436.

[41] *Cf. ibid.*, 429.

[42] *Ibid.*, 436.

eral region caused long-continued unconsciousness, and finally he referred to Hess's demonstration[43] that this part of the brain is related to sleep.

Penfield considered[44] that the integrity of the frontal cortex is not essential to the existence of consciousness, although it bears some relation to it. He based this belief on the fact that radical extirpation of the frontal lobe does not even temporarily impair consciousness (as indicated, apparently, by the ability to verbalize). He concluded[45] that the hypothalamic localization does not mean that other parts of the brain are not related to consciousness. On the contrary, he thought that all parts of the brain may be involved normally, although the basic localization is probably in the interbrain.

On the basis of many clinical case histories, including patients with sleeping sickness, as well as certain experimentation, both Haškovec[46] and Lhermitte[47] decided that lesions of the third ventricle and surrounding regions are related to loss of consciousness. This area is practically the same as that which Penfield chose.

Findings of other workers also point to the hypothalamus as the seat of consciousness. Dubois and a succession of workers since 1901[48] have believed that there is a hypothalamic "awake" center, and that lesions or stimulation there can make one either continuously unconscious (ASLEEP, COMATOSE, UNRESPONSIVE TO STIMULATION) or continually awake.

Various writers[49] have also suggested that the thalamic-hypothalamic region is the seat of unconscious (PSYCHOANALYTIC MEANING) processes. This suggestion is based upon the Freudian belief that certain primitive instinctual passions are the major unconscious

[43] W. R. Hess, The autonomic nervous system (concluded), Lancet, 223, 1932, 1259-61.
[44] W. Penfield, *op. cit.*, 436.
[45] *Ibid.*, 442.
[46] L. Haškovec, Nouvelles contributions au psychisme sous-cortical, *Encéphale*, 24, 1929, 846-55.
[47] J. Lhermitte, La régulation des fonctions corticales, *Encéphale*, 27, 1932, 757-85.
[48] *Cf.* F. Harrison, The hypothalamus and sleep, in *The Hypothalamus, Res. Publ. Ass. Nerv. Ment. Dis.*, 20, 1940, 652-3.
[49] *E.g.*, J. Jastrow, *loc. cit.*

(PSYCHOANALYTIC MEANING) functions. Cannon[50] in classical studies has demonstrated the important role of the thalamic-hypothalamic area in emotion. Bard[51] corroborated Cannon, finding that when all the brain craniad to this region (*i.e.*, the middle of the interbrain and the ventral part of the thalamus) is removed, cats easily exhibit sham rage. Clinical findings of Head[52] also bear out Cannon's theory. From these researches some depth psychologists have argued that the unconscious (PSYCHOANALYTIC MEANING) passions are mediated by the hypothalamus, and that the inhibiting cortical processes are conscious.

Most theories that localize consciousness in the cortex and unconsciousness (ANY MEANING) in the thalamic-hypothalamic region rest either on questionable conclusions drawn from good experiments like Cannon's and Bard's, or on logical conclusions resting on uncertain experimental bases.[53] Such an unconvincing argument is Calwell's deduction[54] from the difference between the brains of apes and of human beings. He said that apes are not "self-conscious" or are only feebly so, and cannot say "I think, therefore I exist." They appear, however, to have the passions and primitive characters which Freudians count part of the unconscious (PSYCHOANALYTIC MEANING) processes of man. He believed it follows from these facts that the primitive brain common to man and ape is the seat of unconsciousness (PSYCHOANALYTIC MEANING), and the higher association centers peculiar to man mediate his peculiar "self-consciousness." This argument assumes without warrant that a given neural structure in the ape has the same function that it has in man.

[50] W. B. Cannon, The James-Lange theory of emotions: a critical examination and an alternative theory, *Amer. J. Psychol.*, 39, 1927, 106-24; also, Again the James-Lange and the thalamic theories of emotion, *Psychol. Rev.*, 38, 1931, 281-95.

[51] P. Bard, A diencephalic mechanism for the expression of rage with special reference to the sympathetic nervous system, *Amer. J. Physiol.*, 84, 1928, 490-515.

[52] H. Head, *Studies in Neurology*, London: Frowde and Hadder and Stoughton, 1920, II, 620-2.

[53] *E.g.*, W. H. R. Rivers and H. Head, A human experiment in nerve division, *Brain*, 31, 1908, 323-450. An extensive reinvestigation and critique of this problem is E. G. Boring, Cutaneous sensation after nerve-division, *Quart. J. Exper. Physiol.*, 10, 1916, 1-95.

[54] W. Calwell, The unconscious: a suggestion, *J. Ment. Sci.*, 71, 1925, 97-100.

Finally there are the data on localization which led Alford[55] to conclude that "an area somewhere in the left base [of the brain] is concerned with the maintenance of awareness." He stated specifically[56] that his criterion of unconsciousness was the one we considered in Chapter I (p. 24) under Definition 2 (UNRESPONSIVE TO STIMULATION). His important arguments were:

(*a*) In right-handed people right frontal brain tumors, right occipital brain tumors, extirpation of the entire right cortex down to the basal ganglia, and tying the right anterior cerebral artery leave the patient with apparently normal consciousness. In right-handed patients, moreover, of thirty-three cases of left hemiplegia (most probably involving the right base) none showed confusion of consciousness, but of fifty-five cases of right hemiplegia (most probably involving the left base) twenty-seven were more or less confused. So in right-handed people the right cortex and base appear not to be concerned with consciousness.

(*b*) Tumors of the left cerebrum in the frontal, occipital, and parietal regions and ablations of the left frontal, occipital, and temporal lobes give no disturbance of consciousness. Lesions in the speech zone of the left cortex appear not to affect consciousness in Alford's sense. This eliminates most of the left cortex as a possible seat of consciousness.

(*c*) Only the left base remains, and proof has already been presented in (*a*) that confusion of consciousness frequently arises from lesions here.

The statistics cited by Alford are interesting and suggestive, but his findings, like most clinical data, have certain necessary limitations. Two major questions which they raise are: Why did not all the cases of right hemiplegia show loss of consciousness? And which of the regions where lesions can cause right hemiplegia was affected in those cases that did lose consciousness? Lashley's proof[57] that one part of the cortex can assume the function of another, at least

[55] L. B. Alford, Localization of consciousness and emotion, *Amer. J. Psychiat.*, 12, 1933, 799.
[56] *Ibid.*, 790.
[57] K. S. Lashley, *loc. cit.*

in lower animals, vitiates Alford's reasoning that if one section is removed without loss of consciousness it cannot be the seat of awareness.

THE PERIPHERAL LOCALIZATION OF CONSCIOUSNESS

We see from all this research that reasons have been suggested for localizing consciousness, in various senses of the term, in many parts of the central nervous system. What are the answers from proponents of peripheral theories? They come mainly from experimental psychologists, for the peripheral theories are usually theirs rather than the physiologists'. For psychologists it is the response to a stimulus that must be the index of consciousness, and it is natural therefore that they should localize consciousness as near to the effector of the response as possible. As these experimentalists first posed the problem half a century ago, it was: Can one think (*i.e.*, be conscious) without some muscular activity? The body of experiments by no means answers this conclusively. Because of the psychologists' notorious disregard for neurophysiology, much of this writing makes man appear to be a robot of reacting muscles whose neural attachments are of small importance.[58]

Stricker[59] thought that one cannot have an idea of a song without feeling some muscular movement. He asked a hundred people if they spoke to themselves while thinking or silently reciting a poem, and they all said they did. Paulhan[60] opposed Stricker, for he found that he could say one vowel while thinking of another. Hansen and Lehmann[61] discovered that when a subject concentrates, unintentional audible whispering nearly always occurs; Courten[62] found that when material is read silently there is always some motion of

[58] *Cf.*, *e.g.*, C. H. Woolbert, A behavioristic account of sleep, *Psychol. Rev.*, 27, 1920, 420-8.

[59] S. Stricker, Studien uber die Sprachvorstellungen, Vienna, 1880.

[60] F. Paulhan, Le langage intérieur et la pensée, *Rev. Philosophique*, 21, 1886, 26-58.

[61] F. C. C. Hansen and A. Lehmann, Ueber unwillkurliches Flustern, *Philos. Studien* (Wundt), 11, 1895, 471-530.

[62] H. C. Courten, Involuntary movements of the tongue, *Stud. Yale Psychol. Lab.*, 10, 1902, 93-5.

the tongue; and Wyczoikowska[63] determined that all thought produces some movement of the tongue. On the other hand, Curtis,[64] Reed,[65] Pintner,[66] Clark,[67] and Thorson[68] reported work which seems to show that muscular movement may, but does not always, accompany thought. All these researches were done before 1926, and none succeeded in refining measurements of small muscular movements enough to be conclusive.[69] If only for this technical fault, they must be discounted.

More recently adequate procedures have produced significant results. Freeman has observed[70] activity of leg, arm, and jaw muscles during mental work, and Max[71] found that the muscular action currents which exist in the fingers and arms of deaf-mutes (for these are their organs of speech), during waking as well as during dreaming sleep, become minimal in dreamless sleep. From this last work it might be deduced that the deaf think with the fingers with which they do their conversing.

These two researches are the mainstays of peripheral or motor theories of consciousness. Max wrote[72] that the central principle of these theories is "that consciousness is not a correlate of merely cortical activity, but is intrinsically a reaction, functioning in terms of complete sensori-motor arcs, with the motor part of each arc just as essential to the process as the central segment." The emphasis of peripheral theorists, however, has always been laid upon

[63] A. Wyczoikowska, Theoretical and experimental studies in the mechanism of speech, *Psychol. Rev.*, 20, 1913, 448-58.

[64] H. S. Curtis, Automatic movements of the larynx, *Amer. J. Psychol.*, 11, 1900, 237-9.

[65] H. B. Reed, The existence and function of inner speech in thought processes, *J. Exper. Psychol.*, 1, 1916, 365-92.

[66] R. Pintner, Inner speech during silent reading, *Psychol. Rev.*, 20, 1913, 129-53.

[67] R. S. Clark, An experimental study of silent thinking, *Arch. of Psychol.*, 7, 1922, No. 48.

[68] A. M. Thorson, The relation of tongue movements to internal speech, *J. Exper. Psychol.*, 8, 1925, 1-32.

[69] *Cf. ibid*, 5; also L. W. Max, An experimental study of the motor theory of consciousness: I, *J. Gen. Psychol.*, 11, 1934, 116-9

[70] G. L. Freeman, The spread of neuro-muscular activity during mental work, *J. Gen. Psychol.*, 5, 1931, 479-94.

[71] L. W. Max, An experimental study of the motor theory of consciousness: III, *J. Comp. Psychol.*, 19, 1935, 469-86.

[72] *Ibid.*, I, 112. By permission of the *Journal of Comparative Psychology* and of the Williams & Wilkins Company.

the motor part of the arc. The discussions of this doctrine which were written by academic psychologists during the 1910's and the 1920's, even when the last two experiments had not been reported, passed far beyond the meager experimental evidence on which they were based.[73] For that reason we shall neglect them.

The best-known motor theory of consciousness was Watson's. He contended[74] that in normal individuals thought is activity of the laryngeal muscles. In this way he rounded out his behaviorism. Though Watson continually stressed experimental investigation, conclusive proof for this hypothesis of his has not appeared.

Important criticisms have been made of this kind of theory. Pillsbury argued[75] that, if motor activity is the basic characteristic of consciousness, stimulation of the motor area of the cortex should give a particularly rich conscious experience. Cushing, he said, did stimulate the motor cortex of unanesthetized patients, but they reported no such experience. They moved their limbs, but their introspection indicated that the only effect of the stimulation on consciousness was the kinesthetic sense from the muscles. McComas suggested[76] that, if the motor theorists are correct, injuries to the motor areas of the cortex should affect consciousness more than lesions elsewhere. He believed, therefore, that the demonstration by Southard and others that injuries of the motor cortex have no such peculiar effect discredits the motor theory. He argued further that if, as the motor theory insists, every impression must result in behavior, consciousness would be a kind of perpetual St. Vitus's dance.

In these peripheral theories is little place for the concept of unconscious (ANY MEANING) processes. If consciousness is a property of the function of all sensori-motor arcs, no behavior could be unconscious (ANY MEANING). Subjective experience not accompanied

[73] *Cf.* M. F. Washburn, *Movement and Mental Imagery*, Boston: Houghton Mifflin, 1916, 17-26.

[74] J. B. Watson, Is thinking merely the action of language mechanisms?, *Brit. J. Psychol.*, 11, 1920, 88.

[75] W. B. Pillsbury, The place of movement in consciousness, *Psychol. Rev.*, 18, 1911, 87.

[76] H. C. McComas, Extravagances in the motor theories of consciousness, *Psychol. Rev.*, 23, 1916, 401.

by muscular activity alone could be described as lacking consciousness, and the peripheral theories deny that there can be such experience.

COMPROMISE OF CENTRAL AND PERIPHERAL THEORIES

It has been noted[77] that where an investigator localizes consciousness depends upon his personal attitude and interests. If his interest is in stimulus and response, he places consciousness in sense receptors and muscles; if his interest is in the complex adaptations of the organism, he locates it in the central nervous system. All the links in the chain from receptor to effector are essential for the existence of consciousness to be apparent to an observer. Peripheral and central theories must therefore be compromised. This has been done most adequately by Freeman.[78] He maintained[79] that muscular activity facilitates cortical operation, and that both subjective experience and muscular activity can be explained only by reference to principles of central nervous operation. He compiled convincing evidence that muscular activity facilitates higher mental processes.

(*a*) His own work has shown[80] that alterations in the tension of muscles closely parallel the fluctuations in efficiency of mental activity which occur throughout the day.

(*b*) Extreme muscular relaxation was found by Miller[81] to reduce the extent of finger reaction to an electric shock, increase the reaction time, and produce subjectively an apparent diminution of the intensity of the stimulus.

(*c*) The research of Jacobson indicated[82] that with complete relaxation mental activity diminishes or disappears.

[77] E. G. Boring, *The Physical Dimensions of Consciousness*, New York: Century, 1933, 237.

[78] G. L. Freeman, Mental activity and the muscular processes, *Psychol. Rev.*, 38, 1931, 428-49.

[79] *Ibid.*, 428-9.

[80] *Ibid.*, 432.

[81] M. Miller, Changes in the response to electric shock produced by varying muscular conditions, *J. Exper. Psychol.*, 9, 1926, 26-44.

[82] E. Jacobson, *Progressive Relaxation*, Chicago: University of Chicago Press, 1929, 127-89.

(*d*) Jacobson and Carlson found that muscular relaxation causes a decrease in the amplitude of the knee-jerk.

(*e*) Bills demonstrated[83] that the rate of learning is increased by muscular tension.

To explain how contraction of muscles can facilitate cortical activity, Freeman advanced the theory that proprioceptive stimulation from the muscles alters the thresholds of irritability of cortical neurones. An indication that this alteration occurs is the demonstration by Cardot, Régnier, Santenoise, and Varé[84] that muscular contraction lowers the *chronaxie* (*i.e.*, the time required for excitation by a standard stimulus) of cortical areas. If, then, muscular activity lowers cortical thresholds, Freeman reasoned, when muscles are tense (as in waking) the cortex will respond to stimuli which otherwise would be inadequate (as in sleep). In sleep the facilitating impulses from the muscles would fall, the thresholds of cortical neurones would consequently rise, and these neurones would then be unable to respond to moderate stimuli. Thus the "vigilance" of the cortex would be lowered.

NEURAL VIGILANCE AND LEVELS OF FUNCTION

The concept of neural vigilance was developed by Head[85] to represent a state of high-grade physiological efficiency. He stated[86] that neural centers react to identical stimuli with different degrees of physiological efficiency, depending upon their state of vitality. Consciousness results from vigilance of the higher centers just as adaptive and purposive reflexes follow from vigilance of lower

[83] A. G. Bills, The influence of muscular tension on the efficiency of mental work, *Amer. J. Psychol.*, 38, 1927, 227-51.

[84] H. Cardot, J. Régnier, D. Santenoise, and P. Varé, Influence de l'activité musculaire sur l'excitabilité corticale, *Comptes Rendus Soc. Biol.*, 97, 1927, 698-701. That heat applied to an extremity and electrical stimulation of the skin have a similar effect is seen in A. Rizzolo, Influence de l'échauffement d'un membre sur l'excitabilité du point moteur cortical correspondant and A. Rizzolo, Effet de l'excitation électrique de la peau sur l'excitabilité de l'écorce cérébrale, *Comptes Rendus Soc. Biol.*, 97, 1927, 1607-8 and 1608-11, respectively.

[85] H. Head, The conception of nervous and mental energy (II), *Brit. J. Psychol.*, 14, 1923, 126-47.

[86] *Ibid.*, 143, 146.

centers. When vigilance is high, a response to stimulation is obtained more easily, and also appears to be more adaptive or purposive, than when vigilance is low. This vigilance may be lowered by structural changes in the central nervous system, by toxic influences like chloroform and sepsis, or by any other factor that diminishes physiological capacity. Into this statement Freeman dovetailed his well-grounded theory, saying[87] that stimulation of cortical centers from the muscles is a very important one of the conditions which lower or raise physiological capacity.

Though it appears from these statements of Head's that consciousness for him is in higher centers and mere "purposive reflexes" are in the lower centers, this interpretation is in conflict with the fundamental implications of his theory. He sometimes bogged down in the morass of the mind-matter problem, but his basic tenet was that all nervous tissue is capable of the vigilance necessary to control the activities of the body:[88]

> Whatever the level, conscious or automatic, on which this control is exercised, it would have been impossible without a high degree of vigilance. . . . Any influence, which lowers neural potency, acting on some appropriate portion of the central nervous system, even for a moment, may abolish consciousness as a whole or eliminate some specific group of psychical or somatic responses. Should the disturbing agent exert a universal effect, as is the case with chloroform, one function after another disappears in order, beginning with those of highest rank and culminating with the most mechanical and preordained responses.

Head stated that when, for some reason, neural impulses do not pass through a certain part of the nervous system, the local vigilance vanishes, and what he calls the "neural schema" or awareness of that part is lacking. He illustrated this by the event recounted in Case VI of Chapter II (p. 52), the patient who suffered complete destruction of the ulnar nerve which supplies the little finger. Later this hand was amputated and the phantom hand that appeared afterward lacked the little finger. Head explained

[87] G. L. Freeman, *op. cit.*, 434.
[88] H. Head, *op. cit.*, 144-5.

that, because impulses had not passed through this finger before it was cut off, it seemed like part of the outside world—the conscious schema had been lost. The vigilance of the ulnar nerve and the centers connected with it had disappeared. Such clinical evidence might be interpreted to indicate that consciousness, like conductivity and irritability, is a characteristic of the function of any neural tissue. (Bostock has gone farther and said it is a property of all protoplasm.[89])

Facts we have considered have made it seem that the locus of consciousness is in the cortex; yet all parts of it can be removed without loss of consciousness. There are data that point to other parts of the cerebrum, yet a decerebrate cat[90] can discriminate water from alcohol, become excited at barking, and shake its head in a way that would dislodge a flea when the hairs of its ear are touched. All this is consciousness by the criterion of discrimination. Some findings would put consciousness in the hypothalamus near the third ventricle, but a dog with no part of the central nervous system above the spinal cord functioning can be conditioned (and so be conscious, according to one criterion). Even the operation of peripheral nerves and the tenseness of muscles seem to affect consciousness.

To bring order into this apparent chaos we must hold that the central nervous system is capable of being organized to operate at various levels. Each level has its own threshold, and impulses which reach one may not be able to push on to another. Wherever in the system at the moment is the greatest vigilance, there is the control of discrimination, and from the point of view of that criterion, the locus of consciousness. As Cobb wrote:[91] "Consciousness probably is found at several levels, but largely it seems to be the awareness of that part of the stream of impulses that reaches the highest level of nervous integration of a given organism."

[89] J. Bostock, *The Neural Energy Constant*, London: Allen and Unwin, 1930, 24 ff.

[90] H. Head, *op. cit.*, 130-1. *Cf.* also H. C. Bazett and W. G. Penfield, A study of the Sherrington decerebrate animal in the chronic as well as the acute condition, *Brain*, 45, 1922, 185-265.

[91] S. Cobb, *A Preface to Nervous Disease*, Baltimore: Wood, 1937, 73.

We cannot neglect to observe that, as reviewed in this chapter, introspective attestation of consciousness was not to be found mediated by the lower levels of the nervous system. In recognizing that consciousness (by the discrimination criterion) can be localized in all parts of the nervous system, we must also realize that no data show consciousness (by the criterion of ability to communicate) in the lower levels.

This is the localization of consciousness. Where is unconsciousness (ANY MEANING)? In whatever functioning part of the nervous system remains. If we accept the communication criterion, any function of the nervous system which has insufficient vigilance to pass the threshold of the mechanism of report is unconscious (INCOMMUNICABLE). This criterion, thus, divides the individual into functioning levels—communicable and incommunicable. By the discrimination criterion the organism is a whole. Only if it does not have the vigilance to react at all to stimulation is it unconscious (UNDISCRIMINATING), for, if it behaves, it is conscious.

CONCLUSIONS

Three explanations may be given for the multitude of localizations of consciousness, and hence by exclusion of unconsciousness (ANY MEANING), which have been referred to in this chapter. First, in certain cases there is disagreement about the observed facts. Second, some of the arguments are grounded on no empirical basis whatever or are not self-consistent, and hence their conclusions are not sound. Third, different criteria and meanings of consciousness have been employed. Proper empirical observation can remedy disagreement about the localization that arises from the first two causes, but that which arises from the third cause can be dealt with only by a careful separation of the various senses in which *conscious* is used.

There are a number of functions of the organism which have nothing in common except that they have all been called conscious by someone. We have reviewed the research that shows that the

integrity of various different levels of the nervous system must be maintained for these various events to occur. One of these conscious (DISCRIMINATING) functions is the ordinary unconditioned reflex; for this to take place the reflex arc must be preserved, but no other neural organization is essential. Another is the conditioned reflex, for which a higher level of organization, though nothing above the spinal cord, must remain in operation. A third conscious (COMMUNICABLE) function is speech, and for it a still higher neural level of organization is required. Actually these sorts of consciousness are as different types of behavior as are focusing one's eyes and eating one's dinner.

The several kinds of consciousness and unconsciousness (ANY MEANING) are governed by various levels of neural integration. At any given moment in a given individual, the integration of conscious mechanisms is controlled at the level of highest vigilance in the nervous system. Throughout the life of the individual this level of organization frequently alters.

CHAPTER V

STATES OF UNCONSCIOUSNESS

We have seen that different sorts of consciousness may be organized at various levels of the nervous system. There is a sense in which the degree of consciousness varies from level to level. Just as the amount of activity of an individual and the number of reflexes that can be elicited from him differ in waking, sleep, and surgical anesthesia, so also the subjective characteristics of those states differ. It may well be that as the degree of neural vigilance diminishes, the subjective feeling of consciousness (AWARE OF DISCRIMINATION) decreases.

Whether these various levels of unconsciousness (UNAVAILABLE TO AWARENESS)—or of consciousness, if you will—constitute a continuum, one merging into another, or whether there is somewhere a sharp dividing line, is a puzzle which must plague us continually in this and future chapters. The states of unconsciousness with which we are here concerned are: hypnosis, sleep, unconsciousness from concussion or other abnormal physiological causes (fainting, coma), anesthesia, dream states, and reverie or day-dreams. Objectively these states can be distinguished by absence of proper response to various kinds of stimulation, as to pain or to questioning. Subjectively certain of them have definite, recognizable characteristics, but the quality of one fades imperceptibly into that of another. Lashley said[1] in 1923 that introspective reports on their similarities and differences are of little practical value. He maintained that, while certain states may be considered typically conscious and others typically unconscious (UNAVAILABLE TO AWARENESS), there are borderline cases, like the hypnagogic state just at waking, which fall between the two classifications. Moreover, introspection on these

[1] K. S. Lashley, The behavioristic interpretation of consciousness II, *Psychol. Rev.*, 30, 1923, 339-40.

states requires an effort of examination that in itself destroys them. From these observations Lashley concluded that no subjective criterion of consciousness is reliable, and that all any introspector can do is to assert that the bounds of consciousness lie near the level at which subjective experience becomes so vague that it cannot be contemplated further.

Unquestionably the difficulties of introspection which Lashley spoke of are real, but it must be remembered that he wrote at the height of the outcry against subjective report. Admittedly the descriptions of passing under anesthesia mentioned later in this chapter are of little value in explaining that kind of unconsciousness (ANESTHETIZED), but on the other hand, as we have seen (p. 101), the subjective reports of exactly when sleep begins and ends have been found to coincide well with changes in brain waves. Perhaps the reason that the point of appearance of consciousness during a gradual awakening is difficult to determine, as Lashley insists, is that the phenomenon occurring is a change in degree, just as subjective report pictures it. It is difficult to deny, however, that while introspection has sometimes been revealing, the most significant clinical and experimental knowledge that we have of the group of states which we are about to consider is physiological, objectively determined.

HYPNOSIS

The large number of experimental studies of hypnosis which have been conducted cannot possibly be reviewed here. It is impossible even to sketch in the evidence on whether the hypnotic state resembles more the waking state or sleep. This work has been carefully analyzed by Hull.[2] It seems certain at present that there are definite differences between the behavior of people who are hypnotized and the actions of those who are asleep. It is known also that posthypnotic behavior differs from any which follows sleep. The physiological concomitants of the two states, moreover, are dis-

[2] C. L. Hull, *Hypnosis and Suggestibility*, New York: Appleton-Century, 1933, 193-223.

similar. Jenness and Wible, for example, have shown[3] that electrocardiograms and breathing records of subjects under hypnosis are more like their records when they are awake than when they are asleep. Hypnosis is not sleep, then, but it is entirely conceivable that a hypnotized subject could fall asleep.

It has been shown repeatedly[4] that one can remember better under hypnosis than normally, especially remote events. In one sense, therefore, a man is more unconscious (UNREMEMBERING) when awake than when hypnotized. How, then, is a hypnotic subject unconscious? Perhaps in the sense of UNNOTICING or UNATTENDING, and certainly in the use UNABLE TO COMMUNICATE. The proof is manifold[5] that, under the suggestion of the hypnotist, the subject appears to attend only to what he is directed to consider. In the trance and even afterward at the command of the hypnotist, he may act as if he entirely lacked perception of parts of his environment which he would never normally overlook, and later report that he never saw them. From these clues one would say the subject was unconscious (UNNOTICING or UNATTENDING) of part of his environment, and in some cases this may be true, though there are three reasons why it is certain that it is not always right:

(*a*) Many subjects admit later that they were play-acting, and that, when their attention appeared deflected from something, they nevertheless were aware of it.

(*b*) In Case I of Chapter II (p. 46), Witt., in her hypnotic trance, appeared oblivious of the realities of her surroundings as long as her bluff was not called. When it was called, it became apparent that she was attending acutely to her environment. This event illustrates a common hypnotic phenomenon.

(*c*) In an experiment of Dorcus's,[6] although subjects under hypnosis reported the subjective feelings which usually accompany the activities which it was suggested that they were performing,

[3] A. Jenness and C. L. Wible, Respiration and heart action in sleep and hypnosis, *J. Gen. Psychol.*, 16, 1937, 197-222.

[4] *Cf.* C. L. Hull, *op. cit.*, 105-27.

[5] *E.g.*, *ibid.*, 23-40.

[6] R. M. Dorcus, Modification by suggestion of some vestibular and visual responses, *Amer. J. Psychol.*, 49, 1937, 82-7.

they did not show the proper objective concomitants of those responses. For instance, when they were told by the hypnotist that they were being rotated in a chair (although this was untrue), they said they felt the rotation but they did not show the proper eye-movements that normally accompany such rotation. Dorcus concluded that the true facts of behavior under hypnosis are unconscious, not in the sense of UNAVAILABLE TO AWARENESS, but merely in the sense of INCOMMUNICABLE. He believes that the subjects' apparent insensibility can be adequately explained on a basis of heightened suggestibility, rather than by a theory of dissociation or restriction of consciousness. Behavior under hypnosis often presents a paradox not easy to resolve unless levels of function are postulated. At the level of the eye responses, for instance, the subject is aware of the environment. The eyes do not show nystagmus, for they have not been properly stimulated. At the level of speech, often as obviously sincere as the astronomer's report of a new comet, he insists he was rotated.

SLEEP

Certain characteristics differentiate the unconsciousness (UNRESPONSIVE TO STIMULATION) of sleep from other states like hypnosis or anesthesia. Kleitman has listed[7] the most important criteria of the sleep state. A sleeping organism has a loss of differentiated reaction to external stimuli; a raised threshold for all types of response; and a capacity to be aroused to a waking state. There are many depths of sleep, from the light hypnagogic condition of just waking up, which is between waking and sleeping, to profound levels. Judging the level by the intensity of stimulus necessary to wake the sleeper, Endres and von Frey as well as others[8] have found, by determining the intensity of stimulus required to waken sleepers, that there are great variations as to when during an ordinary night sleep is heavy or light. The curves of the depth of sleep do not have the all-inclu-

[7] N. Kleitman, Sleep, *Physiol. Rev.*, 9, 1929, 624.

[8] G. Endres and W. v. Frey, Ueber Schlaftiefe und Schlafmenge, *Ztschr. f. Biol.*, 90, 1930, 70-80. *Cf.* also H. M. Johnson and T. H. Swan, Sleep, *Psychol. Bull.*, 27, 1930, 1-18.

sive validity that is sometimes ascribed to them, for there is no proof that any single stimulus can adequately measure the level of the general sleep process. Also it is certain that people differ widely as to when their sleep is deepest. There is evidence[9] that one's sleep is lightest just after he has made muscular movements.

Numerous studies have been made of physiological characteristics of sleep. The investigations of muscular activity in sleep have established[10] that while movement is less than in the waking state, it still is definitely present.

Neural vigilance generally decreases in sleep, as is shown by the generally recognized fact[11] that certain proprioceptive reflexes, like the knee-jerk, show diminished excitability during sleep. On the depth of sleep depends the strength or even the presence of such reflexes. Kleitman found[12] that in puppies the labyrinthine righting reaction acting on the head is lost in sound sleep, and this is true of other animals. It has also been shown[13] that certain reflexes to stimulation of the skin are preserved. Facial grimaces and movements of the hand capable of eliminating the source of stimulation can be elicited by brushing the cheek. Also the iris of the eye constricts to light and dilates to certain extraneous stimuli. The heart action, too, alters during sleep, its rate changes probably being of reflex origin.

Some evidence exists[14] that a cognizance of time continues throughout sleep, for subjects have waked themselves close to the time set without any cues to help them. The findings on this problem have been equivocal. There is reason to believe[15] that some sleepers can hear and remember on waking conversations carried on in their presence while they are asleep. Freud has given his

[9] N. Kleitman, N. R. Cooperman, and F. J. Mullin, Is there a continuous curve of the depth of sleep?, *Amer. J. Physiol.*, 116, 1936, 92-3.

[10] *Cf.* N. Kleitman, *op. cit.*, 624-7.

[11] *Cf. ibid.*, 633.

[12] N. Kleitman, Studies on the physiology of sleep, V, *Amer. J. Physiol.*, 84, 1928, 391.

[13] N. Kleitman, Sleep, *Physiol. Rev.*, 9, 1929, 633-4.

[14] *E.g.*, E. N. Brush, Observations on the temporal judgment during sleep, *Amer. J. Psychol.*, 42, 1930, 408-11.

[15] *E.g.*, H. H. Goddard, A case of dual personality, *J. Abnorm. and Soc. Psychol.*, 21, 1926, 185.

agreement[16] to Burdach's observation that we are capable of interpreting sensory impressions while asleep (as can the nurse who wakes when her infant charge cries but to no other sound). He believed that the reason most stimuli will not wake us is that we are not sufficiently interested in them. Frequently activities and experiences of sleep are not remembered upon waking. Case II of Chapter II (p. 47) is one of many examples of somnambulism so forgotten—*i.e.*, unconscious (INCOMMUNICABLE).

Finally, dreaming goes on during much sleep.

Let us now take up the leading theories that attempt to explain sleep, and review the data which have been adduced to substantiate them.

(*a*) There are various philosophical and psychoanalytic theories. LeDantec has said[17] that sleep is general inattention; Bohn[18] and Crile[19] have referred in explanation to bipolarism of the central nervous system; Rignano has said[20] that sleep is a suspension of affective mental activity. The usual psychoanalytic interpretation, as of Freud[21] or Rank,[22] is that man wishes to return to the fetal intrauterine life and partially achieves satisfaction of this desire in sleep. Lack of rigorously controlled supportive evidence discredits all these doctrines.

(*b*) Von Economo has called[23] one class of interpretations of the nature of sleep "theories of lack of stimuli." To those who developed such theories the disappearance of consciousness seemed the most important characteristic of sleep and was the only one which they attempted to explain. Sleep was for them caused by some interruption of the conduction of stimuli to the cortex. Exner and Rabl-

[16] S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill, New York: Random House, 1938 (*The Interpretation of Dreams*), 279.

[17] F. LeDantec, Considérations sur le repos et le sommeil, *Rev. Philosophique*, 77, 1914, 136.

[18] G. Bohn, La dynamique cérébrale, *Rev. Philosophique*, 87, 1919, 251-69.

[19] G. W. Crile, *A Bipolar Theory of Living Processes*, New York: Macmillan, 1926, 32-4.

[20] E. Rignano, *The Psychology of Reasoning*, trans. W. A. Hall, London: Kegan Paul, Trench, Trubner, 1923, 293-7.

[21] S. Freud, *A General Introduction to Psychoanalysis*, New York: Liveright, 1920, 67-8.

[22] O. Rank, *The Trauma of Birth*, New York: Harcourt, Brace, 1929, 74 ff.

[23] C. v. Economo, Sleep as a problem of localization, *J. Nerv. and Ment. Dis.*, 71, 1930, 250.

Rückhard believed that ganglion cells of the brain in sleep retract their dendrites; Purkinje held that congestion of basal ganglia "strangles" neurones that pass to and from the cortex and so interrupts conduction; Mauthner and Veronese and Trömner made similar suggestions.[24] The mechanisms outlined by these various workers have not been substantiated by histological or other findings. Even if this were done, no explanation of what sets the interrupting mechanisms into action would have been given. Hence this class of theory has not proved to be useful.

(*c*) Other theories explain sleep by some chemical influence on cells of the nervous system or within the cells themselves. Purkinje's, Pflüger's, and Dubois's interpretations[25] do not have sufficient basis. Piéron[26] postulated formation of a hypnotoxin during wakefulness which acts as a soporific to produce sleep. He had some experimental corroboration of this, finding that after cerebrospinal fluid, blood serum, or an extract of cerebral tissue from a tired animal is injected into a normal, wide-awake animal, the latter becomes drowsy and falls asleep. Experiments of Kroll[27] and of Ivy and Schnedorf[28] have shown that changes in bodily chemistry occur during sleep and can cause sleep, but they have raised serious doubts about the correctness of Piéron's original explanatory formulation.

There is no evidence for the oft-repeated idea that lactic acid or some other product of muscular activity can affect the nervous system to cause sleep or relaxation.

All the phenomena of sleep cannot be explained by any chemical theory, for it often occurs without fatigue; moreover, comparatively weak stimuli can interrupt normal sleep, giving rise to clearness of consciousness. Claparède has considered[29] resting in sleep a defense against the intoxication of exhaustion rather than intoxication itself.

[24] C. v. Economo reviews these various theories, *ibid.*, 250-1.

[25] *Cf. ibid.*, 251-2.

[26] H. Piéron, *Le problème physiologique du sommeil*, Paris: Masson, 1912.

[27] F.-W. Kroll, Über das Vorkommen von übertragbaren schlaferzeugenden Stoffen im Hirn schlafender Tiere, *Ztschr. f. ges. Neurol. u. Psychiat.*, 146, 1933, 208-18.

[28] A. C. Ivy and J. G. Schnedorf, On the hypnotoxin theory of sleep, *Amer. J. Physiol.*, 119, 1937, 342.

[29] E. Claparède, Opinions et travaux divers relatifs à la théorie biologique du sommeil et de l'hystérie, *Arch. de Psychol.*, 21, 1928, 113-61.

It may indeed be true that sleep is such a protective mechanism, and that when for any reason the concentration of intoxicating substances becomes pathologically high, syncope, narcosis, or narcolepsy ensue.

(*d*) Other quasi-chemical theories depend more upon endocrine function than upon formation of fatigue substances. Mingazzini and Barbara have explained[30] the periodicity of waking and sleep on much the same basis of endocrine function as the periodicity of the female sexual cycle can be interpreted. Alternation of rest and activity may be seen in most plants and animals, and in lower animals may not necessarily be dependent upon the brain or head ganglion. When an earthworm is cut in two, both ends continue to exhibit such periodicity.[31] In mammals, though, there is a control of sleep by the brain so that, when the spinal cord is isolated from the brain by transection, nothing like sleep occurs in the part of the body below (aboral to) the separation, but the fore part shows typical periodic sleep.[32]

(*e*) The doctrine that cerebral anemia causes sleep was once widely held,[33] but has been repeatedly disproved.[34]

(*f*) Pavlov's school has explained sleep by its principle of "internal inhibition." Loucks discovered[35] that conditioning in response to electrical stimulation of cortical sensory elements disappears in sleep. This occurred apparently because of some "internal" inhibitory process of the central nervous system. Dogs were observed by Pavlov[36] to fall asleep during conditioning experiments.

[30] C. v. Economo, *op. cit.*, 253, discusses this theory.

[31] J. S. Szymanski, Die Verteilung von Ruhe- und Aktivitats perioden bei einigen Tierarten, *Pflugers Arch.*, 172, 1918, 439-42.

[32] P. Bard (ed.), *Macleod's Physiology in Modern Medicine*, 9th ed., St. Louis: Mosby, 1941, 241.

[33] *E.g.*, W. H. Howell, A contribution to the physiology of sleep, based upon plethysmographic experiments, *J. Exper. Med.*, 2, 1897, 313-46.

[34] *E.g.*, J. F. Shepard, *The Circulation and Sleep*, New York: Macmillan, 1914.

[35] R. B. Loucks, The conditioning of salivary and striped muscle responses to faradization of cortical sensory elements, and the action of sleep upon such mechanisms, *Psychol. Bull.*, 34, 1937, 743-4.

[36] I. P. Pavlov, *Lectures on Conditioned Reflexes*, trans. W. H. Gantt, New York: International, 1928, 305-8.

He found that, if they were allowed to remain in the conditioning situation for some time, they went to sleep. He stated a general law:[37]

> A more or less enduring stimulation falling on a certain part of the hemispheres, whether or not it is of vital significance (and especially if it is without such significance), and no matter how strong it may be,—every such stimulation, if it is not accompanied by simultaneous stimulation of other points, or if it is not alternated with other stimulations, leads inevitably sooner or later to drowsiness and *sleep.*

Dogs have been put to sleep with strong electric shocks in Pavlov's laboratory, and it seems that any sort of stimulation is capable of producing sleep so long as it is monotonously continuous. Kleitman criticized[38] this theory on the grounds of his finding that dogs, placed in conditioning stands similar to those used by Pavlov, go to sleep without conditioning. This criticism is without point, however, for it is to be noted that Pavlov's explanation of sleep quoted above states that internal inhibition can be set up by any monotonous stimulation and not only by a specific conditioning situation.

(*g*) Certain muscular theories of sleep have been developed to fit in with the motor or peripheral explanations of consciousness considered in the last chapter. Washburn, for example, has written[39] that sleep is an attitude of complete muscular relaxation. Hence in "perfect sleep" one cannot be conscious, because consciousness depends on muscular contractions. All this, however, is almost pure verbalism with scarcely any empirical basis.

Kleitman also has emphasized[40] the importance in sleep of muscular relaxation and the consequent diminution in the number of impulses from the muscles reaching the central nervous system. The hypnagogic state in puppies was observed by Kleitman,[41] and he made observations of muscular activity in sleep. In waking, the limb and abdominal musculature, which had been relaxed, stiff-

[37] *Ibid.*, 307. By permission of International Publishers.

[38] N. Kleitman, Sleep, *Physiol. Rev.*, 9, 1929, 650-1.

[39] M. F. Washburn, *Movement and Mental Imagery*, Boston: Houghton Mifflin, 1916, 227.

[40] N. Kleitman, Sleep, *Physiol. Rev.*, 9, 1929, 654-9.

[41] N. Kleitman, Studies on the physiology of sleep, V, *Amer. J. Physiol.*, 84, 1928, 390-1.

ened. Freeman added[42] observations of human behavior that also show that restoration of muscular tenseness accompanies waking. He found that frequently when he grasped the alarm clock immediately on being aroused from sleep by it, it fell through his fingers. This did not occur when he took time to stretch first. He believed that, while stimulation from nonproprioceptive senses are important in maintaining the waking state, sleep intervenes whenever proprioceptive stimulation drops below a crucial minimum, no matter how strong the other stimuli are.

(*h*) A final type of theory concerning sleep is that there is a localized sleep center in the central nervous system. Often this center has been thought to be cortical, and the cortex probably mediates functions related to normal sleep in man,[43] but there are lower centers. One indication that there is a subcortical sleep center is Kleitman and Camille's demonstration[44] that decorticate dogs display in every twenty-four hours several periods of what appears objectively to be sleep, alternating with states of activity.

Many workers have been connected with the research which has led to locating a sleep center in the hypothalamus and a region about the third ventricle, but the studies by von Economo, Hess, Ranson, and Harrison have been the most significant. Von Economo concluded[45] from clinical and pathological study of cases of lethargic encephalitis that the prolonged sleep which is the outstanding symptom of this disease is caused by lesions in this region. The soporific effect of disease in this part of the brain has been repeatedly confirmed.[46] Von Economo believed that fatigue substances circulating in the blood activate this center, which thereupon inhibits cortical activity causing the unconsciousness (UNAVAILABLE TO AWARENESS) of sleep. He thought that this action might be the internal inhibition

[42] G. L. Freeman, Mental activity and the muscular processes, *Psychol. Rev.*, 38, 1931, 440-2.

[43] N. Kleitman, Sleep, *Physiol. Rev.*, 9, 1929, 651-4.

[44] N. Kleitman and N. Camille, Studies on the physiology of sleep, VI, *Amer. J. Physiol.*, 100, 1932, 474-80.

[45] C. v. Economo, *op. cit.*, 254-8.

[46] *Cf.* N. Kleitman, Sleep, *Physiol. Rev.*, 9, 1929, 646-7; also F. Harrison, The hypothalamus and sleep, in *The Hypothalamus, Res. Publ. Ass. Nerv. Ment. Dis.*, 20, 1940, 636-8.

of Pavlovian theory. At the same time, according to him, the sleep center also regulates the physiological characteristics of sleep through lower centers—like those controlling respiration, metabolism, etc. Hess placed[47] electrodes into the region of the third ventricle in cats, and, after the animals had recovered from this operation, he stimulated the brain with low voltages through these electrodes. Some of the animals became excited; others became somnolent. He concluded that he had stimulated a sleep center in this region. The numerous attempts to demonstrate the region of effect of pharmacological agents that produce sleep have resulted[48] in no clear-cut answer, but point to the hypothalamic region.

Recently a different interpretation of the function of this region has developed. Ranson and his co-workers have discovered[49] that experimentally produced lesions in the posterior part of the lateral hypothalamus cause somnolence in the cat and the monkey. They believe that the normal function of this center is important in maintaining the waking state, and that it is really the reverse of a sleep center. They reinterpret von Economo's findings about lethargic encephalitis to show that damage to this center prevents it from carrying out its normal function of maintaining the waking state. Harrison produced somnolence[50] in several animals by passing electrical current through the lateral hypothalamic area, but this stimulation produced permanent lesions. Stimulation which did not cause lesions merely excited the animals. It may well be, therefore, that Hess's stimulation which caused somnolence produced lesions which he did not find. The evidence in general,[51] then, leads to the conclusion that depression of the activity of a specific area of the hypothalamus causes sleep, while stimulation of it causes excitement.

[47] W. R. Hess, The autonomic nervous system (concluded), *Lancet,* 223, 1932, 1259-61.

[48] *Cf.* F. Harrison, *op. cit.,* 638-42.

[49] S. W. Ranson, Some functions of the hypothalamus, *The Harvey Lectures, 1936-1937,* Baltimore: Williams and Wilkins, 1937, 111-5; also S. W. Ranson, The functional and clinical significance of the hypothalamus, *Quart. Bull. Northwestern U. Med. School,* 14, 1940, 141-3. *Cf.* also S. Berggren and E. Moberg, Experimentelle Untersuchungen zum Problem des Schlafes, *Acta Psychiat. et Neurol.,* 4, 1929, 1-46; also, G. Marinesco, O. Sager, and A. Kreindler, Experimentelle Untersuchungen zum Problem des Schlafmechanismus, *Ztschr. f. ges. Neurol. u. Psychiat.,* 119, 1929, 277-306.

[50] F. Harrison, *op. cit.,* 643-7.

[51] Reviewed by F. Harrison, *op. cit.,* 635-56.

There is no reason why more than one of these theories of sleep cannot be right, or why the evidence adduced for them cannot be amalgamated. The localization theories have good support, and it appears certain that chemical factors affect sleep and waking. There is no reason why the hypothalamic center cannot be susceptible to chemical stimulation or depression, just as is the respiratory center. Monotonous stimulation, such as Pavlov referred to, may also activate the center, and its action may be promoted by a diminution of proprioceptive impulses from the musculature, which become less frequent as the relaxation that accompanies sleep begins. The omens all point to some such merger as the interpretation of the physiology of sleep most likely to be substantiated by further investigation.

UNCONSCIOUSNESS FROM ABNORMAL PHYSIOLOGICAL CAUSES

When certain lesions, like tumors, have caused loss of consciousness, it is possible at operation or autopsy to determine accurately where the nervous system was affected. Fainting is an example of loss of consciousness due to abnormal physiological states. The commonest cause of fainting is anemia of the nuclei in the hindbrain controlling vasomotor nerves, resulting in a vaso-vagal attack. Many conditions may give rise to cerebral anemia and fainting, such as pooling of blood elsewhere in the body or spasm of the vessels supplying the brain.[52]

Guttmann and Winterstein have said[53] that loss of consciousness ("awareness of external environment and accessibility") is the commonest symptom of head injury. The following symptoms have been listed by Jaspers[54] as characteristic of such disturbances in consciousness, though all are not present in every patient. (*a*) Detachment from reality; difficulties in apprehension and in fixing attention. (*b*) Disorientation. (*c*) Disconnected and incompre-

[52] S. Cobb, *A Preface to Nervous Disease*, Baltimore: Wood, 1937, 72-3.

[53] E. Guttmann and C. E. Winterstein, Disturbances of consciousness after head injuries, *J. Ment. Sci.*, 84, 1938, 347.

[54] K. Jaspers, *Allgemeine Psychopathologie*, Berlin: Springer, 1923, 101.

hensible behavior. (*d*) Disturbances of retention and memory at the time, as well as subsequent amnesia; slowness of thought processes. An analysis of the subjective states through which boxers pass after being knocked out has been made by Guttmann and Winterstein.[55] They observed that the patient recovering from an uncomplicated knockout never passes through delirium, but for a time afterward the sensations may be blurred and vague and the visual field narrow. Commonly there is a feeling of depersonalization and detachment from one's body. More serious cases may take quite some time to come to. During recovery such patients are slow in response and, though not correctly oriented, are not disturbed by hallucinations. If they make mistakes, it is generally during the period of amnesia after they come to.

Case III of Chapter II (p. 48) is an example of such disturbance of consciousness. This boxer was in a twilight state for thirty-six hours before he suddenly awakened, reacting normally as far as his friends could tell, but having a gap in memory covering not only the period of lack of control of his body, but also a time afterward when he seemed to behave normally. During a long period he seemed conscious in every sense (unless we consider his sluggish reflexes as poor discrimination), but afterward it appeared from his report that he had been unconscious (UNREMEMBERING as well as UNAWARE OF DISCRIMINATION) all the time.

There is no certainty about what goes on in the skull after a head injury, but Guttmann and Winterstein mention[56] four sorts of explanations which have been suggested. These are: (*a*) a molecular concussion of the whole brain substance; (*b*) abnormal intracranial pressure; (*c*) anoxemia, hemorrhages, or other circulatory abnormalities; and (*d*) localized effects on some part of the central nervous system, *e.g.*, the vestibular mechanism or the medulla. Insufficiency of data makes these no more than theories.

Penfield has made reference[57] to a pathological state of conscious-

[55] E. Guttmann and C. E. Winterstein, *op. cit.*, 347-51.
[56] *Ibid.*, 349-50.
[57] W. Penfield, The cerebral cortex in man, I, *Arch. Neurol. and Psychiat.*, 40, 1938,

ness much like that which follows head injuries—the postepileptic automatic state. He reported that patients in this condition are in full control of their bodies but are unaware of what they do. They may answer questions and obey commands or may react violently to interference. As in posttraumatic states, acts in the postepileptic condition are not remembered afterward.

ANESTHESIA

Local anesthesia makes the individual regionally unconscious (UNSENSING, SENSORY TRACT INCAPABLE OF CONVEYING STIMULI). The subjective proof of this is that the patient feels no pain, pressure, or other sensation from the part of the body anesthetized. Objectively, he does not exhibit behavior such as we have come to connect with painful stimuli. The work of several experimenters has shown[58] that the order of disappearance of sensation in peripheral nerves upon anesthetizing them locally is first cold, then warmth, then pain, and finally pressure.

As to general anesthesia—we know that there are many levels. For instance, under ether there are four recognized states: analgesia, excitement, surgical anesthesia, and respiratory paralysis. The third stage is commonly subdivided into three or four planes of increasing depth. Various responses—such as reactions to pain, coughing, vomiting, eye movements, pupil dilatation and contraction, action of the intercostal muscles, and maintenance of muscular tenseness—change at certain levels, and these changes are observed in clinical practice in order to determine the level of anesthesia. Magnus has carefully detailed[59] the order in which an extensive series of postural and balance reflexes disappear under anesthesia. Such evidence shows that in some way general anesthetics put one nervous center after another out of operation. The mechanism by which general anesthetics exert this effect is not known, and the theories on the

[58] *Cf.* P. Bard (ed.), *op. cit.*, 77.
[59] R. Magnus, *Körperstellung*, Berlin: Springer, 1924.

subject need not be considered here, for they deal with cellular physical chemistry.[60]

Numerous introspective studies of going under and coming out of anesthesia have been conducted. Making such reports seems to have been a fad of the 1890's and 1900's. Few of these are of any value, for they refer to such incomprehensible experiences as a sense of "the unity of consciousness"[61] or a clear sense of the anesthetic drug passing into the capillaries.[62] Most such investigations, however, indicated clearly that the various sensory and motor abilities disappear at different times, so confirming the objective proofs of this that we have mentioned. Jones, for example, said[63] that hearing went first; then the other senses, vision among the last; then the problem-solving ability and memory imagery. In a report of comparatively recent work, Ranschburg claimed[64] to have found evidence of a continuous gradation under anesthesia from self-consciousness down to a barely conscious state. At a deeper stage, which he calls a "purely vegetative level," he found no indication of any processes that could be called conscious.

DREAM STATES

Most writers on dreams consider them to be unconscious (because they occur during sleep in which one is UNRESPONSIVE TO STIMULATION). Moreover, much Freudian theory depends on dream content being unconscious (PSYCHOANALYTIC MEANING). A diametrically opposite position is maintained by Washburn,[65] who classified dreaming as a conscious state. This follows from her motor theory that muscular activity is consciousness. Dreams, then, are the consciousness accompanying the limited motion that goes with incomplete

[60] *Cf.* H. K. Beecher, *The Physiology of Anesthesia,* N. Y.: Oxford University Press, 1938, 20-46.

[61] H. Spencer, *The Principles of Psychology,* N. Y.: Appleton, 1901, I, appendix, 636.

[62] E. E. Jones, The waning of consciousness under chloroform, *Psychol. Rev.,* 16, 1909, 50.

[63] *Ibid.,* 51-4.

[64] P. Ranschburg, Beitrage zum Verhalten der Reflexe, Automatismen und bewussten Funktionen in scheinbar unbewussten Zuständen, *Ztschr. f. Psychol.,* 129, 1933, 338-52.

[65] M. F. Washburn, *op. cit.,* 17.

relaxation during imperfect sleep. The fitfulness of these movements, she said, is responsible for the fragmentary and incoherent character of dreams.

Cobb has said[66] that dreaming is probably localized in the cortex. Dreams, however, occur at times when there is every reason to believe that the cortical vigilance is lowered—under anesthesia, in sleep, in certain epileptic conditions. We know practically nothing about the physiology of dreaming, so that almost our whole treatment of dreams must be psychological. All scientific students of dreams will admit, however, that in some way the physiological tensions and disequilibria of the dreamer, as well as the sensations he receives during sleep from his environment, do affect the content of his dreams.[67]

The subjective report of any dreamer tells us that the experience of dreaming has elements of waking consciousness—more, some say, than the hypnagogic state. The common report is, however, that it has an "unreal" character. Certainly the events of most dreams could not happen in real life. Penfield described[68] similar feelings of unreality in dream states which certain epileptic patients experience. They seem to experience feelings of strangeness and unexplained familiarity, to see scenes from their past lives, and at the same time, by a double awareness which Jackson has termed "mental diplopia," they realize that this is all unreal and that they are having a fit.

This dissociation from the world of everyday is the main subjective characteristic of dreams. It appears to be a separate existence related to the waking life but not bound by its rules and standards. For instance, there is the story of the composing of a jingle which has since become so much public property that no one seems to know who wrote it.[69] As the story goes, the author dreamed one

[66] S. Cobb, *op. cit.*, 71.

[67] *Cf.* S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill, New York: Random House, 1938 (*The Interpretation of Dreams*), 276 ff.

[68] W. Penfield, *op. cit.*, 431.

[69] Mrs. Amos Pinchot has repeatedly been incorrectly said to have been the author of this quatrain. She denies any responsibility for it, however, and the true author appears to be shrouded in anonymity.

night that he had written a poem of such ultimate truth that he was immediately acclaimed to be the greatest poet and philosopher of all time. He immediately rose and scribbled it down, and the next morning found that he had written:

Hogamus Higamus
Men are Polygamous
Higamus Hogamus
Women Monogamous.

Like impairment of judgment in dreams under ether was reported by Oliver Wendell Holmes.[70] Experimentally he took ether and, while under it, the key to all the mysteries of philosophy was revealed to him. As he came to, he still remembered it, and at the first possible moment scrawled the all-embracing truth on paper. The words were: "A strong smell of turpentine prevails throughout."

To indulge in the speculative delights of the nervous system, one might picture dreaming as the incidental function of the cortex "at play," when some lower center has assumed the vigilance necessary to control the body. Subjectively this process has characteristics of consciousness; it depends on memory of the past; it is vaguely responsive to present bodily conditions; but there is temporarily no responsibility to act in a real world. Some such theory of dreams is held by psychoanalysts. It explains all facts adequately, but it has too few of them to explain. Freudians believe that, because dreams are removed from reality and because the censorship of repression is relaxed, unconscious (PSYCHOANALYTIC MEANING) wishes in thinly disguised form may slip into dream consciousness which could never be known in the waking state. Case IV of Chapter II (pp. 49-50) illustrates how Freud believed this occurs.

REVERIE

This unconscious (UNRESPONSIVE TO STIMULATION) state has much in common with dreaming. Subjective report puts it midway be-

[70] O. W. Holmes, Mechanism in thought and morals, in *Pages from an Old Volume of Life*, Boston: Houghton Mifflin, 1895, 283-4.

tween waking and dreaming, and it can easily shade off into either one. Many psychoanalysts believe that fantasies of reverie represent repressed wishes of the individual much as dreams do. The thematic apperception test of Morgan and Murray,[71] in which the subjects create stories suggested to them by pictures shown to them, is based on this belief. It is an attempt to reveal the needs which motivate the subjects' behavior by evoking fantasies. They maintain this because of the many times the basic desires of people appear only thinly veiled in their reveries. An example is Case V of Chapter II (p. 51), the law student who could not read his texts because of the visions that appeared on the pages.

A little psychological experimentation on states of day-dreaming has been done. Travis reported[72] finding differences in auditory threshold during reverie between suggestible normal subjects, hysterics, and psychoneurotics, on the one hand, and negativistic normal subjects and schizophrenics, on the other. He believed[73] that the ability which suggestible people show to become somewhat dissociated during crystal-gazing gives heightened sensory acuity, and resistance to suggestion, which negativistic individuals show, has the opposite effect. Much more careful work by Bartlett[74] did not confirm Travis's findings.

Jacobson has studied experimentally[75] the effect of muscular relaxation upon reverie. He found, from introspective reports, that the thought processes and images accompanying reverie gradually diminish with progressive relaxation.

CONCLUSIONS

In analyzing these various states of unconsciousness (UNRESPONSIVE TO STIMULATION), we have found that, though they have dif-

[71] H. A. Murray *et al., Explorations in Personality,* New York: Oxford University Press, 1938, 530-45.

[72] L. E. Travis, Suggestibility and negativism as measured by auditory threshold during reverie, *J. Abnorm. and Soc. Psychol.,* 18, 1924, 350-68.

[73] L. E. Travis, Changes in auditory acuity during the performance of certain mental tasks, *Amer. J. Psychol.,* 37, 1926, 141.

[74] M. R. Bartlett, The auditory threshold in reverie, *Arch. of Psychol.,* 27, 1935, No. 182.

[75] E. Jacobson, *Progressive Relaxation,* Chicago: University of Chicago Press, 1929, 164-89.

ferent causes, the most adequate physiological explanation of all of them is that there is some interference with the vigilance of some level of the central nervous system. This they have in common. They differ probably because of the level affected and the degree to which its vigilance is lowered. Though these states can be introspectively distinguished at times, they fade into each other just as the levels of the nervous system merge. A typical hypnotic trance, however, can be subjectively differentiated from typical sleep, or reverie, or the other conditions mentioned in this chapter. Individuals in these various states, moreover, while always behaviorally unresponsive to some stimulation, vary greatly as to what stimuli bring response and what do not.

CHAPTER VI

SUBLIMINAL UNCONSCIOUSNESS

The synonyms *subliminal* and *subthreshold* are in the preferred vocabulary of investigators in all the fields that deal with unconsciousness (ANY MEANING). The cornerstone of an eminently respectable branch of academic psychology, psychophysics, is the theory of the threshold and subliminal stimulation which Fechner, influenced by Herbart, developed[1] early in the history of experimental psychology. *Subliminal* has been used by students of psychic research, like F. W. H. Myers,[2] to characterize phenomena of the hinterland that they explore. Some psychological clinicians have referred[3] to unconscious (SUBLIMINAL STIMULI AFFECTING ORGANISM) content, which is not repressed but merely below the threshold of consciousness, in explanations of the behavior of certain patients. In physiology, also, the laws of the threshold have been carefully established experimentally and are fundamental in explaining the reaction of nervous tissues to stimulation.

As originally conceived, the limen was a point on the scale of intensity of ideas or sensations below which they were unconscious (usually in the sense of INCOMMUNICABLE). Such a dividing line has come to seem arbitrary and valueless to many psychologists, especially to those behaviorists who consider discrimination to be the only criterion of consciousness. To them any activity of the organism is *conscious* (if the word is to be used at all), and there is no apparent distinction between actions that are *conscious* and those that are not. Speaking as a behaviorist, Lashley wrote[4] that the dynamic

[1] G. T. Fechner, *Elemente der Psychophysik* (1860), 2d ed., Leipzig: Breitkopf und Härtel, 1889.

[2] F. W. H. Myers, *Human Personality,* New York: Longmans, Green, 1903, I, 14-5.

[3] C. G. Jung, *Die Beziehungen zwischen dem Ich und dem Unbewussten,* Darmstadt: Reichl, 1928, 11-2.

[4] K. S. Lashley, The behavioristic interpretation of consciousness II, *Psychol. Rev.,* 30, 1923, 341.

features of conscious processes are in no way different from those of unconscious processes. He believed, furthermore, that theorists had established such a complicated hierarchy of states—unconscious, subconscious, preconscious, etc.—because even for introspectionists unconsciousness merged indistinguishably through this hierarchical continuum into consciousness.

A statement like Lashley's would today be contested hotly by most depth psychologists, who find between consciousness and unconsciousness (PSYCHOANALYTIC MEANING) as great a gulf as between the world of the living and the underworld of Pluto. To them these worlds are watertight compartments of the personality, communicating only at a passage guarded by a Cerberus "censor" which, unless bribed or outwitted, will let nothing through from Avernus to the light of day.

Once the psychoanalysts have told us that their unconsciousness is as different from consciousness as night is from day, however, they admit that there is a twilight between the dark and the daylight. This intermediate state, this way-station across an unbridgeable chasm, the Freudians have named *preconsciousness.* To this level unconscious (PSYCHOANALYTIC MEANING) ideas, which Freud told us[5] can never reach consciousness unaltered because they are anathema there, can pass, and from here they may slip into consciousness. Preconsciousness is a decompression chamber in which ideas, after having tunneled underground, stay awhile to have the air pressure gradually lowered until they can once again go out into the outside world without suffering "the bends." The psychoanalysts have recognized a difference between unconsciousness (PSYCHOANALYTIC MEANING) and consciousness and have desired to keep the two entirely apart, but even their most orthodox theorists have been unable to achieve this divorce and still explain all the facts.

These are the facts: On the one hand, consciousness and unconsciousness (UNAVAILABLE TO AWARENESS) are introspectively dis-

[5] S. Freud, *The Basic Writings of Sigmund Freud,* ed. A. A. Brill, New York: Random House, 1938 (*The Interpretation of Dreams*), 491.

similar. [Whether behavior is different when it is determined by conscious processes from when it is regulated by unconscious (UNAVAILABLE TO AWARENESS) processes is a problem for future chapters.] On the other hand, consciousness merges into unconsciousness (UNAVAILABLE TO AWARENESS) through imperceptible gradations like the various states considered in the last chapter.

In such a case an arbitrary distinction must be made at some point. During the month of Ramadan, when the night has worn so far into day that a black thread can be told from a white, Mohammedans must stop their feasting of the night and fast until the next dusk. Because dawn does not come up like thunder in most of the lands of Islam, the Koran decrees this ritual for making the necessary distinction between night and day. Such a ritual is the determination of the limen, which is a boundary conventionally decided upon merely because such a division is useful.

A final fact, which is abundantly illustrated in succeeding pages, is that an individual may perform actions which have no subjective representation in consciousness (COMMUNICABLE and perhaps also AWARE OF DISCRIMINATION). To strict behaviorists such a statement of lack of correspondence between discrimination and subjective experience would have no meaning. To depth psychologists the fact that the limen of consciousness differs from the limen of discrimination is of primary importance. This is their battleground.

NEUROPHYSIOLOGY OF THE THRESHOLD

Although the concept of the threshold was developed in psychology originally without any physiological basis, today any scientific interpretation of subliminal phenomena must be made in the light of the fundamental physiological data concerning the nature of the threshold, especially in neural tissues.[6] The minimal intensity of stimulation which will cause a neurone to conduct an impulse is the threshold intensity. Various nerves and single neurones differ in

[6] *Cf.* P. Bard (ed.), *Macleod's Physiology in Modern Medicine*, 9th ed., St. Louis: Mosby, 1941, 8-14.

their threshold values. If, however, a stimulus is strong enough to excite a neurone, the resulting impulse carried by the neurone will, according to the all-or-none law, be of a specific, invariable magnitude, no matter how strong the stimulus.

An important principle of subthreshold stimulation which has now received abundant proof[7] is the summation of subliminal stimuli, also known as latent addition. If two or more stimuli of subthreshold intensity reach a neurone within a brief interval, excitation can occur and an impulse can pass down the neurone. This fact indicates that the first stimulus begins some local process with which the second summates to produce the neural impulse. That several subliminal stimuli may finally cause a response has important implications for the psychological theory of unconsciousness (SUBLIMINAL STIMULI AFFECTING ORGANISM). It suggests that repetition of stimuli which appear too weak to elicit response and are unable to give rise to subjective report may still affect a person's behavior.

Another important neurophysiological discovery, now well authenticated, is that it is possible to distinguish in all somatic nerve trunks at least three types of fibers, which Erlanger and Gasser have called[8] A, B, and C fibers. The A fibers are the largest, and have the lowest threshold. The B and C fibers are smaller; the thresholds of B fibers are higher than A and of C higher than B. Composed as it is of different sorts of fibers, a total nerve trunk has more than one threshold. It is thus quite possible that stimuli which are adequate to pass the thresholds of fibers that regulate certain motor reactions might nevertheless be of insufficient intensity to excite fibers going to the level of the nervous system which is at the moment mediating consciousness.

Certain data hint that there may be such levels of functional integration of the nervous system, distinguishable by different thresholds. The present facts, however, are in conflict.

[7] *E.g.*, E. A. Blair, The effect of brief currents on axons, especially in relation to the postulated nonconducted response, *Amer. J. Physiol.*, 123, 1938, 455-70.

[8] J. Erlanger and H. S. Gasser, The action potential in fibers of slow conduction in

(*a*) Burge, Wickwire, Orth, Neild, and Elhardt studied[9] the electrical potentials of the cerebral cortex in anesthetized dogs. Under these circumstances the cortex was electropositive in relation to the sciatic nerve. As the etherization became less, this polarity was reversed, and when the anesthesia was reapplied there was a change back. This occurred repeatedly. Similar results were obtained in unconsciousness (presumably UNRESPONSIVE TO STIMULATION) from bleeding and suffocation. The authors concluded that there is a threshold potential of the cortex below which an animal loses consciousness. Since it is known that inactive tissue is electropositive and active tissue electronegative, it was assumed that consciousness is related to activity of the cortex.

(*b*) Neet experimentally compared[10] verbal, manual, and conditioned responses as methods of report in determining the threshold of auditory intensity. If the thresholds as reported by these three sorts of response differed, that would be presumptive evidence for threshold organization levels in the central nervous system. Though he found that verbal report yielded lower thresholds than either manual or one sort of conditioned response, another method of conditioned response gave about the same threshold values as verbal report. He assumed, therefore, that the nature of the response mechanism need not alter the threshold of auditory stimulation.

(*c*) Similarly, Newhall and Rodnick could find[11] no difference in visual thresholds as reported verbally, by hand key and by foot pedal.

These three researches leave unsettled the question of whether in the nervous system there are various levels of organization with different thresholds, but the definitely positive results of the first study are by no means canceled by the last two, especially since they used such widely different approaches. This is an important field for further study.

[9] W. B. Burge, G. C. Wickwire, O. S. Orth, H. W. Neild, and W. P. Elhardt, A study of the electrical potential of the cerebral cortex in relation to anesthesia, consciousness and unconsciousness, *Amer. J. Physiol.*, 116, 1936, 19-20.

[10] C. C. Neet, A comparison of verbal, manual, and conditioned-response methods in the determination of auditory intensity thresholds, *J. Exper. Psychol.*, 19, 1936, 401-16.

[11] S. M. Newhall and E. H. Rodnick, The influence of the reporting-response upon the report, *Amer. J. Psychol.*, 48, 1936, 316-25.

THE TRANSITION FROM THE PHYSIOLOGY TO THE PSYCHOLOGY OF THE THRESHOLD

The application of the physiology of the threshold to psychology is not easy. The tendency in present-day academic psychology is to consider that Fechner's discussion of "negative sensations" caused by subthreshold stimuli is of little or no importance. If a stimulus is of subliminal intensity, the argument runs, it may have some local effect on the nerve, but, since it does not produce behavior or a sensation, it need not be considered. In such a tone Boring wrote:[12]

> The phenomena of both sensation and memory follow the all-or-none principle. . . . It has been conventional to speak of 'strong subliminal associations,' as if subliminal associations were of various strengths, but the inference as to subliminal strength is indirect and uncertain. So also a sensation either occurs from stimulation or it does not. If it does not, it has no demonstrable intensity. Fechner talked about negative (subliminal) degrees of intensity, but that is not good psychology to-day. Above the limen we can sense degrees of intensity, but introspection cannot directly measure these degrees. We are forced to comparison, and there again we meet an all-or-none principle. Either we can observe a difference or we cannot. Introspection as to the amount of difference is not quantitatively reliable.

Such application of the all-or-none law not only (as it was originally formulated) to a single nerve fiber, but even to whole behavior patterns, so denying that stimuli not producing sensations or overt response have any effect on the organism,[13] has resulted in relative neglect of experimentation on unconscious (SUBLIMINAL STIMULI AFFECTING ORGANISM) behavior.

THE VARIABILITY OF THE THRESHOLD

In questions of the threshold, physiology fades imperceptibly into psychology. It has been demonstrated[14] that a lowering of the blood

[12] E. G. Boring, *The Physical Dimensions of Consciousness,* New York: Century, 1933, 219. By permission of the author and of D. Appleton-Century Company.

[13] *Cf.* R. Dodge, Theories of inhibition, II, *Psychol. Rev.,* 33, 1926, 187.

[14] J. La Barre and P. Destrée, L'influence des variations glycémiques sur la motilité astrique, *Comptes Rendus Soc. Biol.,* 103, 1930, 532-4.

sugar level in a dog will cause the stomach contractions associated with hunger to begin, and that an intravenous injection of glucose will stop them. Murphy, Murphy, and Newcomb have interpreted[15] this sort of finding to indicate that changes in blood chemistry alter thresholds of neural excitability. They believe that endocrine secretions into the blood can operate similarly, and instance the increased activity, emotionality, and general irritability characteristic of patients suffering from hyperthyroidism. Hyposecretion of the thyroid gland, conversely, acts to raise neural thresholds. Undoubtedly adrenal function, and quite likely the operation of all parts of the endocrine system affect threshold levels.[16]

Laboratory psychologists have been eager to study experimentally a wide range of conditions which alter thresholds. Some of the psychological factors which have been shown to cause variations in judgments of the presence or absence of stimuli or comparison of stimuli by human subjects are:[17] attention, difference in judgmental processes, preguessing, influence of preceding experiments, inertia, habituation of judgmental processes, changes of motivation, changes in co-operation, doubt, unsuitable criteria of judgment, and time of making judgments. If one or more of these factors operate to lower a subject's threshold, a stimulus of which he would be unconscious (SUBLIMINAL STIMULI AFFECTING ORGANISM) usually, can reach his consciousness.

Investigations relating to "Heymans's law" have brought to light other factors which affect the threshold. This "law" states that the inhibitory power of a stimulus (as measured by the intensity of a stimulus whose effect it can just completely inhibit) is proportional to its intensity. The fact that one stimulus or one impulse can inhibit another has interesting applications to the theory of unconsciousness (SUBLIMINAL STIMULI AFFECTING ORGANISM). It has frequently

[15] G. Murphy, L. B. Murphy, and T. M. Newcomb, *Experimental Social Psychology*, rev. ed., New York: Harper, 1937, 224-5.

[16] *Cf. e.g.*, G. H. Wang, The relation between 'spontaneous' activity and oestrous cycle in the white rat, *Comp. Psychol. Monog.*, 2, 1923, No. 6.

[17] *Cf.* E. G. Boring, The control of attitude in psychophysical experiments, *Psychol. Rev.*, 27, 1920, 440-52; also F. C. Thorne, The psychophysical measurement of the temporal course of visual sensitivity, *Arch. of Psychol.*, 25, 1934, No. 170.

been used, often carelessly, as a model of the mechanism of repression.

It is known that after an impulse passes along a neurone there is a period during which the neurone is refractory and will not conduct another impulse if stimulated in the same way again. In other words, one impulse can inhibit another from being conveyed by the neurone.[18] Other kinds of inhibition may occur at the junctures of neurones. It may be that subthreshold stimuli can in like manner make the neurone refractory to other stimuli, but recent research[19] makes this questionable. The following experiments show how inhibition can alter thresholds:

(*a*) Heymans with human subjects has shown[20] that simultaneously presented visual, auditory, or taste stimuli raise the visual thresholds.

(*b*) Spencer studied[21] in rats the inhibition of one visual stimulus by another simultaneously presented. He found definite individual differences in susceptibility to such inhibition.

(*c*) Spencer and Cohen,[22] using the same method as Spencer used in (*b*), discovered a large variability of the threshold of individual rats over a period of fifty days. A difference of over two hundred per cent between the highest and the lowest threshold values was found during this period. The effect of sleep and freshness upon the threshold was also definitely demonstrated.[23]

(*d*) Dodge performed experiments[24] with human subjects which showed that, under certain favorable circumstances, stimuli too faint to elicit recordable muscular contractions may, on occasion, so affect the neuromuscular system that a succeeding stimulus which would normally evoke a marked response will have no effect.

[18] *Cf.* R. Dodge, *op. cit.*, 173.

[19] E. A. Blair, *loc. cit.*

[20] *Cf.* L. T. Spencer, The concept of the threshold and Heymans' law of inhibition, I, *J. Exper. Psychol.*, 11, 1928, 88-9.

[21] *Ibid.*, 88-97.

[22] L. T. Spencer and L. H. Cohen, The concept of the threshold and Heymans' law of inhibition, II, *J. Exper. Psychol.*, 194-201.

[23] *Ibid.*, III, 281-92.

[24] R. Dodge, *op. cit.*, 182-7.

(*e*) Collier found[25] that a subliminal stimulus in the periphery of the visual field under certain conditions modifies responses, but that a cutaneous subliminal stimulus does not summate with a visual subliminal stimulus of the same shape but acts as an inhibiting distractor. This confirms "Heymans's law."

A further series of experiments also has demonstrated that the level of the threshold is affected by other stimulation, but these researches have given results contradicting "Heymans's law." These studies have shown that simultaneously presented stimuli lower, rather than raise, the threshold.

(*a*) It has been demonstrated by Kravkov and by Hartmann[26] that the acuity of one eye can be increased (*i.e.*, the threshold be lowered) when the other eye is simultaneously stimulated by a bright light. A minority of Hartmann's subjects, however, confirmed "Heymans's law" by developing diminished acuity with a light in the other eye.

(*b*) Hartmann also showed[27] that simultaneous stimulation through the auditory, olfactory, or tactual modalities is capable of increasing visual acuity.

(*c*) Beitel showed[28] that, within certain visual angles, two stimulus patches have a lower threshold when presented together than when exposed separately. The threshold decreases, moreover, as the distance of their separation is lessened. These results were interpreted to indicate that the subliminal stimuli summate.

(*d*) It has been demonstrated by Karn,[29] in research similar to Beitel's, that the intensity necessary to produce supraliminal stimulation in one patch of light diminishes as the intensity of an adjacent

[25] R. M. Collier, An experimental study of the effects of subliminal stimuli, *Psychol. Monog.*, 52, 1940, No. 236.

[26] S. W. Kravkov, Ueber eine zentrale Beinflussung der Sehscharfe, *Graefes Arch. f. Ophthal.*, 124, 1930, 76-86; also G. W. Hartmann, I. The increase of visual acuity in one eye through illumination of the other, *J. Exper. Psychol.*, 16, 1933, 383-92.

[27] G. W. Hartmann, II. Changes in visual acuity through simultaneous stimulation of other sense organs, *J. Exper. Psychol.*, 16, 1933, 393-407.

[28] R. J. Beitel, Jr., Spatial summation of subliminal stimuli in the retina of the human eye, *J. Gen. Psychol.*, 10, 1934, 311-27.

[29] H. W. Karn, The function of intensity in the spatial summation of subliminal stimuli in the retina, *J. Gen. Psychol.*, 12, 1935, 95-107.

patch of subliminal light is increased. These findings were interpreted to prove that subliminal stimuli summate.

This series of experiments seems definitely to contradict the preceding series. The only conclusion which can be reached is that the threshold can be altered, even by subliminal stimuli, but what determines the direction of alteration is not yet known.

THE STATISTICAL NATURE OF THE THRESHOLD

Many conditions within the organism and outside of it may change the threshold. By reviewing those determining conditions which have been mentioned, we may see that their effect can be either long-lasting or transient. Since they are continually in flux, the threshold will be forever changing. Any view of the threshold as a fixed and permanent level is incorrect. The limen of a single neurone may be determined with a good deal of accuracy if its environment is kept constant. The values obtained from trial to trial will vary only slightly. When an entire individual is involved in the responses necessary for determining a psychological threshold, there is great variation from trial to trial, no matter how constant an environment is maintained.

Because of this variability of the total organism, the threshold must be determined statistically. It is commonly taken to be that intensity at which the stimulation is reported to be present just fifty per cent of the times it is presented. The choice of this point is entirely arbitrary and conventional. (From time to time individual experimenters have decided to employ other statistical definitions of the threshold.) The threshold, then, is a statistically determined point in what is really a continuous function—as stimulation gradually becomes stronger it is reported more and more frequently. The conditions may all be just right at one time, so that an exceedingly slight stimulus, well below the statistical limen, is perceived. Another time a strongly intense stimulus may not be noticed. This fact has been neglected by many who have worked with the threshold of stimulation. In the rest of this chapter several researches are mentioned which have assumed improperly that because a specific stimu-

lus was below threshold intensity determined statistically, it was therefore unperceived and the observer was unconscious (SUBLIMINAL STIMULI AFFECTING ORGANISM) of it.

SUBLIMINAL PERCEPTION

Not only can subliminal stimuli by inhibition and facilitation alter thresholds, but through the years it has been demonstrated that they can affect behavior directly. Our actions are determined by many things we cannot report.

The experimentation on direct response to subliminal stimulation falls under two headings: subliminal perception and subliminal conditioning or learning. First, subliminal perception.

(*a*) In the middle of the last century Suslowa reported[30] work with the esthesiometer. The esthesiometer is essentially a compass for determining the two-point limen, sometimes two points being put down and sometimes one, and the subject being asked to tell whether he feels one or two. The limen is the distance apart the points can be before they are recognized as two rather than one. Suslowa found that under electrical stimulation esthesiometer sensitivity was lowered, even when the current was subliminal. This result seems to illustrate operation of "Heymans's law." The esthesiometer was used again much later by de Laski, who reported[31] on the basis of experiments that "subliminal separations" of the esthesiometer-points can be discriminated. By "subliminal" he meant below the statistical threshold. Stimuli below this mathematically determined point gave rise to sensations of shapes intermediate in form between one dot and two, such as a dumb-bell or a paddle. Decisions as to whether one or two points were being presented were based on the sort of shape sensed. Friedline, working on de Laski's general problem, obtained results[32] which she held to show an "extreme delicacy of discrimination" between various cutaneous patterns

[30] M. Suslowa, Veranderungen der Hautgefüle unter dem Einflusse electrischer Reizung, *Ztschr. f. Rationelle Med.*, 18, 1863, 155-60.

[31] E. de Laski, On perceptive forms below the level of the two-point limen, *Amer. J. Psychol.*, 27, 1916, 569-71.

[32] C. L. Friedline, Discrimination of two cutaneous patterns below the two-point limen, *Amer. J. Psychol.*, 29, 1918, 400-19.

below the level of the two-point esthesiometer limen, statistically determined. This delicate discrimination was probably based on those individual cases at this "subliminal" level which were actually strong enough to be perceived.

(*b*) Another sort of experimentation on subliminal perception was begun by Peirce and Jastrow, who reported[33] experiments with weights less than one *j.n.d.* apart. (A *j.n.d.*, or *just noticeable difference*, between weights is the increase in mass which on the average is necessary to make one stimulus weight just recognizably heavier than another. In any given case, however, sensory acuity might be so increased that less than one j.n.d. could be perceived.) They discovered that judgments of which was heavier were more often right than wrong, though made with no confidence whatsoever. This result has been amply borne out since that time. The difficulty with considering this to be true subliminal perception is that half of the cases could be guessed correctly by chance, and clues on only a few others would give Peirce and Jastrow's results. These clues could be obtained in those cases in which, owing to the constant fluctuations of determinants of the threshold, sensory acuity might be so increased that less than one j.n.d. could be perceived.

Fullerton and Cattell,[34] investigating the lifting of weights of almost identical mass, asked their subjects to judge whether one was heavier or lighter than the other. They were then asked to rate the degree of their confidence in this judgment either *a* (certain), *b* (less confident), or *c* (uncertain). The subject was nearly always right when he was willing to say *a*, less frequently right with *b*, and still less frequently with *c*. Even when the judgment was of the *c* rating and little confidence was felt, he was more likely to be right than wrong. Similar findings resulted from judging comparative intensities of visual stimuli. While working with judgments of weight, whenever the subjects thought that two weights were equal, Urban[35]

[33] C. S. Peirce and J. Jastrow, On small differences in sensations, *Mem. Nat. Acad. Sci.*, 3, 1884, 73-83.

[34] G. S. Fullerton and J. McK. Cattell, On the perception of small differences, *U. of Penna. Pub., Philos. Series*, 1892, No. 2.

[35] F. M. Urban, *The Application of Statistical Methods to the Problems of Psychophysics*, Philadelphia: Psychological Clinic Press, 1908, 99-100.

made them guess whether one was heavier or lighter than the other. He found that, although the weights were to all intents and purposes subjectively equal, when they guessed on the basis of the differences which were too small to be perceived, their percentage of correct judgments was better than chance. These last two studies prove their point much more satisfactorily than did the work of de Laski, of Friedline, or of Peirce and Jastrow, for they include subjective evidence that the weights on which guesses were made were perceived as the same.

(*c*) Sidis reported[36] four series of experiments. In the first series he was the subject, using only his right eye, which had diminished vision. Though he could not distinguish the shapes he saw with it, he guessed correctly in 71.5 per cent of the cases whether a character presented was letter or figure, so that his results were 21.5 per cent above chance. In the second series, he guessed both whether the object was letter or figure and also what the specific figure was, with successes well above chance. In the third series, he got like results from subjects with normal vision when cards bearing the characters were held at such a distance that the subjects said that they could not differentiate the characters. In the final series, proper names on cards held at a like distance were distinguished better than could be accounted for by chance. Sidis stated[37] that "all these experiments tend to prove the presence within us of a secondary subwaking self that perceives things which the primary waking self is unable to get at." He said[38] that by *self* he meant no reference to a person, but "mere consciousness." He developed a whole theory of the threshold concerning normal and abnormal psychological phenomena. In this he defined the subconscious as "consciousness below the threshold of attentive personal consciousness." It is apparent that he referred to thresholds of *psychic states* and not to neurological limens. He believed[39] that James agreed with his general point of

[36] B. Sidis, *The Psychology of Suggestion,* New York: Appleton, 1898.

[37] *Ibid.,* 171. By permission of D. Appleton-Century Company.

[38] B. Sidis, The theory of the subconscious, *Proceedings Soc. Psychical Research,* 26, 1912, 319.

[39] *Ibid.,* 319-20.

view. A like attitude has been expressed by Horst[40] within recent years.

Stroh, Shaw, and Washburn reported[41] their modifications of Sidis's experiments. With slightly better control they repeated his experiment in letter differentiation, and also whispered the letters subliminally. The letters *A* to *J* were used. All the results corroborated Sidis and indicated subliminal perception. It may have been that general outlines of the letters used could be seen and that *C* and *G* would, for instance, appear different from *I*. This differentiation might explain the fact that these results were above chance. Coover performed[42] a well-controlled experiment based on Sidis's and Stroh, Shaw and Washburn's procedure and found that subliminal cues can be used unconsciously (INCOMMUNICABLE) by subjects to produce "better-than-chance" results in guessing what dimly seen or poorly heard stimuli are. Pillai repeated[43] work of this general nature, which was reported in 1939. Typewritten letters too small to be discriminated were shown to some subjects; to others the names of letters were whispered subliminally. Forty subjects in the visual experiment made a total of 10,125 guesses, and sixty subjects in the auditory experiment made altogether 13,500 guesses. All achieved scores significantly above chance. Scores improved as the intensity of stimulation increased. There was no evidence of improvement with practice in the ability to guess. (Learning with practice in a like situation was found in the experiments of the author to be considered in the next section of this chapter.)

(*d*) In a study of the use of the divining rod, Barrett and Besterman concluded[44] that the movements of the rod were due to the diviner's unconscious (INVOLUNTARY) movements of his muscles resulting from his unconscious (UNAWARE OF DISCRIMINATION) per-

[40] L. v. d. Horst, Het onderbewuste, *Ned. Tijdschr. Psychol.*, 5, 1937, 183-93 (not viewed).

[41] M. Stroh, A. M. Shaw, and M. F. Washburn, A study in guessing, *Amer. J. Psychol.*, 19, 1908, 243-5.

[42] J. E. Coover, *Experiments in Psychical Research at Leland Stanford Junior University*, Stanford: Stanford University Press, 1917 (not viewed).

[43] R. P. B. K. Pillai, A study of the threshold in relation to the investigations on subliminal impressions and allied phenomena, *Brit. J. Educ. Psychol.*, 9, 1939, 97-8.

[44] W. Barrett and T. Besterman, *The Divining-Rod*, London: Methuen, 1926, 275.

ception of the object searched for. There has been much evidence produced by Faraday and others[45] that the class of phenomena which includes the motions of the Ouija board and spirit-rapping is to be explained by such involuntary movements of suggestible individuals. A similar interpretation can be made of the parlor game with the so-called sex-determiner, a pendulum which, when held in the hand, swings in an arc over a male and in a circle over a female. (If the person suspending the pendulum gets the directions wrong, so will the "sex-determiner.") The phenomenal achievements of the "mind-reading" horse, Clever Hans,[46] can be explained by signals sent by means of muscular motions of small magnitude which may have been involuntary. Kennedy referred[47] to various cases of telepathy, some of which have gained a great deal of notoriety, which it either has been proved or is highly probable can be explained by perceptions of involuntary minimal muscular cues.

(*e*) In 1895 Hansen and Lehmann suggested[48] that unconscious (INVOLUNTARY) whispering cues explained the thought transference of experiments of the Sidgwicks and Smith.[49] When the sender was in the same room as the receiver, the results obtained were better than chance, but when the two subjects were not in the same room the results were not above chance. To investigate the basis for auditory cues, Hansen and Lehmann set up two parabolic sound reflectors with the sender seated in the focus of one reflector and the receiver in the focus of another at some distance away. Much as in a whispering gallery, sounds made involuntarily by the sender could be heard easily by the receiver. When the sender, knowing the purpose of the experiment, tried to whisper very quietly, the messages were received with significantly better than chance accuracy. Hansen and Lehmann also found that the mistakes made in their experiment

[45] *Cf.* J. L. Kennedy, A methodological review of extra-sensory perception, *Psychol. Bull.*, 36, 1939, 60-1.

[46] O. Pfungst, *Clever Hans*, trans. C. L. Rahn, New York: Holt, 1911.

[47] J. L. Kennedy, *op. cit.*, 61-2.

[48] F. C. C. Hansen and A. Lehmann, Ueber unwillkürliches Flüstern, *Philos. Studien*, 11, 1895, 471-530.

[49] H. Sidgwick, Mrs. H. Sidgwick, and G. A. Smith, Experiments in thought-transference, *Proceedings Soc. Psychical Research*, 6, 1889, 128-70.

were much like those of the Sidgwick-Smith experiment, apparently because of the ambiguity of the slight auditory cues. Kennedy recently has repeated[50] the Hansen-Lehmann experiments with some modification. The senders did not know of the reflectors and were blindfolded before they were taken into the room to be seated in front of the reflector. There they concentrated intently upon the material they were to transfer. The receivers knew the plan of the experiment, and found that the senders made audible cues which were unconscious (INVOLUNTARY).

(*f*) Dunlap[51] in an early experiment used a modification of the Müller-Lyer illusion in which the angular lines were subliminal shadows. (This illusion in its normal form consists of two horizontal lines of equal length drawn one below the other. One has angular lines running in from the tip toward the center of the line like a double arrowhead, and the other has angular lines of the same length running out like arrowheads pointing at the tips of the line. Although both horizontal lines are of the same length, the first one, with the arrowheads pointing outward from the center of the line, almost invariably appears to be shorter than the other.) Dunlap found that the illusion was present, though slight, under his conditions.

Titchener and Pyle repeated[52] Dunlap's experiment with the Müller-Lyer illusion and reported opposite results. They added, further, that they could not find any correlation between the degree of imperceptibility of the arrowheads and the strength of the illusion. Manro and Washburn[53] made cards of the Müller-Lyer illusion with inked horizontal lines and lightly penciled arrows. Following Sidis's procedure, these workers exposed the stimuli at such a distance that the penciled lines were not visible to the subjects. Of ten

[50] J. L. Kennedy, Experiments on "unconscious whispering," *Psychol. Bull.*, 35, 1938, 526. *Cf.* also J. L. Kennedy, A methodological review of extra-sensory perception, *op. cit.*, 63.

[51] K. Dunlap, Effect of imperceptible shadows upon the judgment of distance, *Psychol. Rev.*, 7, 1900, 435-53.

[52] E. B. Titchener and W. H. Pyle, Effect of imperceptible shadows on the judgment of distance, *Proceedings Amer. Philos. Soc.*, 46, 1907, 94-109; also *Amer. J. Psychol.*, 18, 1907, 388.

[53] H. M. Manro and M. F. Washburn, Effect of imperceptible lines on judgment of distance, *Amer. J. Psychol.*, 19, 1908, 242.

subjects, eight got no illusion, and two got some. Of 1,370 judgments, 700 favored the illusion. The authors came to the questionable conclusion that these results confirmed those of Titchener and Pyle. Several years later a student of Hollingworth's carried on an experiment[54] using essentially Manro and Washburn's procedure, and found that seventeen out of twenty subjects got the illusion. These findings were interpreted to indicate wide individual differences in susceptibility to the suggestion of the illusion. Bressler[55] more recently constructed a Müller-Lyer illusion with gray papers, making the arrows of grays less than one just noticeable difference different from the background. He discovered that the Müller-Lyer illusion was effective even when the arrows were not visible to the subject. The strength of the illusory effect varied directly with the intensity of the arrows. Presuming that these results are the most recent on the problem of the Müller-Lyer illusion, we may figure the score at present to stand at approximately three to one against Titchener and Pyle, with one tie. The subliminal stimuli win.

(*g*) Newhall and Dodge have reported[56] that under certain conditions colored after-images can result from "subliminal" chromatic stimuli. In their experiments the stimuli were not seen because they were first presented at a definitely subthreshold intensity and then slowly made brighter—so slowly that adaptation occurred to the brightness and the color could not be seen. If the light was brought to this intensity rapidly, color could be seen. This question has been subjected to repeated experimental study.[57]

(*h*) In 1904 Dunlap reported[58] discovering that subjects perceived the interruption of inaudible sounds.

(*i*) Recently three similar experimental investigations of discrimination between subliminal stimuli have been carried on. Baker

[54] *Cf.* H. L. Hollingworth, *Advertising and Selling,* New York: Appleton, 1913, 229-32.

[55] J. Bressler, Illusion in the case of subliminal visual stimulation, *J. Gen. Psychol.,* 5, 1931, 244-50.

[56] S. M. Newhall and R. Dodge, Colored after images from unperceived weak chromatic stimulation, *J. Exper. Psychol.,* 10, 1927, 1-17.

[57] *Cf. ibid.,* 2.

[58] K. Dunlap, Some peculiarities of fluctuating and inaudible sounds, *Psychol. Rev.,* 11, 1904, 308-18.

used[59] both auditory and visual modalities. In the auditory he had the subjects distinguish between subliminal dots and dashes; in the visual, between subliminal perpendicularly crossed lines in the "plus" and "multiplication sign" positions. He concluded from his results in both sensory modalities that the verbal behavior of each subject was influenced by stimuli that were "below the conscious judgment threshold." He believed that therefore thresholds of consciousness (COMMUNICABLE) are higher than physiological thresholds. Finally, Baker stated that his findings showed that the influence of subliminal stimuli on behavior increases as a function of the intensity of the stimulation.

Williams has reported[60] that he projected from the rear upon a ground glass screen three geometric figures (circle, triangle, square). He presented these figures 594 times to eleven inexperienced subjects in a prearranged order, showing each figure an equal number of times. They were projected at an intensity below the limen. The subjects reported which figure they thought of while looking at the screen. Williams then chose the four subjects with the highest scores for a second experiment. To each of these he presented eight series of twenty-seven figures each, every series at a different level of subliminal intensity, and then 108 control figures at zero illumination. He had the subjects report the degree of confidence with which they guessed what the figure was: 1 = image seen clearly; 2 = doubt, but something seen; 3 = pure guess, nothing seen. In tabulating the results, only figures below the limen which gave rise to "3" judgments were considered. The subjects were therefore unconscious of the figures in two senses (SUBLIMINAL STIMULI AFFECTING ORGANISM and UNABLE TO COMMUNICATE). All the results were well above chance frequency, except in the control trials with no illumination, when the results were of chance frequency. The experimenter reported that no relation between the number of correct calls and the intensity of the subliminal stimulation could be discovered.

[59] L. E. Baker, The influence of subliminal stimuli upon verbal behavior, *J. Exper. Psychol.*, 20, 1937, 84-100.

[60] A. C. Williams, Jr., Perception of subliminal visual stimuli, *J. Psychol.*, 6, 1938, 187-99.

An experiment by the author also showed[61] that a subject is capable of being unconscious (SUBLIMINAL STIMULI AFFECTING ORGANISM and UNABLE TO COMMUNICATE) and conscious (DISCRIMINATING) of the same thing at the same time. In this research five different geometrical figures were projected upon the back of a transparent mirror at a subliminal intensity. The subject, sitting on the other side of what appeared to him to be an ordinary mirror, did not know that the images were being projected at a low intensity through it. He was told to use the mirror like a crystal to help him in the telepathic experiment (guessing the geometrical figures) which he was to perform. Two types of subjects, naïve (who did not know that the figures were projected) and sophisticated (who did know), were used. It was found that for both sorts of subjects the effect of the projected figures in improving the guesses was demonstrable at a lower illumination than that at which communicable consciousness of images on the mirror developed. It was found that, as the illumination was increased, the correctness of calling the cards also increased, even though the subject was unconscious (UNABLE TO COMMUNICATE) of the figures on the screen. When the naïve subjects finally learned at the end of the experiment that they were seeing real images on the mirror, they showed reactions of surprise, whose significance is considered in Chapter VIII.

Though, as has been pointed out, several of this series of researches have serious faults, their total effect is to show beyond doubt that subliminal stimuli affect behavior.

SUBLIMINAL CONDITIONING AND LEARNING

That unconscious (SEVERAL MEANINGS) learning exists will be repeatedly demonstrated in this and succeeding chapters. In this chapter the evidence concerning unconscious (SUBLIMINAL STIMULI AFFECTING ORGANISM) learning and conditioning will be reviewed. Cason and Katcher in 1933 said:[62] "Although it has been demon-

[61] J. G. Miller, Discrimination without awareness, *Amer. J. Psychol.*, 52, 1939, 562-78.

[62] H. Cason and N. Katcher, An attempt to condition breathing and eyelid responses to a subliminal electric stimulus, *J. Exper. Psychol.*, 16, 1933, 831-42.

strated that subliminal stimuli can influence bodily activities, it has not yet been shown that a connection can be formed between a subliminal stimulus and a conscious or unconscious response by the process of learning." This statement followed their unsuccessful attempts to condition breathing or eyelid responses to a subliminal electric shock.

(*a*) In the same year, Newhall and Sears reported[63] finding that finger withdrawal can be conditioned to stimuli below the statistical psychophysical limen, but they were uncertain whether this conditioning is accompanied by consciousness (COMMUNICABLE). There was, of course, no certainty that the subjects were unconscious (SUBLIMINAL STIMULI AFFECTING ORGANISM) of the stimuli just because they were below the mere statistical psychophysical limen.

(*b*) Silverman and Baker tried[64] unsuccessfully to condition to a subliminal shock an increase in breathing or in foot pressure. In three out of twelve subjects, however, increased frequency of the eyelid response was conditioned, and two of these were reconditioned later. The subjects had no idea that they were receiving electric shocks. Neet claimed[65] to have corroborated part of this work.

(*c*) More recently Baker reported[66] successful conditioning of the pupillary response below what he referred to as "the absolute limen of awareness of the stimulus," which is lower than the statistical psychophysical limen that was used by Newhall and Sears. It is the lowest intensity at which it is ever possible to be conscious (ABLE TO COMMUNICATE) of a stimulus. Therefore no stimuli involved in the development of this conditioning were perceived.

A careful reduplication of Baker's experiment by Wedell, Taylor, and Skolnick showed[67] no pupillary conditioning to subliminal audi-

[63] S. M. Newhall and R. R. Sears, Conditioning finger retraction to visual stimuli near the absolute threshold, *Comp. Psychol. Monog.*, 9, 1933, No. 43.

[64] A. Silverman and L. E. Baker, An attempt to condition various responses to subliminal electrical stimulation, *J. Exper. Psychol.*, 18, 1935, 246-54.

[65] C. C. Neet, A comparison of verbal, manual, and conditioned-response methods in the determination of auditory intensity thresholds, *J. Exper. Psychol.*, 19, 1936, 401-16.

[66] L. E. Baker, The pupillary response conditioned to subliminal auditory stimuli, *Psychol. Monog.*, 50, 1938, No. 223.

[67] C. H. Wedell, F. V. Taylor, and A. Skolnick, An attempt to condition the pupillary response, *J. Exper. Psychol.*, 27, 1940, 517-31.

tory stimuli such as he reported. Of course these negative findings do not disprove his work, but they reopen the whole question.

(*d*) In 1940 the author reported[68] a study of unconscious (SUBLIMINAL STIMULI AFFECTING ORGANISM) learning in which he used the same transparent mirror apparatus described above (p. 153). The geometrical figures were projected through the mirror at subthreshold intensity, and the subjects looking at the mirror guessed figures one by one, entirely unconscious (UNABLE TO COMMUNICATE) that the images were actually being projected through the screen. After each guess they were told whether the call had been right or wrong. Various motivations to learning were used: the desire to please the experimenter; apparent increasing success; monetary reward and punishment; and punishment by electric shock together with reward by praise. It was found that under the last motivation subjects could improve steadily in learning to call the cards. This experiment showed that one can learn to respond to stimuli below the absolute limen which Baker used rather than the statistical threshold.

In summing up the preceding group of researches we may say that it is uncertain whether conditioning can be developed upon subliminal stimulation but it has been demonstrated that learning can be.

SUBLIMINAL STIMULATION IN EVERYDAY LIFE

Certain experiments illustrate the effect of subliminal stimulation on the activity of the whole individual as it is seen in ordinary life.

(*a*) In 1912 Dunlap stated, presumably on the basis of his own experience:[69]

> The effect of the subconscious perception may be demonstrated, even when recall is impossible. If you present to a subject a number of cards containing simple marks or designs, some of which he has previously seen subconsciously, and if you ask him to choose several

[68] J. G. Miller, The rôle of motivation in learning without awareness, *Amer. J. Psychol.*, 53, 1940, 229-39.

[69] K. Dunlap, *A System of Psychology*, New York: Scribner's, 1912, 330. By permission of Charles Scribner's Sons.

> from the number, he will be apt to choose the ones which were previously seen. . . . [This is a typical experimental procedure] for demonstrating the existence of subconscious perception.

It is hard to tell whether by saying the subject had seen the cards subconsciously before, Dunlap meant that they were subliminal, unattended to, or forgotten.

(*b*) Wolff did research[70] in which the subject's own voice, profile, shape, picture of hands, mirrored writing, and other forms of expression were presented to him for comparison with similar forms of expression by other subjects. In many cases the subject did not recognize that these were his own. For instance only sixteen per cent of the judges recognized their voices as their own. Nevertheless, the individual usually judged his own forms of expression more favorably than he judged the average of the others. Seldom would he be neutral about judgments of his own forms of expression; sometimes he rated them most unfavorably. Huntley has repeated[71] Wolff's work under much more carefully controlled conditions. He was able to get photographs of the hands and part and full profiles of the subject as well as a record of him reading a story, without his being aware that they were made. Also a sample of handwriting was taken. Huntley called all these "forms of expression." Six months later these forms of expression were presented to each of the subjects for judgment in comparison with a series of the same forms from others. Each subject was asked to rate the forms of expression of each series in order of preference. Definite statistical evidence was obtained that showed that in a predominant number of cases a subject preferred his own form of expression. It was found, however, by asking the subject when recognition of any of the forms had taken place, if at all, that in many of the cases he had been unconscious (UNABLE TO COMMUNICATE) that his own form of expression was in the series. On several occasions a subject,

[70] W. Wolff, Selbstbeurteilung und Fremdbeurteilung im wissentlichen und unwissentlichen Versuch, *Psychol. Forsch.*, 16, 1932, 251-328. *Cf.* also W. Wolff, The experimental study of forms of expression, and W. Wolff, Involuntary self-expression in gait and other movements, *Character and Personality*, 2, 1933, 168-76 and 3, 1935, 327-44, respectively.

[71] C. W. Huntley, Judgments of self based upon records of expressive behavior, *J. Abnorm. and Soc. Psychol.*, 35, 1940, 398-427.

on being told that one of the forms was his own, showed evidence of surprise. Even when the subject was asked to point out his own form of expression, he was frequently unable to do it. This fact is proof that the differentiating characteristics were in these cases subliminal. The ability of the judge to identify positively his own forms from among other similar ones ranged from forty-eight per cent for the hands, which was highest, to thirty-nine for the recording of his voice, which was lowest. Why a subject rated his own forms of expression higher than others', and why (as Huntley found) this rating was more extreme when he was unconscious (UNABLE TO COMMUNICATE) that he was rating his own, are interesting questions of unconscious (INHERITED?) motivation worthy of study to see why the presence of consciousness thus alters behavior.

This research is of significance here to show that, in terms of the complicated behavior of individuals almost at the clinical level, it can be definitely demonstrated that a person may be unconscious (SUBLIMINAL STIMULI AFFECTING ORGANISM) and conscious (DISCRIMINATING) at the same time. The experience which Hankin related concerning his observation of the flight of birds, Case VII of Chapter II (p. 53), is another excellent example of this apparently paradoxical condition.

Practical clinical insight into the nature of psychological phenomena usually keeps well ahead of the discoveries of the laboratory. In this tradition Jung more than a decade ago saw the ramifications which the notion of the subliminal can take. He wrote:[72]

> The unconscious has also still another aspect: within its compass are included not only the *repressed* content but also all such psychical material as does not reach the threshold of consciousness. It is impossible to explain the sub-threshold character of all this material by the principle of repression, otherwise a man, at the release of repression, would certainly achieve a phenomenal memory that forgot nothing.
>
> We call attention to the fact that, besides repressed material, everything psychic which has become subliminal is found in the uncon-

[72] C. G. Jung, *Die Beziehungen zwischen dem Ich und dem Unbewussten,* Darmstadt: Reichl, 1928, 11-2. (Author's translation.)

> scious, including subliminal sense perception. Moreover, we know, not only from clinical experience but also on theoretical grounds, that the unconscious also contains that material which has not yet reached the threshold of consciousness.

Here Jung recognized that sense perceptions can be subliminal, but he also contended that memories can fade away so that they no longer can pass the threshold of consciousness and be recalled. Also he made reference to unconscious (PSYCHOANALYTIC MEANING?) content, presumably the hidden drives, instincts, and wishes of which the psychoanalysts speak, which have never reached the threshold of consciousness. Thus unnoticed stimulation, forgetting, and hidden drives and wishes can all be interpreted in terms of the limen.

CONCLUSIONS

Physiological studies of neural thresholds have proved that stimulation must attain a certain minimal intensity if it is to affect a person at all. Below that strength it cannot pass through sense receptors and over afferent neurones. Psychological investigations have shown that above a certain higher intensity of stimulation a person is conscious (ABLE TO COMMUNICATE) of the stimulus. Between these two intensities is a range which the individual can perceive and learn to discriminate even though he is unconscious (UNABLE TO COMMUNICATE) of the stimuli. Until an oncoming train has reached a certain point a signal light will not be bright enough to affect the engineer; then it may determine his behavior even though he cannot tell of seeing it. Finally, perhaps after his hand has reached the air brake, he will become aware of it. The structure and function of the nervous system arbitrarily determine what part of the environment, which is constituted of imperceptible gradations of stimulation, may reach the various levels of nervous integration.

CHAPTER VII

INATTENTIVE UNCONSCIOUSNESS

As there is continuity between the conscious and unconscious (UNRESPONSIVE TO STIMULATION) states, and as there is a continuum above and below the limen, so are there imperceptible gradations between the focus and the margin of attention. This is the difference between the consciousness and subconsciousness of the French school of clinical psychologists and of certain academic theorists. Dunlap expressed this position[1] when he equated the term *subconsciousness* with inattention and said that the degrees of consciousness are degrees of vividness, clearness, or attention.

Freud stated that in distinguishing consciousness and preconsciousness he, too, recognized a gradation of attention. He carefully explained, though, that this is not the same as the difference between consciousness and unconsciousness (PSYCHOANALYTIC MEANING). His most illuminating statement on attention was included in the development of his theory of humor:[2]

> The comic process cannot stand examination by the attention, it must be able to proceed absolutely unnoticed in a manner similar to wit. But for good reasons, it would contradict the nomenclature of "conscious processes" which I have used in *The Interpretation of Dreams*, if one wished to call it of necessity *unconscious*. It rather belongs to the *foreconscious* [*i.e.*, preconscious], and one may use the fitting name "automatic" for all those processes which are enacted in the foreconscious, and dispense with the attention cathexis which is connected with consciousness.

MOTOR ASPECTS OF ATTENTIVE CONSCIOUSNESS

Closely related to attention, perhaps its outward manifestation, is the phenomenon of set. Set is a condition of the individual which

[1] K. Dunlap, *A System of Psychology*, New York: Scribner's, 1912, 293.

[2] S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill, New York: Random House, 1938 (*Wit and Its Relation to the Unconscious*), 791. By permission of Random House, Inc.

results in the facilitation of a certain activity. It is abundantly illustrated in everyday life. It is seen in the dog, trained not to touch food without his master's permission, that stands gazing intently at the food, tense and often quivering, keyed to react only to his master's voice and the food. That it is difficult to distract by peripheral stimulation an animal so set is objective proof of the inhibition of extraneous parts of the environment not related to the focus of the set.

Certain muscular or motor concomitants characteristically accompany attention and constitute the objective criteria of attention which are often called *set*. Pillsbury has listed them, as follows:[3]

(*a*) Adjusting the sense organs in order best to receive the stimulus. Examples of this are fixing the gaze on a speaker and turning the head to locate a sound.

(*b*) Contractions of muscles of the legs and trunk which have been found to help in perceiving similar stimulation in the past. A case of this is the tendency of a football crowd to lean toward the goal line which their team is trying to cross.

(*c*) Diffuse contractions of muscles throughout the body which will not aid in the reception of stimulation. Tuttle has proved experimentally,[4] for instance, that the knee-jerk is greater than normal during periods of attention to problem solving.

(*d*) Alterations in respiratory and circulatory processes. These changes vary with the type of stimulus which causes the attentive reaction. The pattern of action of a startled person has typical circulatory and respiratory characteristics, and the common phrase "breathless attention" recognizes another sort of respiratory concomitant.

In these motor concomitants has been found a basis for motor theories of attention, which have much in common with the motor theories of consciousness discussed in Chapter IV. We have seen that one sense of *unconscious* is UNATTENDING, and attention has often been equated with consciousness.

[3] W. B. Pillsbury, *Attention*, New York: Macmillan, 1908, 25.

[4] W. W. Tuttle, The effect of attention or mental activity on the patellar tendon reflex, *J. Exper. Psychol.*, 7, 1924, 401-19.

Tuttle's research mentioned above constitutes an experimental evidence that motor activity is closely related to attentive consciousness, and so does a research of Freeman's.[5] He arranged a mechanism of levers and optical systems which made sensitive records of the motions of important muscles of the legs and arms. The results showed that these muscles of the subject were under increased tension when his attention was set to receive sounds or electric shocks, or when he performed mental arithmetic. This tension was present even in muscles not directly employed in any of the operations. Weber experimentally confirmed[6] the commonly recognized fact that during attention there are such diffuse muscular tensions as wrinkling the brow and clenching the teeth. Weber's subjects showed these reactions after achieving, despite strong distraction, tasks requiring undivided attention.

Long before this research was done, in the Victorian era of taffeta petticoats, many an experienced speaker could determine how much he was interesting his audience by listening to the rustling caused by many slight motions. If the attention of his audience was not sufficiently intense, many motions would not be inhibited; but if his auditors were spellbound, there would be complete silence.

While it is difficult not to hold the belief that muscular tenseness facilitates attentive consciousness, it is hard to set up a situation that will conclusively prove it. There is no doubt that tenseness accompanies mental activity[7] and that relaxation occurs concomitantly with diminished thought processes.[8] Which is cause and which effect, however, is hard to determine. One sort of approach to the question was followed by Bills,[9] who had subjects squeeze in both hands dynamometers measuring the strength of their grips at the same time as they memorized, added, or read disconnected letters

[5] G. L. Freeman, The spread of neuro-muscular activity during mental work, *J. Gen. Psychol.*, 5, 1931, 479-94.

[6] H. Weber, Untersuchungen über die Ablenkung der Aufmerksamkeit, *Arch. f. ges. Psychol.*, 71, 1929, 185-260.

[7] *Cf., e.g.*, G. L. Freeman, Changes in tonus during completed and interrupted mental work, *J. Gen. Psychol.*, 4, 1930, 309-34.

[8] E. Jacobson, *Progressive Relaxation*, Chicago: University of Chicago Press, 1929, 164-89.

[9] A. G. Bills, The influence of muscular tension on the efficiency of mental work, *Amer. J. Psychol.*, 38, 1927, 227-51.

as rapidly as possible. These tasks were done better under these conditions than when the hands were relaxed. Other workers[10] have been unable to corroborate Bills' finding that mental work under muscular tension is consistently better than under relaxation. The difficulty is that each person may well have an optimum muscular tension which he habitually maintains, and that deviation in either direction from the optimum would diminish his efficiency.

It is still to be demonstrated whether or not muscular activity increases attention. In some way, however, there must be a relationship between motor and attentive processes. There are at present no certainties about this relationship, but only pregnant hints like the following: (*a*) Clenching the fists increases the knee-jerk. (*b*) Attention to a task increases the knee-jerk. (*c*) Attention accompanies muscular tenseness. It would seem to follow from these three facts that attention is a sort of selective facilitation by a level of the central nervous system of certain functions of the organism. Surely inhibition of most extraneous stimuli and facilitation of the relevant few constitute one of the major rôles of the observable set which usually accompanies attention. Beyond these vague statements nothing with empirical foundation can be said at present about the motor aspects of attentive consciousness.

THE TYPES OF ATTENTIVE CONSCIOUSNESS

Certain psychologists who accept as valid only objective evidence insist that attention is merely the outwardly observable set, "the degree of the sensorimotor adjustment of the organism with respect to a particular stimulus."[11] They are unwilling to believe such adjustments are merely outward concomitants of a subjective state. Johnson, for instance, has written[12] that he could see "no reason why a description of attentive behavior, made in strictly objective

[10] E. N. Zartman and H. Cason, The influence of an increase in muscular tension on mental efficiency, *J. Exper. Psychol.*, 17, 1934, 671-9; also H. Block, The influence of muscular exertion upon mental performance, *Arch. of Psychol.*, 29, 1936, No. 202.

[11] H. M. Johnson, The definition and measurement of attention, *Amer. J. Psychol.*, 36, 1925, 601. By permission of the *American Journal of Psychology.*

[12] *Ibid.*, 606. By permission.

terms, need be accompanied by a discussion of clearness of content, to complete the exposition of facts relative to the former topic."

One sort of argument that attention has no meaning except in objective terms is illustrated by the following quotation from Boring:[13]

> Attention is reportability. It is limited by the range of the organizations that underlie report. It is determined by whatever determines these organized neural activities. It is ever changing with the change of such organization under the physiological laws of rapid growth and decay.
>
> Whatever conscious content can be easily reported is focal and available to introspection. What cannot be reported at all is unconscious.

If what is reportable is conscious and what is not is unconscious (INCOMMUNICABLE), then it is this objective criterion that distinguishes consciousness (ATTENDED) from unconsciousness (UNATTENDED). This is not the only sense of consciousness whose presence must be indicated by communication (usually verbal). All determinations of limen depend upon communication. It is not the "sheer reportability" but the meaning of the words of the report that attests the presence of a specific sort of consciousness. The passenger may be able to report the supraliminal sound of the bell of the locomotive pulling out from the station, though at the same time his attention may be directed entirely to the disappearing figures of his friends. In such matters reliance must be put upon the significance of the words used in introspection, and not merely on the objective fact that a communication takes place.

Introspectively two types of attention have been differentiated, attributive clearness (*Klarheit*) and cognitive clearness (*Deutlichkeit*). All one's powers of attention (*Klarheit*) may be concentrated upon the perception of a stimulus which, because it is vague or complex or only rapidly viewed, is not comprehended and so lacks cognitive clearness (*Deutlichkeit*). It is a common experience for English pilots to attend with all their capacity through a blanketing

[13] E. G. Boring, *The Physical Dimensions of Consciousness*, New York: Century, 200. By permission of the author and of D. Appleton-Century Company.

fog to dim beams from a lighthouse so shrouded that the light may be seen only intermittently. Titchener first recognized that:[14] "A process may be traversing the very centre of consciousness, and therefore from the point of view of a psychology of attention may be maximally clear: yet it may be so weak, so brief, so instable, that its whole character is vague and indefinite."

A lengthy battle has been waged over the question of whether Titchener and his followers were correct when they differentiated the two kinds of attention, *Klarheit* and *Deutlichkeit.* The problem arises again later in this chapter in the discussion of levels of attention, but it can be said here that the majority of psychologists today interpret the evidence to show that there is subjectively only one sort of attention.

THE ECONOMY OF ATTENTIVE CONSCIOUSNESS

To anyone interested in unconsciousness (UNATTENDED), two major facts are of outstanding importance beyond all the others that are known: (*a*) attention may be directed toward more than one thing, but its range is limited; and (*b*) attention shifts. If the jury is attending to the attire of the pretty young woman on the witness stand, it is safe to presume that they are not carefully analyzing her testimony. Apparently if one thing is to be done most effectively, others must be pushed temporarily toward the margin of consciousness. Phenomena occur unconsciously (UNATTENDED) because of this principle of economy of the organism—the greatest vigilance is at one level of the nervous system, the attention on one thing, and whatever other acts occur are relatively or completely automatic. We all have an unconscious (UNATTENDED; NOT INVOLVING INSIGHT; UNREMEMBERED—suppressed or repressed; UNLEARNED; INCOMMUNICABLE; IGNORED; PSYCHOANALYTIC MEANING) selective mechanism, our able receptionist—meeting all visitors; turning away some; allowing some to wait; permitting a few to enter one at a time—in all this subservient to her employer's desires.

[14] E. B. Titchener, *Lectures on the Experimental Psychology of the Thought-Processes,* New York: Macmillan, 1926, 17. By permission of The Macmillan Company, publishers.

THE LIMITED RANGE OF ATTENTIVE CONSCIOUSNESS

The original experiments measuring the range of attention dealt with thresholds of sensory apprehension rather than true attention. Hamilton in the last century found,[15] for instance, that if one estimates at a glance the number of several marbles thrown on the floor, no more than six or seven can be consistently counted correctly after one rapid viewing. He thought that the largest number that can be called correctly is the span of attention. It is now generally recognized that this is the span of visual apprehension of number and has no more relation to attention than has any other sensory act.

Glanville and Dallenbach have tried more recently[16] to find out, not how many objects may be visually apprehended at once, but how many may have attentive clearness at one time. They showed to their subjects in a short-exposure apparatus various numbers of geometric figures, and found that for one subject attentive clarity was affected by the number of figures exposed, but for the two other subjects there was no relation between the number of figures and whether they were all attentively clear. It was therefore concluded that the number of objects is not what compels certain parts of an observed field to be attentively more clear than others. These authors decided on the basis of this work that attentive consciousness is always a unified whole, and in this sense its range is always "one."

This conclusion of the singleness of attention forces one to remember that it is nevertheless true that an individual frequently, and in fact always, is doing more than one thing at a time. Besides the various continual operations of his other physiological systems like the gastrointestinal tract and the endocrine glands, his sense receptors are all the time sending afferent impulses to the central nervous system and his "voluntary" muscles are forever active. He may drive

[15] W. Hamilton, *Lectures on Metaphysics and Logic,* Edinburgh: Blackwood, 1859, I, 254.

[16] A. D. Glanville and K. M. Dallenbach, The range of attention, *Amer. J. Psychol.,* 41, 1929, 207-36.

a car, watch the traffic signals, listen to the car radio, and talk, all simultaneously.

Is the attention devoted to all such simultaneous acts, or is it not? Glanville and Dallenbach's conclusion about the unity of attention might be correct even though man is so often a three-ring circus. Attention might shift rapidly from act to act as the juggler's gaze shifts from ball to ball; or one act might be attended to and the others, because of long practice, might proceed unattended; or all acts might be united into a single integrated performance.

Numerous researches have been devoted to determining whether or not more than one activity can be attended to at once. Experimentation on simultaneous performances is to be found at least as early as 1887. Paulhan found[17] that he could write down a poem and recite one at the same time, but that a difficult operation was retarded by even the automatic recitation of a familiar poem at the same time. Binet attempted[18] to have subjects do simple motor tasks —pressing rubber bulbs—and continue reading aloud, reciting aloud, or doing mental arithmetic at the same time. He found that unless both problems were easy, or one was "automatic," there was interference, and both were disturbed. Also he had subjects squeeze a bulb in rhythm—twice with the left hand to every five times with the right. Usually one of the hands drew the other into its rhythm, in which case there would be only a single task. Jastrow and Cairnes found[19] that simple mental activities like adding or reading have only slight if any mutual interference with simple motor tasks, but that there is greater interference in more complex tasks. For one subject, tapping rapidly hastened mental activities by a sort of facilitation.

Later experimentations improved upon these preceding investigations because they practically succeeded in keeping the subjects' attention from wandering and also prevented one of the tasks from

[17] F. Paulhan, La simultanéité des actes psychiques, *Rev. Scient.*, 39, 1887, 684-9.

[18] A. Binet, La concurrence des états psychologiques, *Rev. Philosophique*, 29, 1890, 138-55.

[19] J. Jastrow and W. B. Cairnes, The interference of mental processes, *Amer. J. Psychol.*, 4, 1891, 219-23. *Cf.* also R. Vogt, Ueber Ablenkbarkeit und Gewohnungsfahigkeit, *Psychol. Arbeit.* (*Kraeplin*), 3, 1901, 62-201.

becoming automatic by presenting in every trial two novel, short, and disparate tasks simultaneously. This procedure would obviate the criticism which could be made of previous experimentations, that two tasks could be performed together because one of them had left the focus of attention and become automatic. All these later researches were done by a group of German workers who attacked the problem at about the same time. Schulze, employing the new procedure, discovered[20] that in ninety per cent of all cases two simple intellectual tasks could be performed at the same time. Eliasberg found in work of the same sort[21] that two tasks could be carried on simultaneously in 42.7 per cent of his cases. Mager reported[22] that in only eleven per cent of the cases could a correct simultaneous appreciation of two problems be obtained. He believed that neither his work nor Schulze's proved that two disparate deliberative judgments could be performed as a single act of attention, though he admitted that the natures of both tasks could sometimes be perceived concurrently and then solved separately afterward.

Pauli also has performed experiments on this problem. In one of these[23] pressures were applied to a finger on each hand and the subject was to say which pressure was stronger. At the same time he had to do some such visual task as telling how many geometrical figures, from three to six, were rapidly exposed before him. Either task alone was nearly always correctly performed, but when presented simultaneously one or both were incorrect in nearly ninety per cent of the trials. From this it may be concluded that simultaneous performance of two attended acts rarely occurs. In 1931 Pauli reported his attempt[24] to show the mutual exclusiveness of conscious (ATTENDED) processes by determining the difference in

[20] *Cf.* N. Ach, Zur Frage der Enge des Bewusstseins, *Arch. f. ges. Psychol.*, 74, 1930, 261-74.

[21] W. Eliasberg, Über Schwierigkeit und Ausschliesslichkeit im Seelischen, *Arch. f. ges. Psychol.*, 74, 1930, 173-200.

[22] A. Mager, Zur Frage der Enge des Bewusstseins, *Arch. f. ges. Psychol.*, 74, 1930, 163-72.

[23] R. Pauli, Der Umfang und die Enge des Bewusstseins, *Ztschr. f. Biol.*, 81, 1924, 93-112.

[24] R. Pauli, Über den experimentellen Nachweis der Enge des Bewusstseins, *Ztschr. f. Biol.*, 92, 1931, 37-44.

reaction times between when they are presented singly and when they occur simultaneously. The tactual task was to compare the intensities of two touch sensations presented at the same time; the visual task was principally to detect errors in printed words. The average tactual reaction time under certain conditions was 0.7 second; the visual was 1.4 seconds. When both tasks were presented together, however, the average reaction time was 2.5 seconds. This 2.5 seconds he thought was the sum of 0.7 for the tactual, plus 1.4 for the visual, plus 0.4—the time required for shifting the attention.

All this laboratory work seems to sum up to the conclusion that it is sometimes possible for more than one distinct activity to be in the focus of attention at once. Under such circumstances there can be more than one center of vigilance at a time. It is impossible to escape the conclusion, however, that usually attention is directed toward only one thing at a time, and that it never can be focused on more than a few things. It is the economy of the organism to automatize all except one or at most a few of simultaneous acts, for attention cannot be spread thin over many. If the trombone is soloing in the one-man band, it is fairly certain that the violin and drums are being played unconsciously (UNATTENDED). Because the personalities of even the least musical of us are much like one-man bands, these findings should be of interest to clinicians.

THE EFFECT OF ATTENTIVE CONSCIOUSNESS IN IMPROVING EFFICIENCY

No research has yet shown that attention improves trombone playing, but there is good reason to believe that it may, for it improves other responses.

(*a*) Grassi studied[25] the effect of concentrated and dispersed attention upon speed of reaction. When a part of the body which the subject was expecting to be stimulated was touched, the response was more rapid than when his expectation was directed toward two points, and one of them was touched. This second reaction time,

[25] I. Grassi, Einfache Reaktionszeit und Einstellung der Aufmerksamkeit, *Ztschr. f. Psychol.*, 60, 1911, 46-72.

moreover, was less than when the contact occurred on a part of the body where it was not expected, or when it took the subject by surprise. Stone, in corroboration, found[26] that, with expectation directed toward hearing a sound, a tactual stimulus is perceived about 0.05 second later than if the expectation is directed toward a touch. Boring said[27] that this shows an excitation can wait fifty milliseconds in a "vestibule of consciousness" until attention favors it, and Grassi stated[28] that in her experiment the reactions to stimulation of the less-prepared spots were slower because time is required to adjust the direction of attention to a new region.

(*b*) Attention not only speeds up response, but it also improves discrimination. Newhall[29] depended upon various types of preparations to determine the subject's expectancy of and hence attention to a weak tactual stimulus. The attention was least when the stimulation occurred without warning; it was stronger when the preparatory signal was given at a definite interval before the stimulus was presented; it was strongest when the subject could watch a moving pointer approach a point, knowing that when it reached it the stimulus would be given. In half of the trials stimulation occurred and in half it did not. The order was random. The subject reported whether or not a stimulus had been given. The findings were that the greater the attention, the better the discrimination between presence and absence of stimuli. This finding was also shown, though less certainly, to be true for visual as well as tactual stimulation.

Numerous efforts have been made to determine whether attention improves sensory acuity by measuring discrimination of stimuli with and without distraction. The results have been openly conflicting, and the most probable reason for this is that, though so-called distractors may decrease the degree of attention, they may also act as stimulators and increase it. Mitchell, for example,

[26] S. Stone, Prior entry in the auditory-tactual complication, *Amer. J. Psychol.*, 37, 1926, 284-7.

[27] E. G. Boring, *op. cit.*, 142.

[28] I. Grassi, *op. cit.*, 72.

[29] S. M. Newhall, Effects of attention on the intensity of cutaneous pressure and on visual brightness, *Arch. of Psychol.*, 9, 1923, No. 61.

found[30] that distraction improves discrimination; Travis[31] confirmed Mitchell's findings. Though both these last researches are vitiated by their assumption that extraneous stimuli must distract and may not stimulate, Newhall's work is not subject to that criticism.

The effect of attention upon the visual limen has also been studied. Wirth believed[32] that he demonstrated that the limen of recognizable change of visual brightness is lower in a region of the visual field that is attended to than in one that is not. As Geissler showed,[33] this demonstration was not statistically convincing. Wirth's procedure was a valuable method, however, and more recent workers, Guratzsch[34] and Bretschneider,[35] using his general technique, have proved his original thesis more satisfactorily.

Guratzsch's procedure illustrates the sort of technique employed earlier by Wirth and later by Bretschneider. His subjects were required to fixate a spot on the center of a perimeter with both eyes. Clearness was measured at various points in the field by determining the visual threshold at these points. This procedure was carried out when attention was over the whole field, when it was on the center of the field, and when it was directed on a side point. (The attention changed, but the eyes did not move from the central fixation point.) The best average clearness was found when attention was distributed over the whole field. If attention was concentrated on a single point anywhere in the field, clearness was greatest there and diminished as a function of the distance from that point. This fact shows that the clearness was a function of attention and not of visual acuity, for visual acuity diminishes toward the periphery of the visual field and the maximum acuity cannot move from point

[30] D. Mitchell, The influence of distractions on the formation of judgments in lifted weight experiments, *Psychol. Monog.*, 17, 1914, No. 74.

[31] L. E. Travis, Changes in auditory acuity during the performance of certain mental tasks, *Amer. J. Psychol.*, 37, 1926, 139-42.

[32] W. Wirth, Die Klarheitsgrade der Regionen des Sehfeldes bei verschiedenen Verteilungen der Aufmerksamkeit, *Psychol. Studien*, 2, 1907, 30-88.

[33] L. R. Geissler, A critique of Professor Wirth's methods of measurement of attention, *Amer. J. Psychol.*, 20, 1909, 120-30.

[34] W. Guratzsch, Das Klarheitsrelief der Gesichtsempfindungen unter dem Einfluss der willkurlichen Aufmerksamkeit, *Arch. f. ges. Psychol.*, 70, 1929, 257-310.

[35] E. Bretschneider, *Unterschiedschwellen im Sehfeld unter dem Einfluss der willkurlichen Aufmerksamkeit*, Bielefeld: Beyer und Hausknecht, 1935.

to point unless the eyes move. These results thus show that attention improves discrimination. They also show that attention fades off imperceptibly, and that there are no watertight compartments separating consciousness (ATTENDED) from unconsciousness (UNATTENDED) any more than there are in the other senses of these words which are analyzed in preceding chapters.

(*c*) Ordahl experimented[36] with the effect of attention in developing an unconscious (INCOMMUNICABLE) set. She chose to work with the so-called motor set—the well-known fact that in judging weights, if a heavy weight is lifted by the hand first, a lighter weight lifted next seems lighter than it really is. Ordahl had her subjects lift a weight *A* with the right hand, and then determine what weight, *B*, when lifted with the left hand, was subjectively equal to *A*. Then a weight *C*, twice as heavy as *B*, was lifted several times with the left hand. After this *B*, raised by the left hand, was compared with *A*, lifted by the right. Ordahl found that the "motor set" in the left hand made the subjects underestimate the weight of *B*. She noted further that, if the subjects attended closely to lifting weight *A*, the motor set was greater than if their attentions were distracted by reading to them as they lifted the weight. This last finding showed that attention aids the development of even such an unconscious (INCOMMUNICABLE) motor set.

(*d*) It has been demonstrated by Rowe and Washburn[37] that figures drawn with the left hand are better remembered by right-handed people than figures drawn with the right. This fact has been interpreted[38] as showing that the narrower attention required for this unaccustomed act improves the memorizing.

Inattention to the starter's gun can lose a hundred-yard dash, and everyday experience shows that attentive consciousness can improve many other responses. If some behaviorist says that consciousness and unconsciousness (UNATTENDED) are useless concepts because

[36] L. E. Ordahl, Consciousness in relation to learning, *Amer. J. Psychol.*, 22, 1911, 158-213.

[37] L. Rowe and M. F. Washburn, The motor memory of the left hand, *Amer. J. Psychol.*, 19, 1908, 243.

[38] *Ibid.;* also L. E. Ordahl, *op. cit.*, 175.

behavior is the same whether they are present or absent, it can be replied that the above evidence shows that, when a person is unconscious (UNATTENDING), his behavior is distinctly different from that when he is on the *qui vive*. He reacts less rapidly, he discriminates less accurately, and he memorizes less well.

SHIFTS OF ATTENTION

The second major fact about attention is that it shifts. Most of the traditional experimentation on this fact of fluctuation dealt with phenomena of sensory apprehension rather than attention. In this misconception the early research on the subject resembled the work on range of attention. Urbantschitsch found,[39] for example, that the faint ticking of a watch held at a distance disappeared and reappeared periodically, and this sensory phenomenon was often thought to be a fluctuation of attention. As Woodworth has written,[40] introspectively the fluctuation of a faint stimulus is different from the shift of attention focus away from it: in the first case the stimulus becomes entirely unconscious (UNSENSED), but in the second it is still present in the margin (UNATTENDED). Attention can, moreover, shift from a faint stimulus even though it remains in a positive phase of fluctuation. A subject of Guilford's reported:[41]

> I noticed during the first part of the experiment when the stimulus was present in the field, that I could direct my attention variously without in any way affecting the stimulus. I directed my attention to the biting-board, to the head-rest, to the light that seems to come in from the left side of the room, which I never noticed before. In spite of the fact that they seized my attention the stimulus persisted. . . . After it has disappeared I can, on the contrary, attend away from all those things and direct my whole efforts to the expecting and waiting for the stimulus, but to no avail.

True shifting of attention was studied in research directed by

[39] V. Urbantschitsch, Ueber eine Eigenthümlichkeit der Schallempfindungen geringster Intensitat, *Centralbl. f. Med. Wissen.*, 13, 1875, 625-8.

[40] R. S. Woodworth, *Experimental Psychology*, New York: Holt, 1938, 703.

[41] J. P. Guilford, 'Fluctuations of attention' with weak visual stimuli, *Amer. J. Psychol.*, 38, 1927, 579. By permission of the *American Journal of Psychology*.

Pillsbury, and carried on by Work and Billings[42] independently. Billings's subjects had instructions to attend to one particular point (say, in a picture), and to indicate by pressing a telegraph key whenever their attention wandered from it. For several subjects in many situations, it was found that the attention would focus on one object or idea for about two seconds before shifting. The range was from a small fraction of a second to more than ten seconds. In commenting on this work Pillsbury said[43] that really the two-second average should be halved, because every recorded shift of attention represented really two actual shifts, one from the point observed to the distracting point or idea, and the other to the recognition of the distraction. Certain other factors might serve to decrease the time values even further.

Other techniques of investigating shifts in attention have been less satisfactory. It has been an assumption of some researches[44] that these shifts are the sole causes for the changes of efficiency which occur in continuous tasks. This assumption is fallacious, for the changes might be caused by many physiological variations, as in oxygen content of the blood or adrenalin secretion. The fluctuation of attention can, however, now be studied quantitatively by Work's and Billings's method and the causes of it can be determined.

Some characteristics of a stimulus which are capable of making it stand out against a background and attract attention to it are known. A few are: intensity (a blinding flash of lightning); extensity (a full-page advertisement); motion (the movement of a camouflaged mud-colored toad); and change (the stopping of the clock's ticking). Dallenbach has found other similar factors.[45] The experimental evidence for all this is extensive. To illustrate—Wilcocks exposed[46] for short periods a number of series of letters, one letter

[42] M. LeR. Billings, The duration of attention, *Psychol. Rev.*, 21, 1914, 121-35.

[43] W. B. Pillsbury, "Fluctuations of attention" and the refractory period, *J. Philos., Psychol., and Sci. Methods*, 10, 1913, 182-3.

[44] *E.g.*, H. C. McComas, A measure of the attention, *J. Exper. Psychol.*, 5, 1922, 1-18.

[45] K. M. Dallenbach, Attributive *vs.* cognitive clearness, *J. Exper. Psychol.*, 3, 1920, 183-230.

[46] R. W. Wilcocks, The effect of an unexpected heterogeneity on attention, *J. Gen. Psychol.*, 1, 1928, 266-319.

in each series being of a different color. He found memory for the colored letter much better than for the others and presumed it was more attention-compelling. Again, he exposed a series of nonsense syllables five times, but the sixth time he introduced a new syllable in the series. This was much better remembered than the other syllables. In a third experiment he found that moving letters had a higher memory value than stationary ones. There were similar studies of other factors influencing attention. It is interesting to note in passing that Wilcocks used a memory criterion to test consciousness in another sense (ATTENDED). He thus equated unconsciousness (UNREMEMBERED) with unconsciousness (UNATTENDED).

Wilcocks concluded from his results that attention is compelled by change, by novel or heterogeneous stimuli. This is a behavioral as well as an introspective fact. The motor concomitants of attentive consciousness—the "what is it?" reflex—usually appear after a change in stimulation. In the next chapter it is shown that the rapid appearance of these motor concomitants upon change of the environment is an objective indication that unconsciousness (NOT INVOLVING INSIGHT) has shifted to consciousness.

DISTRACTABILITY AS A MEASURE OF DEGREE OF ATTENTIVE CONSCIOUSNESS

Distraction causes shifts of attention, and the ease of distractability has become a common measure of the strength of attention. Normal adults trying to concentrate can be distracted temporarily, but usually are able after this initial lapse to attend for a long period to a given task, heedless of external stimulation. An entertaining research of Hovey's[47] illustrated these two facts. He gave one form of the Army Alpha intelligence test to a number of college students, and on the basis of their scores divided them into two matched groups, *A* and *B*. Six weeks later Group *A* took another form of the Army Alpha test under normal conditions, while Group *B* took

[47] H. B. Hovey, Effects of general distraction on the higher thought processes, *Amer. J. Psychol*, 40, 1928, 585-91.

it under conditions of distraction. The following distractors were used: seven electric bells of different tones in various parts of the room, sounding intermittently; five buzzers; a spot-light sweeping continually from side to side; a ninety-thousand-volt spark gap; a blaring phonograph; two organ pipes; three whistles; a circular metal saw struck at intervals; a photographer taking pictures of the subjects; men marching on the floor above; and various assistants entering the room noisily in unusual attire and carrying peculiar pieces of apparatus or rolling nail kegs down the aisles. The average results of the two groups were as follows: Group *A*, working under normal conditions, 137.6; Group *B*, working under distraction, 133.9; loss, apparently due to distraction, 3.7. In this work higher mental processes were thus demonstrated to be comparatively unaffected by distraction.

The mechanism of making oneself relatively unconscious (UNDISCRIMINATING) of the distracting stimulation has been investigated by Morgan,[48] who measured the strength subjects put into each stroke of a key in a task somewhat like typewriting, and at the same time made a record of their breathing. These data were gathered during periods of quiet and of distraction, and the essential findings were: At the beginning of the distraction, there was some slowing of the work; within a few minutes the subject regained his former speed and continued to increase it; after the distraction was stopped, a slower rate was resumed. Extra pressure was exerted on the keys during distraction to overcome the noises. Articulation referring to the task, as shown by changes in breathing, also occurred during the noise to aid in overcoming it. Ford in similar work[49] discovered that muscular tenseness increases with the onset of distraction, but he did not believe that the strength of motor activity is an index of the degree of mental activity at the moment. He also found indications of articulation during distraction, as did Morgan. Insofar as both of these experiments indicate that increased muscular contractions accompany the overcoming of distraction,

[48] J. J. B. Morgan, The overcoming of distraction and other resistances, *Arch. of Psychol.*, 1916, No. 35.

[49] A. Ford, Attention-automatization, *Amer. J. Psychol.*, 41, 1929, 1-32.

they corroborate any motor theory of consciousness (ATTENTIVE). Ford had some doubts, however, whether his work should be interpreted as such a corroboration.

Geissler found[50] that introspective reports of the degree of attention on the basis of an arbitrary subjective scale are reliable indices of the degree of attention as shown by the rate of performing tasks under distracting conditions, like adding or drawing lines through circles. An attempt was made to keep constant all factors which might alter this rate, except attention. Geissler found this introspective measure better than any measure of degree of distraction or of muscular tenseness. The degree of distraction was shown to bear no relation to the degree of attention. Similar research by Dallenbach[51] gave similar results. He worked with tasks involving judgments about auditory and tactual stimuli during various sorts of distraction and during the performance of secondary tasks. He found that time of reaction in making sensory judgments was under his conditions a good measure of degree of attention.

LEVELS OF ATTENTIVE CONSCIOUSNESS

This chapter begins with a controversial statement, that there is a continuum of gradations between focus and margin of attention. It was made on the basis of evidence to be reviewed now, but it is by no means incontestable, and it has been hotly disputed by those who hold that there are only two levels of attention. Introspectionists who have two-level theories seem to believe in what are really three levels—clear attention, vague attention, and unconsciousness (UNATTENDED).

It was noted previously (pp. 20 and 136) that Freudian theory has three such strata—consciousness, preconsciousness, and unconsciousness (PSYCHOANALYTIC MEANING). Freud's main distinction of levels is between unconsciousness (PSYCHOANALYTIC MEANING), whose contents can normally never become conscious, and preconsciousness,

[50] L. R. Geissler, The measurement of attention, *Amer. J. Psychol.*, 20, 1909, 473-529.

[51] K. M. Dallenbach, The measurement of attention, *Amer. J. Psychol.*, 24, 1913, 465-507; also K. M. Dallenbach, The measurement of attention in the field of cutaneous sensation, *Amer. J. Psychol.*, 27, 1916, 443-60.

whose contents may become conscious. The difference between preconsciousness and consciousness did not seem so great to him, for thoughts can flow easily from one to the other. Though he made no explicit statement of his position, it is more probable that he believed that one degree of attention fades into another than that there are only two levels. The Gestalt psychologists, however, are more likely to favor two distinct strata, which they call *figure* and *ground,* besides the third level of *unconsciousness* (UNAVAILABLE TO AWARENESS). They are strongly opposed to referring to the stratification as levels of attention, but have sometimes come close to equating the figure and ground with the focus and periphery of attention.[52]

If strictly objective psychologists who depreciate introspection choose to have a theory of attention, it must logically be a two-level theory. For them there can be no third level, for their criterion of whether a stimulus is attended to is whether it is discriminated. If the subject discriminates that red light from the other green lights, he attends to it. When objective behavior is the criterion, consciousness (ATTENDED) is the same as consciousness (DISCRIMINATING), and unconsciousness (UNATTENDED) equals unconsciousness (UNDISCRIMINATING). There are really only these two levels, though Boring[53] has suggested that behaviorally clearness and vagueness of attention might be distinguished by whether the report of the discrimination comes quickly and with assurance or slowly and with doubt. The slowness of report of a vaguely attended stimulus would be accounted for by the time necessary to shift attention to it. It was, however, through an introspective experiment that it was originally learned that time is required for such a shift,[54] and certainly the "low assurance" is an introspective report. It is thus still true that, by mere observation of behavior, vagueness and clarity of attention are not distinguishable.

Whether there are only two levels of attention or whether attention fades imperceptibly from focus to margin must be settled on a

[52] *E.g.,* K. Koffka, Perception: an introduction to the *Gestalt-Theorie, Psychol. Bull.,* 19, 1922, 561.

[53] E. G. Boring, *op. cit.,* 200.

[54] *Cf. e.g.,* M. LeR. Billings, *loc. cit.,* which work is discussed on p. 173.

frankly introspective basis. Two experiments were performed by Dallenbach, one in collaboration with Gill,[55] in which geometrical figures were rapidly exposed before subjects who were to report on the number of levels of attributive clearness (*Klarheit*) of their perceptions. With one exception, none reported more than two—clarity and vagueness. Dallenbach believed the data contained grounds for discounting this exception. This is the experimental basis adduced by Dallenbach for the two-level theory.

In later work Wever[56] exposed rapidly before his subjects equivocal stimuli. These stimuli were so designed, and the directions before their presentation were so given, that sometimes one half of the field would appear to be the background and the other half would stand out against it, and in other trials these rôles would be reversed. The subjects were asked to give an absolute judgment on a nine-point scale of the attributive clearness (*Klarheit*) of the two parts of the design. These subjects showed by their introspections that they perceived several levels of attentive clarity. These introspections were directly in conflict with the reports of Dallenbach's subjects in his research mentioned in the previous paragraph. In reply to Wever's experimental contradiction of his work, Dallenbach wrote[57] that he did not consider Wever's technique adequate to deal with the problem and further that he was inclined to accept the reports of his own subjects. There the controversy rested.

The work of Wirth, Guratzsch, and Bretschneider discussed previously (pp. 170-171) has broken this deadlock, and now it appears certain that there are many degrees of attentive clarity that shade off gradually from focus to margin of any given perception.

AUTOMATIC STATES OF UNATTENDED BEHAVIOR

The automatization of acts which have often been repeated or which have no great import to the individual at the moment is fre-

[55] K. M. Dallenbach, Attributive *vs.* cognitive clearness, *loc. cit.;* also N. F. Gill and K. M. Dallenbach, A preliminary study of the range of attention, *Amer. J. Psychol.*, 37, 1926, 247-56.

[56] E. G. Wever, Attention and clearness in the perception of figure and ground, *Amer. J. Psychol.*, 40, 1928, 51-74.

quently illustrated in everyday life. There was, for example, the absent-minded professor who, before leaving his home to go out to dinner, went to his room to change his tie. When he did not come downstairs in twenty minutes, his wife went to his room and found him in his pajamas in bed. His mind on higher things, he had inattentively removed his tie and this act had set off the chain of behavior that landed him in bed. Another illustration of conscious (DISCRIMINATING) behavior which was entirely unconscious (UNATTENDED) is found in Case VIII of Chapter II, the girl who took the medicine and tomato juice by mistake.

Similar phenomena have interested experimental psychologists. Ach spoke[58] of the *determining tendency* which develops when a task is set. Under these circumstances certain responses to a stimulus are reinforced and others inhibited. Then, when the stimulation finally occurs, the act happens automatically and often the performer of it is unconscious (UNABLE TO COMMUNICATE) of it. When a typist, for example, wishes to make a quotation mark, she hits the number 2, but makes a quotation mark because, though she could not report it, she had a determining tendency to hit the shift key at the same time.

It has been experimentally proved that unconscious (UNATTENDED) stimuli can modify a person's behavior. Coover[59] showed subjects for 0.085 second in a rapid-exposure apparatus cards, each of which had a letter in the lower right-hand corner and a digit in the upper left-hand corner. The subjects were required to report what the letter was and then to name a digit "at random." They had no knowledge of the digit in the upper right-hand corner, which was in peripheral vision. The digit which had been exposed with the letter, but of which the subjects were unconscious (UNATTENDING), was named much more frequently than could be accounted for by chance.

In somewhat similar work Collier[60] has recently exposed rapidly

[58] N. Ach, *Über die Willenstatigkeit und das Denken*, Göttingen: Vandenhoeck and Ruprecht, 1905.

[59] J. E. Coover, *Experiments in Psychical Research at Leland Stanford Junior University*, Stanford: Stanford University Press, 1917 (not viewed).

[60] R. M. Collier, An experimental study of the effects of subliminal stimuli, *Psychol. Monog.*, 52, 1940, No. 236.

subliminal geometric figures in peripheral vision, of which his subjects were unconscious (SUBLIMINAL STIMULI AFFECTING ORGANISM and UNATTENDING). He discovered that under certain circumstances the subjects would in "random" guessing choose the figure exposed in peripheral vision more often than could be accounted for by chance.

Automatic, unconscious (UNATTENDED) activities are carried out in certain unusual or abnormal states. One illustration of this is automatic writing. "Doodling" with pencil and paper while telephoning is a common form of such writing. The act may be entirely unattended and the finished product surprising to the one who made it. Mühl reported[61] an intensive investigation of automatic writing of more than one hundred and fifty individuals, some psychopathic and some normal. She insisted that all people can learn to do automatic writing. Her usual procedure was as follows. The subject did not look at the page on which the writing was occurring, but kinesthetic and auditory stimuli from the recording pencil reached him. At the same time he would read aloud, and, according to the introspections, would rarely pay attention to what was being written. Nevertheless certain subjects could correctly reply by this automatic writing to questions of whose answers they were usually unconscious (UNATTENDING, UNREMEMBERING, UNABLE TO COMMUNICATE, or PSYCHOANALYTIC MEANING). In several cases forgotten childhood events were recovered this way.

Erickson made[62] a suggestive investigation of automatic writing in two subjects. He showed that words can have a double meaning to a person, one conscious (ATTENDED and COMMUNICABLE) and a second unconscious (UNATTENDED and INCOMMUNICABLE), which the person will admit he recognizes only through the medium of automatic writing. One of Erickson's subjects, for instance, wrote the number *thirty* in such a way that it also looked like *thirty-eight.* She would admit orally only that it read *thirty*, but by automatic

[61] A. M. Mühl, *Automatic Writing,* Dresden: Steinkopff, 1930.

[62] M. H. Erickson, The experimental demonstration of unconscious mentation by automatic writing, *Psychoanalyt. Quart.,* 6, 1937, 513-29.

writing she said that she had purposely concealed *thirty-eight* in the writing. Immediately after this revelation she admitted orally that the word could be read *thirty-eight* also.

For many years experimental attempts have been made to develop automatic states. An early example of such efforts was the research of Solomons and Gertrude Stein, the writer.[63] With extensive practice they were able to develop the ability to do such things as read long passages aloud unconsciously (UNATTENDING) while carrying on some entirely separate endeavor at the same time. This same ability is possessed in high degree by many experienced knitters.

This phenomenon approaches the state of dissociation, the existence of two separate thought systems in the same person at the same time. When one system is conscious (ATTENDED), the other is not. Members of the French school believe[64] that many psychological abnormalities can be explained on the basis of this dissociation of attention. Among these they place alternating amnesias (like Irène, Case XIII of Chapter II, p. 63) or "multiple personalities" (like Miss Beauchamp, Case XIV of Chapter II, pp. 64-65). Study of these cases reveals, however, that any inattention or automatization in them is a less important symptom than unconsciousness (UNREMEMBERED), and that what is really essential about the cases is the motivation for the symptoms. To consider many kinds of mental diseases to be pathologies of attention is superficial —the inattention or lack of cognitive clearness is a symptom and not a disease.

CONCLUSIONS

These, then, are the chief facts of unconsciousness (UNATTENDED). Attention generally has recognizable motor components which disappear during inattentiveness. Attention is limited in range and its focus can shift from point to point, often to a place in the environ-

[63] L. M. Solomons and G. Stein, Normal motor automatism, *Psychol. Rev.*, 3, 1896, 492-512. *Cf.* also G. Stein, Cultivated motor automatism, *Psychol. Rev.*, 5, 1898, 295-306; and L. M. Solomons, Automatic reactions, *Psychol. Rev.*, 6, 1899, 376-94.

[64] *E.g.*, J.-P. Nayrac, *Physiologie et psychologie de l'attention*, Paris: Alcan, 1906, 144-78.

ment where change is occurring: this all in accord with the principle of economy of the organism, for a high grade of vigilance rarely attends more than one process at a time. We know attention can improve many sorts of responses. We have good evidence that consciousness (ATTENDED) shades gradually into automatized unconsciousness (UNATTENDED), and that complicated processes may be carried on in either state. The automatized patterns of behavior, however, are characteristically stereotyped and generally are acts which the individual has practiced many times. Under certain conditions, however, he may react adequately to novel stimuli of which he is unconscious (UNATTENDING).

CHAPTER VIII

INSIGHTLESS UNCONSCIOUSNESS

Once there were three princes of Serendip (Ceylon). Legend relates that they frequently sallied forth on important quests. Because of their sagacity and perseverance, they always returned with something of great significance and value, but not the object for which they thought they were searching when they set out. Horace Walpole condensed this tale's portrayal of a specific characteristic of human nature into the coined word *serendipity*, by which he meant the capacity of looking for one thing and finding another, of equal or greater value. This power of creative thinking is generally unconscious (UNATTENDED, INCOMMUNICABLE, or NOT INVOLVING INSIGHT). It is, as Dummer wrote,[1] "a 'chewing of the mental cud,' a synthetic process or integrative action from which spring the mathematical imagination, the hypothesis of the scientist, the inspiration of the poet and the intuition of the every-day man."

This ability Pareto considered[2] one aspect of the "instinct for combinations"—an instinct, because it is a native endowment. The capacity, of course, varies from man to man; but it can be improved by practice. It is the ability to integrate factors not before combined to produce a new result which will satisfy a need of the individual. Such results usually are achieved suddenly and, so far as introspection goes, inexplicably.

ILLUSTRATIONS OF THE FUNCTIONING OF INSIGHTLESS PROCESSES

Biography and autobiography abound with anecdotes concerning the operation of unconscious (NOT INVOLVING INSIGHT) creative

[1] E. S. Dummer, in C. M. Child *et al.*, *The Unconscious: A Symposium*, New York: Knopf, 1929, 1. By permission of F. S. Crofts and Company.

[2] V. Pareto, *The Mind and Society*, ed. A. Livingston, New York: Harcourt, Brace, 1935, II, 519-96.

processes. Poincaré's careful recounting of how his mathematical discoveries came to him is an excellent example; it is Case IX in Chapter II (pp. 55-56). Eckermann, in *Gespräche mit Goethe*,[3] told how the great man related that his verses came to him suddenly and inexplicably without previous conscious consideration. Scripture wrote[4] of a similar event in his own experience. He was translating a poem from German into English. In his first draft, correctly literal, carefully worded (as he said, "consciously"), the work was poorly done. When, however, he gave up criticizing it carefully, and let the words come freely (as he said, "unconsciously"), the results were much better.

The remarkable literary detective work of Lowes (illustrated in Case X of Chapter II, pp. 57-59), in which he ferreted out from many sources the origins of the thoughts, the figures of speech, and even the very words of Coleridge's best-known poems, throws light upon the mechanism by which unconscious (NOT INVOLVING INSIGHT) composition occurs. Lowes proved convincingly that many diverse passages which Coleridge had read over the years exerted influence upon the construction of even a single stanza of one of the poet's works. Coleridge had a phenomenal "tenacious and systematizing memory," but he could not have recited all these passages, and they were by no means all in his compendious notebook. The creative magic that united all these particles into integral works of art, which give no signs of being mosaics, was unconscious (UNREMEMBERED and NOT INVOLVING INSIGHT). It occurred in what Coleridge called[5] "that shadowy half-being, that state of nascent existence in the twilight of imagination and just on the vestibule of consciousness" where rests (as he once said[6]) "the confluence of our recollections [through which] we establish a centre, as it were, a sort of nucleus in . . . [this] reservoir of the soul."

In the field of music Mozart, among other composers, is said to

[3] J. P. Eckermann, *Gespräche mit Goethe*, Leipzig: Brockhaus, 1885, III, 211.

[4] E. W. Scripture, Ein Einblick in den unbewussten Versmechanismus, *Ztschr. f. Psychol.*, 102, 1927, 307-9.

[5] S. T. Coleridge, *Letters of Samuel Taylor Coleridge*, ed. E. H. Coleridge, London: Heinemann, 1895, I, 377.

[6] S. T. Coleridge, *Biographia Epistolaris*, ed. A. Turnbull, London: Bell, 1911, II, 182.

have found that frequently the major processes of composition were unconscious (NOT INVOLVING INSIGHT), and as Goethe's poetry often came to its creator's consciousness ready-made, so did Mozart's music. He said, in a letter which may not be wholly authentic,[7] that his ideas crowded in upon him with the greatest ease imaginable, but from where he did not know. All he did consciously was to choose from an ample selection of possible passages that suggested themselves, and to arrange them.

In an interesting essay on "subconscious creation" de Gourmont has written[8] that imaginative intellectual creation is inseparable from "subconsciousness." He believed that the creative genius combines the fruits of all the experiences of his life by a sort of chemistry that is largely unconscious (NOT INVOLVING INSIGHT), to give rise to the achievements which astonish the world.

Henderson has written of what practitioners of various trades and professions would term intuitive judgments:[9]

> More often than not skillful diagnosticians reach a diagnosis before they are aware, or at any rate conscious, of the grounds that justify their decision. If asked to explain the reasons for the diagnosis, they often clearly show by their behavior that they are obliged to think them out, and that to do so is an awkward task. This is true of doctors, of lawyers, and of men of affairs. It is here cited as one mark of a kind of skill, hardly ever learned except by long practice, that is indispensable in the interpretation of what men say.

Illustrating these facts from the field of medicine are the examples of remarkable snap diagnoses reported by Hankin in Case XI of Chapter II (p. 60). A comparable instance from the law is to be found in Judge J. C. Hutcheson's humorous and learned defense[10] of decision by intuition in legal cases. Though he admitted that such judgment often appears like the tossing of Rabelais's "little small dice," he believed that it is the most effective sort of decision,

[7] *Cf.* O. Jahn, *W. A. Mozart,* Leipzig: Breitkopf und Härtel, 1858, III, 423-5.

[8] R. de Gourmont, *La culture des idées,* Paris: Soc. du Mercure de France, 1900, 50 and 53.

[9] L. J. Henderson, *Sociology 23 Introductory Lectures,* 2nd ed., Private Distribution, 1938, 15. By permission of the author.

[10] J. C. Hutcheson, Jr., The judgment intuitive, *Cornell Law Quart.,* 14, 1929, 274-88.

because it results from unconscious (INCOMMUNICABLE and NOT INVOLVING INSIGHT) weighing of many complex and interrelated factors which could not be made explicit.

EXPERIMENTATION ON INSIGHTLESS UNCONSCIOUSNESS

Laboratory psychology since the middle of the last century has been vaguely aware of unconscious (NOT INVOLVING INSIGHT) behavior, and in recent years has begun to develop a descriptive understanding of it. Helmholtz in the last century referred[11] to a kind of incommunicable set, which he called an *unconscious inference* (or *conclusion*), to explain certain sensory phenomena like illusions. Though this theory has never been widely accepted, it explains the facts with which it deals as well as any. Helmholtz believed that, if in past experience one sort of stimulus was always accompanied by another, one "unconsciously," as he said, must infer and hence sense the second whenever the first is presented. It was his contention that inferences about what is causing the sensation are made, and result in the illusory perception, just as astronomers infer the size of stars and their distance away from the photographs they take at various parts of the earth's orbit. The only difference is that the inference leading to the illusion is unconscious (NOT INVOLVING INSIGHT and INCOMMUNICABLE) and for this reason, Helmholtz believed, all the more binding. Many today would explain all this in terms of conditioned responses, and say that it is *unconscious* in the sense of CONDITIONED.

There are more complicated sorts of inference and thinking behavior which the individual carries on unconsciously (UNATTENDED or NOT INVOLVING INSIGHT). A classic proof of this is Köhler's work[12] observing anthropoid apes. He studied how apes use tools and erect structures in order to achieve a desired end. When bananas were put out of the reach of one of the apes, outside her cage, and a stick was left in the cage, she whimpered and made beseeching motions and

[11] H. v. Helmholtz, *Helmholtz's Treatise on Physiological Optics,* ed. J. P. C. Southall, Menasha, Wis.: Optical Soc. of Amer., 1925, III, 3-6.

[12] W. Kohler, *The Mentality of Apes,* New York: Harcourt, Brace, 1925.

cries for several minutes. Then, as Köhler described it:[13] "She suddenly casts a look at the stick, ceases her moaning, seizes the stick, stretches it out of the cage, and succeeds, though somewhat clumsily, in drawing the bananas within arm's length." This same kind of situation has also been observed in children.[14] The behavior of the children was like that of the apes except that they talked during the solving of their problems. In a typical problem situation the child would be put in a play-pen with a stick near by, and he would try to get a toy placed out of reach of his hand. The remarkable characteristic of many of these problem-solving scenes has been observed to be the suddenness with which the final act leading to success is undertaken. The apes usually had little regard for the tools they finally employed until all at once they reached for them and used them. The children often did not speak of the aids of which they finally availed themselves until they made use of them. For these reasons it seems likely that the steps in solving these problems were unconscious (NOT INVOLVING INSIGHT) until the prefabricated solution suddenly came "in a flash of insight."

The most enlightening experiment on insight in human beings has been performed by Maier.[15] He wanted to reconstruct the stages of solution of a difficult problem which is solved unconsciously (NOT INVOLVING INSIGHT) and whose answer suddenly appears in consciousness. The aims of his investigation were to find if the solution develops stepwise or as a whole; what the subjects experienced consciously just before the solution was found; and whether they knew what factors helped to produce the proper answer.

The task set for Maier's subjects was to tie two cords together. These cords were so hung from the ceiling and were of such a length that a person holding one could not reach the other. There were many objects in the room: pliers, clamps, ringstands, cords, poles,

[13] *Ibid.*, 33.

[14] A. Alpert, *The Solving of Problem-Situations by Preschool Children*, New York: Teachers College, Columbia University, *Contributions to Education*, 1928, No. 323; P. P. Brainard, The mentality of a child compared with that of apes, *J. Genet. Psychol.*, 37, 1930, 268-93; and E. Matheson, A study of problem solving behavior in pre-school children, *Child Development*, 2, 1931, 242-62.

[15] N. R. F. Maier, Reasoning in humans. II, *J. Comp. Psychol.*, 12, 1931, 181-94.

tables, and chairs. With this equipment there were several possible solutions of this task, as, for instance, tying one rope to a chair or a table, and then going and getting the other. The subject was asked to continue finding solutions to the problems until a specific one was achieved. The acceptable one was weighting one of the cords with a pair of pliers, swinging it like a pendulum, and then going to the other cord and catching the swinging rope as it came toward the other one.

As subjects Maier used 116 college students. Sixty-one were given hints if they did not find the acceptable solution in about ten minutes. (This is the important group.) Another group of fifty-five control subjects was never given hints. The hints used were: First, the experimenter, walking toward the window, by apparent accident brushed against one cord and gave it a slight pendular motion. If this did not cause the proper solution to occur to the subject within a few moments, a second hint was given. This time the experimenter gave the subject a pair of pliers and informed him that the problem could be solved with its aid alone. If this hint was ineffective, the subject was shown the solution. Twenty-four performed the task without any assistance; twenty-three did it after hints were given; and fourteen were unsuccessful even after both hints.

Those twenty-three subjects who solved the problem after hints had been given were carefully studied as the most significant group. Seven reported introspectively that the solution appeared in steps; for instance, the ideas of swinging a cord and of attaching a weight came to mind separately. To the other sixteen the correct procedure occurred as a single unit. Though, out of the seven who solved the problem in steps, six said that the final success was due to the first hint, fifteen of the sixteen to whom the solution came as a unit failed to report having noticed the first hint. When these last subjects were asked whether they had seen the cord swinging or not, most of them insisted that they were unconscious (UNAWARE OF DISCRIMINATION) of having been helped by it. Even if these subjects did report that they were unconscious of the hints, there were two

important proofs that they were of assistance: (*a*) Of the control group only twenty per cent found the solution after ten minutes, so the extra working time after the hints were given did not account for the successful results of the decisive group; and (*b*) the time between the hint and the solution was always short, averaging forty-two seconds. Maier concluded from his findings that the perception of the solution of a problem is sudden, and comes without the intermediate stages having been conscious.

THE RELATION OF INSIGHTLESS PROCESSES TO "CHANCE" AND "FREE-WILL" BEHAVIOR

In his monumental *Philosophy of the Unconscious* Hartmann, the precocious genius intellectually beyond his age, was also beyond his time when he wrote[16] that "the Unconscious" in artistic creation selects the items that are to enter consciousness in accordance with the purpose of the work in hand. He believed that a train of thought may appear to be uncontrolled fantasy, but that the associations which make it up are always regulated by the prevailing interests, feelings, and moods of the moment. He further maintained[17] that development and alteration of our beliefs and convictions usually progress by a sort of unconscious (NOT INVOLVING INSIGHT) digestion and assimilation of the opinions of others, with which we may even have disagreed originally, until we are astonished one day to find we have a new attitude on the subject in question.

The data on which Hartmann based this theory were by no means so adequate as those already discussed in this chapter, but what he said is rapidly being proved true by these and other findings. The origins of our thoughts and actions may be entirely unconscious (INSIGHTLESS), we may even think they are due to "chance" or our own "free-will," but actually they are intricately bound up with our past environment or heredity, a past we may have forgotten or of which, perhaps, we were never conscious (ABLE TO COMMUNICATE).

[16] E. v. Hartmann, *Philosophy of the Unconscious*, trans. W. C. Coupland, London: Kegan Paul, Trench, Trübner, 1893, I, 284.

[17] *Ibid.*, 321-3.

Freud blew this horn of Hartmann's so frequently[18] that it has almost lost its resonance, but his industry has had its effect. There are few who can face the facts that can be mustered today and still fail to recognize that the activities of ours which we can least explain are determined in the same way as those whose causes we understand. There is no scientific basis for the fallacy still so commonly expressed: "I ought to know why I acted that way: I did it." It is unfortunately true that we are often more unconscious (INSIGHTLESS) of the causes of our behavior than our psychoanalysts, priests, or neighbors.

THE SUDDEN DEVELOPMENT OF INSIGHT

Where insight is spoken of, the theories of the Gestalt school of psychology cannot be far away. According to this doctrine all sorts of unconscious processes must be explained in terms of the *trace*, which useful concept we shall investigate in detail in the next chapter. The trace is the form in which a past experience persists in the organism, unconscious (UNREMEMBERED) until it floats to the surface of consciousness. Koffka pictured[19] these traces as not at all static, but under dynamic stresses which serve to interrelate them in various ways. In their storehouse these memories are not pigeonholed, but are continually being reorganized to suit the exigencies of the moment. The individual is usually unconscious (INSIGHTLESS) of this activity until suddenly the creature of this reorganization bobs up into consciousness. This is the moment of insight, and the Gestaltists like to emphasize the instantaneousness of it—Köhler's apes acted suddenly, and Maier's subjects all at once saw the solution of their problem.

This rapid alteration of behavior is a phenomenon so striking that it has been overemphasized. It means that some process has at that moment reached such a level of the nervous system that insight about it is gained, and in human beings it usually becomes conscious

[18] *E.g.*, S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill, New York: Random House, 1938 (*The Interpretation of Dreams*), 482-3.

[19] K. Koffka, in C. M. Child *et al.*, *The Unconscious: A Symposium*, New York: Knopf, 1929, 58-9.

(COMMUNICABLE). Reaching that level does not necessarily alter the process in any way. Suppose the process is learning how to play a sonata. A piano teacher has three children, all of whom want to learn to play sonatas. She gives the first child one page of a sonata and then another and another, and he does not recognize that they are related. One day she tells him to play the pages consecutively, and he is astonished to discover he has learned to play a sonata. The teacher follows the same plan with the second child, but he moves away the week before she is going to spring her surprise on him, and never discovers what he has learned. To the third child she gives the whole sonata in one book. He learns a page a week, and realizes that when the last page is memorized he will be able to play a sonata. This example shows that the unconscious (NOT INVOLVING INSIGHT) learning process is not necessarily different from the conscious (INVOLVING INSIGHT). Coleridge might have written *The Rime of the Ancient Mariner* deliberately attempting to use phrases of other writers. That is not to imply that it would have been the same poem as it turned out to be when it was done without insight, but it is to say that the creative process may proceed either consciously or unconsciously (NOT INVOLVING INSIGHT).

Psychologists are to be found who do not agree with statements like the preceding one, but who think, for instance, that the occurrence of consciousness (INVOLVING INSIGHT) suddenly modifies the curves representing the rate of learning. They base their argument on experiments like Pickford's.[20] The task in this research was to find a common feature in geometrical figures shown to the subject. When he saw what he thought was the common feature, the subject responded by pushing a key. The apparatus was so constructed that a bell rang if he made the correct response. Introspections were given after each trial. Before insight developed, the correct responses occurred at only chance frequency. Afterward there was a high percentage of right responses. This is the sort of evidence which has led Tolman, Thorndike, Rock, and others to suggest gradualness of rise of the learning curve as a criterion for unconsciousness (NOT

[20] R. W. Pickford, An experiment on insight, *Brit. J. Psychol.*, 28, 1938, 412-23.

INVOLVING INSIGHT). The Gestalt presumption has been that if in learning a skill or solving a problem there is sudden improvement, insight has occurred. Tolman wrote:[21] "Wherever there is a sudden drop in the learning curve, there there is consciousness. For only by representation of its results (through memory or imagination) could acts hitherto infrequent become thus suddenly and consistently frequent." Apparently by the phrase "a sudden drop in the learning curve," Tolman meant an improvement in the ability to perform the task. It is fairly obvious that he means that such behavioral indices give evidence of the dawning of consciousness.

Corroborating some findings of Thorndike *et al.*[22] in 1932, Thorndike and Rock performed two experiments[23] whose results, they said, showed that learning may proceed without awareness of what is being learned or intent to learn it. In one of these, a free-association experiment, the task was to respond to the stimulus-words rapidly. Responses were judged right or wrong by the experimenter, and the subjects were told that this was done on the basis of an arbitrary list of "right" responses for each stimulus-word. Actually words with sequential connections (*i.e.*, what might normally be the next word in a sentence, as *forest—fires*) were called right and rewarded, and the subjects learned to give such free associations rather than others, such as those connected with the stimulus-word by meaning. Because the learning curve rose slowly, the experimenters assumed that the subjects were not aware of the task, on the grounds that with insight the curves would have risen almost immediately to nearly one hundred per cent correctness. The experimenters also devised a skill test on the same principle, which resulted much the same way.

Irwin, Kauffman, Prior, and Weaver did not believe[24] that the gradualness of the rise of the learning curve was an adequate cri-

[21] E. C. Tolman, A behavioristic theory of ideas, *Psychol. Rev.*, 33, 1926, 366-7.

[22] E. L. Thorndike *et al.*, *The Fundamentals of Learning*, New York: Teachers College, Columbia University, 1932, 207ff.

[23] E. L. Thorndike and R. T. Rock, Jr., Learning without awareness of what is being learned or intent to learn it, *J. Exper. Psychol.*, 17, 1934, 1-19.

[24] F. W. Irwin, K. Kauffman, G. Prior, and H. B. Weaver, On 'learning without awareness of what is being learned,' *J. Exper. Psychol.*, 17, 1934, 823-7.

terion of learning without awareness, and criticized Thorndike and Rock for using it. They rejected this criterion because they had conducted Thorndike and Rock's association-test, telling their subjects the purpose of the experiment half way through it. This did not make the learning curve rise rapidly to one hundred per cent. In a reply, Thorndike and Rock admitted[25] the invalidity of their criterion of gradualness, but said that their experiment still contained much evidence for learning without awareness. They had not asked the subjects whether they were aware of the task, and no other criterion was proposed, so it is difficult to understand to what evidence they referred. Irwin closed the debate with a short note[26] renewing his earlier request for such a criterion. There is at present no proof, though Thorndike's writing[27] makes him appear to believe that there is, that unconscious (NOT INVOLVING INSIGHT) learning proceeds differently from conscious.

INSIGHTLESS PERCEPTION AND LEARNING

There are important studies which show that it is possible to learn to differentiate stimuli while unconscious (INSIGHTLESS) of the basis for distinguishing them.

(*a*) First there is the body of work on mediate association. Hamilton wrote:[28]

> Now it sometimes happens, that we find one thought rising immediately after another in consciousness, but whose consecution we can reduce to no law of association. Now in these cases we can generally discover by an attentive observation, that these two thoughts, though not themselves associated, are each associated with certain other thoughts; so that the whole consecution would have been regular, had these intermediate thoughts come into consciousness, between the two which are not immediately associated. Suppose, for

[25] E. L. Thorndike and R. T. Rock, Jr., A further note on learning without awareness of what is being learned, *J. Exper. Psychol.*, 18, 1935, 388-9.

[26] F. W. Irwin, A rejoinder, *J. Exper. Psychol.*, 18, 1935, 389.

[27] *Cf.* E. L. Thorndike *et al.*, *The Psychology of Wants, Interests and Attitudes*, New York: Appleton-Century, 1935, 70.

[28] W. Hamilton, *Lectures on Metaphysics and Logic*, Edinburgh: Blackwood, 1859, I, 352-3.

> instance, that A, B, C, are three thoughts. . . . A suggests C, not immediately, but through B; but as B, like the half of the *minimum visibile* or *minimum audibile*, does not rise into consciousness, we are apt to consider it as non-existent. . . . An instance of this occurs to me with which I was recently struck. Thinking of Ben Lomond [a mountain in Scotland], this thought was immediately followed by the thought of the Prussian system of education. Now, conceivable connection between these two ideas in themselves, there was none. A little reflection, however, explained the anomaly. On my last visit to the mountain, I had met upon its summit a German gentleman, and though I had no consciousness of the intermediate and unawakened links between Ben Lomond and the Prussian schools, they were undoubtedly these,—the German,—Germany,—Prussia,—and, these media being admitted, the connection between the extremes was manifest.

Scripture[29] first subjected this theory of mediate association to experimental test. He exposed to six subjects first a series of cards, each with a Japanese script letter, and a Japanese word spelled out in Latin letters. Then he exposed a similar series, each with one of the same Japanese script letters and a German word spelled out. Then either one of the German or one of the Japanese words alone was shown, and the subject reported what idea it suggested to him. The subject was usually unable to tell why these ideas came to him. In a total of 185 trials, seventy-nine reported associations were words on one of the cards. When those cases were excluded whose association might be explained by some extraneous factor, two-thirds of the associated words were related to the stimulus words by their having common Japanese script letters on their cards. Scripture believed this showed that unconscious (INCOMMUNICABLE and NOT INVOLVING INSIGHT) factors can give rise to a conscious association of two apparently unrelated ideas.

Despite the criticisms of Smith,[30] which are not altogether valid, this study of Scripture's has important implications. Similar work has been done by Cordes, Messer, Münsterberg, Smith, Howe, and

[29] E. W. Scripture, Ueber den associativen Verlauf der Vorstellungen, Leipzig: Engelmann, 1891, 31-8; reprinted in *Philos. Studien*, 7, 1892, 76-83.

[30] W. G. Smith, Mediate association, *Mind*, 3, 1894, 291.

Ordahl[31] with conflicting results. This problem still is in need of further careful investigation, because its solution is of great importance to the study of the general question of unconsciousness (NOT INVOLVING INSIGHT).

Research much like Scripture's, but not so well controlled, was reported by Sidis[32] a few years later. He corroborated Scripture's findings.

(*b*) Ordahl found[33] that, in learning to throw balls accurately, to write in unaccustomed ways, and to multiply large numbers mentally, subjects were frequently unconscious (INSIGHTLESS and UNABLE TO COMMUNICATE) of important factors which led to improvements in their skill. In the case of the ball throwing, not only were these factors unreportable, but if attention were directed to them the skill was definitely diminished. This same circumstance is often reported to be true of swimming, riding bicycles, and such muscular acts.

(*c*) Frequently unconscious (INCOMMUNICABLE) sets or tendencies to make certain sorts of judgments concerning specific classes of objects or persons may be developed. The effects of prejudices upon action are usually unconscious (INCOMMUNICABLE). There are judges who in all sincerity attempt to decide every case on its merits and who would be astounded to find the proportion of the foreign-born defendants they had found guilty was significantly larger than that of the native-born citizens. The most convincing illustration of the operation of such an unconscious (INCOMMUNICABLE) set is the experimentation of Rees and Israel.[34] They made lists of five-letter words with scrambled letters. The subject's task was to unscramble the letters, as in anagrams. There were two sets of anagrams. One set was nonambiguous (in which the letters could be arranged to make only one word) and the other was ambiguous (which could be arranged to make more than one word). The subjects were divided

[31] For references to this work *cf.* L. E. Ordahl, Consciousness in relation to memory, *Amer. J. Psychol.*, 22, 1911, 164-5 and 179-81.

[32] B. Sidis, *The Psychology of Suggestion,* New York: Appleton, 1898, 172-7.

[33] L. E. Ordahl, Consciousness in relation to learning, *Amer. J. Psychol.*, 22, 1911, 188-203.

[34] H. J. Rees and H. E. Israel, An investigation of the establishment and operation of mental sets, in Studies in psychology from Smith College, *Psychol. Monog.*, 46, 1935, No. 210, 1-26.

into two groups, each of which was given a training series with non-ambiguous anagrams. For one group all the solutions were "nature" words, and, for the other, words having to do with eating. Then both groups were given ambiguous anagrams which for one group contained possible "nature" solutions and for the other possible "eating" solutions. It was found that the training series successfully established a set, so that more ambiguous anagrams were solved after the manner of the set developed (nature words for one group, eating words for the other) than otherwise. Some subjects, when asked if they were aware of the set, reported that they were, but others had no idea of it. Nevertheless, these latter were as much affected by the set as the former.

(*d*) Unconscious (NOT INVOLVING INSIGHT) conditioning was done by Diven.[35] The subjects were told that the experiment was on muscle co-ordination. They gave free associations to a series of words. Twelve seconds after each time a certain critical word (*e.g.,* the word *barn*) was presented, the subjects received an electric shock. In the meantime they had given several associations, and their attention had been directed away from the critical stimulus. This diversion of attention, together with the fact that the shock occurred so long after the critical word, resulted in the connection between them being unconscious (INCOMMUNICABLE) for twenty-one out of fifty-one subjects. These subjects did not know of any rationale for the shocking. Nevertheless measurements of functions mediated by the autonomic nervous system indicated that, after several shocks, these physiological processes began to become apparent whenever critical words or even words indirectly related to them were given to the subjects. The subjects were unconscious (UNABLE TO COMMUNICATE) both of when the shock was coming and of the physiological changes.

THE EFFICIENCY OF INSIGHTLESS PROCESSES

These researches all show that one's present and future behavior may be modified by the past without one's being conscious (IN-

[35] K. Diven, Certain determinants in the conditioning of anxiety reactions, *J. Psychol.*, 3, 1937, 291-308.

SIGHTFUL) of the nature of the modification or even that it is going on. If this is true, the problem that arises is in what way, if at all, unconscious (NOT INVOLVING INSIGHT) processes differ from conscious.

Some believe[36] that creative thought and judgments are more efficient if they occur unconsciously (NOT INVOLVING INSIGHT). Already in this chapter a case has been mentioned (p. 184) in which this belief was illustrated in the translating of a poem. It has also been stated (p. 185) that good physicians frequently make correct diagnoses unconsciously (INSIGHTLESS) and cannot immediately, or sometimes ever, give their reasons. Unconscious (NOT INVOLVING INSIGHT) legal judgments, too, have been praised (pp. 185-186) as more adequate than conscious ones. The following anecdote illustrates how this may be true:[37]

> First it may be explained that Lord Mansfield (1705-1793) was one of the greatest of English lawyers and is regarded as the founder of English mercantile law. It happened that a friend of his was appointed Governor of a West Indian Island. He told Lord Mansfield that the one thing he dreaded about his post was that he would have to sit as a judge and decide cases. Upon which Lord Mansfield advised him to decide according to his notions of commonsense, but never to give his reasons; "for," said he, "your judgments will probably be right, but your reasons will certainly be wrong."
>
> Thus one of the greatest of English lawyers, whose profound knowledge of the law and whose long experience enabled him to rely on his formal reason, advised his friend, who had no experience, to mistrust his formal reason and imitate the jury in relying, in legal matters, on his subconscious judgment.
>
> There was a curious sequel to the story. Some years afterwards, Lord Mansfield, while sitting on Privy Council appeals, had a judgment of this Governor brought before his court, which seemed so absurd in its reasons that there was serious clamour for the recall of the Governor as incompetent. It was found, however, that the decision itself was perfectly right. It appeared that, at first, the Governor had acted on Lord Mansfield's advice by deciding without giving reasons; and, finding that he acquired a great reputation

[36] *E.g.*, R. de Gourmont, *op. cit.*, 49.

[37] From C. James, *Curiosities of Law and Lawyers*, London: Sampson Law, 1882, 59. This wording is the story as retold by H. Hankin, in *Common Sense*, New York: Dutton, 1926, 44-5. By permission of E. P. Dutton & Company, Inc., and of Kegan Paul, Trench, Trubner and Company, Ltd.

thereby, began to think himself a great lawyer, and then, at length, took to giving his reasons with the above-mentioned result.

Besides the accuracy of unconscious (NOT INVOLVING INSIGHT) judgments, their ease and speed have been adduced as proofs that they are more efficient. It is obvious that, if the decision comes to consciousness ready-made, it seems subjectively easier to make, just as a prefabricated house is easier to build than a log cabin. As far as increased speed of judgment goes, Hankin commented:[38]

> If one says to a business man, and if the idea is new to him, that being rich doesn't consist in having money: it consists in having more money than other people—he instantly smiles. But on making this remark to a socialist, he was observed by me to frown instantly. In either case a moment's thought was all that was needed to form an opinion. But what a number of past experiences, of stored data, of preconceived ideas, of beliefs and feelings, must be involved and must be used by the subconscious mind to produce the smile or the frown! And what time would be needed to bring them all out into consciousness and to weigh them in conscious reasoning! It is this extreme rapidity of the work of the subconscious mind that is its salient character and that most urgently needs to be explained.

Undoubtedly one reason why conscious judgments seem to take longer than unconscious (NOT INVOLVING INSIGHT and INCOMMUNICABLE) is that they are almost always verbalized, either overtly or covertly, and the framing of proper wording is a time-consuming process. The essential reason why unconscious (NOT INVOLVING INSIGHT) judgments are more accurate, easier, and more rapid, however, is that they have been frequently practiced. Judgments do not occur unconsciously (NOT INVOLVING INSIGHT or UNATTENDED) unless they concern situations with which the individual has dealt so often before that he can treat them automatically. As Henderson observed (*cf.* p. 185), it is the practice that causes both the automatic character of the judgment and its efficiency; it is not better merely because it is unconscious (NOT INVOLVING INSIGHT or UNATTENDED). Hankin re-

[38] H. Hankin, *Common Sense,* New York: Dutton, 1926, 53. By permission of E. P. Dutton & Company, Inc., and of Kegan Paul, Trench, Trubner and Company, Ltd.

ported a case illustrating this:[39] "He can recognise bad character in an Indian but less easily than in an Englishman, but he finds it very difficult to form an opinion of a Chinaman." This man could judge the kind of face which he had most often evaluated. He had no idea upon what characteristics of the face he made his judgments.

Here we find ourselves at a final possible explanation of why unconscious (NOT INVOLVING INSIGHT) decisions often seem more adequate than conscious. Why did Hankin's friend not know the basis of his character evaluations? Why did the West Indian governor find himself unable to give the reasons for his decisions? Why did Ordahl's subjects become worse in ball throwing when they concentrated upon the mechanism of the action? Most probably because they had depended on subliminal cues of some sort to perform these acts properly—stimuli which could not reach the center of verbalization of the central nervous system and hence were unconscious (INCOMMUNICABLE). Of course the governor may have forgotten the bases for his adjudication long before he pronounced it, just as the jury forgets most of the testimony, but probably he founded it mainly on such intangibles of face and carriage as Hankin's friend used, and could not have told what they were even at the moment he first perceived them. Probably in attending to the act of throwing balls Ordahl's subjects inhibited the effect of subliminal impulses from the muscles and elsewhere which governed the ball-throwing adjustments but were not strong enough to reach the "seat of consciousness."

As Freud once observed,[40] there is a whole series of activities which are best performed when they are automatic, receiving little conscious attention. Possible explanations for this fact are: (*a*) consciousness inhibits the effect of subliminal stimuli on behavior; (*b*) consciousness cannot act on the basis of unconscious (UNREMEMBERED) experience; and, most important, (*c*) the most practiced activities are the most likely to be automatic.

[39] *Ibid.*, 25.

[40] S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill (*Psychopathology of Everyday Life*), 94.

In Chapter VII, however, it was demonstrated that certain acts are improved during attentive consciousness. How can this apparent conflict be resolved? Ordahl once suggested[41] that the more physical and muscular actions are better performed unconsciously (INSIGHTLESS?), but that the "higher mental processes" are more efficient when conscious. If speed is an index of efficiency, Ordahl's statement does not agree with the facts, for consciousness (ATTENDED) has been shown (pp. 168-169) to reduce simple reaction times and unconsciousness (NOT INVOLVING INSIGHT) has been demonstrated (pp. 197-198) to be the best condition for such complex behavior as the West Indian governor's legal decisions.

The fact of the matter probably is that novel, changing situations are best faced consciously (INSIGHTFUL and ATTENDING), but that familiar acts are frequently better performed unconsciously (INSIGHTLESS and UNATTENDING). The rest of this chapter is devoted to amplifying this statement.

NOVELTY, HABIT, AND THE PRINCIPLE OF UTILITY

It is by no means original to say that there is relation between the novel or change and consciousness, on the one hand, and habituation and unconsciousness (UNATTENDED), on the other. A quarter of a century ago Washburn worked this notion into her motor theory of consciousness:[42]

> Introspection suggests that the more smoothly and easily a movement occurs, the less consciousness accompanies it. The process of habit formation is the convincing instance of this. A beginner at riding the bicycle makes the movements of balancing himself with anxious attention and care; later they occur smoothly, accurately, and unconsciously. In current physiological theory the ease with which a movement is performed is held to be due to the low resistance offered at the synapses or meeting-points of neurones which the nervous process has to traverse: hence it has been suggested that consciousness accompanies a high degree of synaptic resistance, unconsciousness a low degree.

[41] L. E. Ordahl, *op. cit.*, 202-3.

[42] M. F. Washburn, *Movement and Mental Imagery*, New York: Houghton Mifflin, 1916, 20.

The "current physiological theory" has been held in some form by, among others, Montague, Thurstone, White, Spencer, Romanes, Mercier, and McDougall.[43] This doctrine makes consciousness appear to be like heat developed by resistance to the passage of an impulse at the synapse. If there is no choice to be made, because the situation is the same as many before and habituation has worn the neural path "smooth," then there is no "heat." When a change in the situation occurs, a choice between several actions has to be made, and hence there is "consciousness" at the synapse.

Though this neural explanation of consciousness has been widely supported, it is based merely on introspection as to what situations produce consciousness, coupled with groundless speculation about the nervous system. It does not even explain all the introspective data, for it is generally recognized that actions which have been performed automatically may return to consciousness. Holt has pointed out,[44] though, that by the terms of this theory, once an act has worn its path smooth, it cannot become conscious again unless relearned on a new set of nerves. Even if this theory is generally discredited, it contains one important truth—that with practice repeated actions in customary situations tend to be carried out unconsciously (UNATTENDING). Probably a better interpretation of this fact, fitting in well with the data supporting Head's theory of vigilance, is Holt's analysis.[45] He suggested that the reason one performs habitual acts inattentively is that, upon being learned, they are integrated into a more comprehensive behavioral unit which is attended to as a whole, and whose components pass out of attention.

In condoning the gullibility of us human beings in believing without criticism or check many things that are told to us, Murphy,

[43] W. P. Montague, Consciousness a form of energy, in *Essays Philosophical and Psychological in Honor of William James,* New York: Longmans, Green, 1908, 128 ff.; L. L. Thurstone, The anticipatory aspect of consciousness, *J. Philos., Psychol., and Sci. Methods,* 16, 1919, 561-8; and W. A. White, in C. M. Child *et al., The Unconscious: A Symposium,* New York: Knopf, 1929, 254-5. E. B. Holt, *The Freudian Wish,* New York: Holt, 1915, 190, is the authority for the fact that the others maintained this theory.

[44] E. B. Holt, *The Freudian Wish,* New York: Holt, 1915, 190-1.

[45] *Ibid.,* 189.

Murphy, and Newcomb wrote[46] that life could scarcely be lived if we were forever on guard. This statement is not strong enough: it is part of the thrifty plan of conservation of our organisms to allow the attention to be lulled into relaxation by any stable situation. Pavlov's dogs fell asleep during any monotonous conditioning (*cf.* pp. 123-124), even when the stimuli were powerful electric shocks. In Janet's metaphor,[47] the individual attempts to conserve his bank account of "psychological force" by spending no more attention than necessary.

The tendency of habitual activities to become unconscious (UNATTENDED) and the tendency of the reorganization of memory traces in the production of new creations to proceed unconsciously (NOT INVOLVING INSIGHT) point to a principle of utility in the organism. It would appear that processes of a repetitive character can be carried on without consciousness, and that in general this is what happens, so that the highest levels of nervous integration may be left free for novel activities.

In speculating on the character of unconscious (NOT INVOLVING INSIGHT) functions, one hypothesis which can be suggested is that solving a problem such as the mathematical puzzle which engrossed Poincaré (*cf.* Case IX of Chapter II, pp. 55-56), or writing poetry as Coleridge did (*cf.* Case X of Chapter II, pp. 57-59), is like trying to fit many pieces of a jig-saw puzzle into a certain place until finally one slips in. The organizing and reorganizing of numerous mental traces until finally the desired solution or creative product results may well be a long, tedious task because of the multitude of possible combinations. Hence, by the principle of utility, it would best be performed unconsciously (NOT INVOLVING INSIGHT). (It has been suggested by de Gourmont[48] that this experimental process of trial and error leading to the final production may go on even dur-

[46] G. Murphy, L. B. Murphy, and T. M. Newcomb, *Experimental Social Psychology*, rev. ed., New York: Harper, 1937, 171.

[47] *Cf.* P. Janet, Psychological strength and weakness in mental diseases, in *Factors Determining Human Behavior*, Cambridge: Harvard University Press, 1937, 70-1.

[48] R. de Gourmont, *op. cit.*, 64.

ing sleep.) When the desired result is accomplished, according to this hypothesis, it appears in consciousness as a flash of insight.

On the other hand it may be that the combinations are carried on consciously, but that the unsuccessful attempts to solve the problem are immediately forgotten as soon as they are discarded as unsatisfactory. Only the successful attempt finally is remembered. It may be that the creative individual spends long hours of such fantasy, forgetting immediately afterward most of what passes through his mind. It seems certain that the inventive discovery is not made unless the field has been well thought over, again and again. *"Dans les champs de l'observation le hasard ne favorise que les esprits préparés."* The immediate rejection and forgetting of unsatisfactory solutions may also be interpreted in the light of the utility principle as an effort to keep from cluttering consciousness with useless material.

It would be possible to determine experimentally which, if either, of these two alternative descriptions of the creative process is correct. Subjects could be put to solving a difficult problem requiring a prolonged period of study, and then be asked from time to time what they were thinking of. If the amount of time spent in conscious (COMMUNICABLE) thought on the question, as measured by this method, correlated well with speed or adequacy of solution, it would suggest that the conscious thought was the essential element in the solution. Then it could be assumed that the reason all this thought cannot be reported later is that the unsatisfactory trials are forgotten. If, on the other hand, the correlation were low, it would seem likely that the whole process was unconscious (NOT INVOLVING INSIGHT).

THE RELATION BETWEEN ENVIRONMENTAL NOVELTY AND INSIGHT

Until death or the lowest depths of unconsciousness (UNRESPONSIVE TO STIMULATION) have engulfed a person, his attention may wander far or seem to disappear, but a sudden change in any part of the environment which is important to him can always call it

back. In Chapter VII (pp. 173-174) it was demonstrated that any heterogeneity of stimulation demands attentive consciousness. Ford has said[49] that one may characterize as *attention* "that mental co-ordination which exists at the beginning of a new and novel stimulus combination." Objective evidences of attention appear rapidly after any sudden stimulation.

(*a*) Often the first of these is the startle pattern, which Landis and Hunt have investigated[50] in human beings. They find this reaction to a sudden stimulus of an intense sort in any sense modality to be brief, stylized, general flexion of body and face muscles. The response usually lasts less than one-half second, and is rarely caused to disappear by neurological lesions, or "voluntary" inhibition. Landis and Hunt said[51] that the startle pattern is a type of catastrophic behavior occurring when sudden, intense stimulation indicates that an emergency exists to which adjustment must be made. As Dewey noted,[52] this sort of reaction is accompanied subjectively by confusion and temporary bewilderment as well as a sudden increase in attention.

(*b*) A wealth of experimentation shows[53] that, along with the startle pattern and many other physiological changes which take place upon development of insightful and attentive consciousness, there is a rapid rise of the electrical conductivity of the skin—the galvanic skin response.

(*c*) Karl Bühler referred[54] to the "aha experience," which is outwardly the sudden physiological reaction, often the drawing in of breath, occurring with sudden insight into the nature of a situation. Under such circumstances one is likely to say "aha." The organism has been behaving somewhat automatically, following habitual reaction patterns, and then in an instant something that has been

[49] A. Ford, Attention-automatization, *Amer. J. Psychol.*, 41, 1929, 31. By permission of the *American Journal of Psychology.*

[50] C. Landis and W. A. Hunt, *The Startle Pattern,* New York: Farrar and Rinehart, 1939.

[51] *Ibid.*, 154.

[52] J. Dewey, *Human Nature and Conduct,* New York: Holt, 1922, 175-83.

[53] *E.g.*, C. Landis and W. A. Hunt, The conscious correlates of the galvanic skin response, *J. Exper. Psychol.*, 18, 1935, 505-29.

[54] *Cf.* K. Buhler, *Sprachtheorie,* Jena: Fischer, 1934, 311.

unconscious (NOT INVOLVING INSIGHT) reaches the conscious, communicable level. Attention perforce follows such a sudden insight. Subjectively it is the exclamatory mood, objectively it is indicated by the presence of the motor concomitants of attention.

(*d*) A like happening is found in much humor. The fun in Dorothy Parker's verse lies in the way she can lull one to quiescence with beautiful love poetry for three stanzas and then double back and slap one in the face with a pert, disillusioned final line.

(*e*) Another case, either humorous or serious, is the delayed reaction, a favorite device of the comedian Edward Everett Horton. He is absent-mindedly carrying on a *tête-à-tête* when his partner in the conversation insults him. This would cause a startle reaction in most people. Instead, because of the pleasant or usual form in which it is phrased, Horton accepts the statement for a moment with a nod and faint smile. Then the threat to his equanimity dawns on him, and his startle pattern is supernormal. In that lies the humor of the situation.

Fred Matter, a survivor of the torpedoing of the Belgian freighter *Ville de Namur* on June 19, 1940, wrote[55] that he always had believed that the delayed reaction was a Hollywood invention until his boat was torpedoed. During the turmoil after the ship was hit he saw the night watchman standing on the last step of the companionway, motionless and apparently half asleep. Matter slapped him and said, "Come on, man, your lifebelt, we're sinking." The watchman continued smiling contentedly for a long moment, and then, suddenly, with an exclamation, he turned and bolted toward his cabin.

THE GUARDING POINT AND SURPRISE

In terms of nervous-system function, we can say that all these cases represent a sudden redevelopment of vigilance in the highest integration centers. The organism, like a fire department, always has a "guarding point"[56] on watch, and when the alarm sounds it

[55] *Cf. Life*, 9, No. 8, Aug. 19, 1940, 56-7.

[56] *Cf.* V. Bakhtiarov, (The problem of narcolepsy), *Sovet. Nevropatol.*, 1932, No. 8, 405-40 (not viewed).

summons all necessary forces at once. Consciousness (INVOLVING INSIGHT and ATTENDED) arises from unconsciousness (NOT INVOLVING INSIGHT and UNATTENDED) when the lazing organism is faced point blank with a change in environment. It may be beneficial or harmful—the determination of that comes second. First, attention to the new stimulus must develop—for thus it is best perceived—and from this insight into the nature of the change may be achieved.

In human beings it is usual for communications or expressions indicating surprise to occur with these sudden flashes of consciousness (INVOLVING INSIGHT). Few besides poker players, diplomats, and facial paralytics can avoid these outward signs. This phenomenon of surprise has frequently been reported in connection with psychological experiments, but has never been suggested as a criterion of the onset of consciousness. It is, nevertheless, one of the surest and most objective criteria there are. It indicates that some part of the environment, which was interpreted to be of a certain nature, at that moment is recognized to be different. Let us investigate a few examples of this sort of behavior recorded in psychological writings:

(*a*) In Chapter XI (pp. 264-265), mention is made of Jastrow and West's research with the automatograph (a scientific Ouija board). They found, among other things, that subjects involuntarily moved their fingers and the board toward objects to which they were told to attend. Also the fingers moved the board in time with ticking sounds. They stated:[57] "The movements are sometimes unconscious but always involuntary, there is often great surprise at the result."

(*b*) Sidis had each of his subjects guess what letters were shown to him at such a great distance that they appeared to be merely blurred dots (*cf.* p. 147). The subjects complained that they would have just as much basis for guessing if they shut their eyes. Sidis reported[58] that they were much surprised when they learned after the experiment that they frequently had named the letters correctly.

[57] J. Jastrow and H. West, A study of involuntary movements, *Amer. J. Psychol.*, 4, 1892, 407. By permission of the *American Journal of Psychology.*

[58] B. Sidis, *op. cit.*, 171.

(*c*) In Chapter VI (pp. 156-157) Huntley's research[59] was considered, in which subjects judged their own "forms of expression" in comparison with those of others, although they did not realize that they were their own. When the subjects discovered that they had been evaluating their own hands, their own handwriting, etc., they gave various exclamations of surprise. They were astonished to find that the purpose of the experiment had been so different from what they had thought it was.

(*d*) Stevens, discussing mathematics as a rational and deductive system, wrote:[60]

> Regardless of how inventive mathematical discoveries may appear to be, they contain nothing not already implicit in the fundamental postulates of the system. The outcome of our symbol-juggling surprises and delights us and fills us with the illusion of discovery, simply because of the limitations of our minds. A man of sufficient intellect would disdain the use of logic and mathematics, for he would see at a glance all that his postulates and definitions implied. He would be aware of all possible discoveries under the rules. The rest of us, however, must continue to do our mathematics stepwise, proceeding from one tautological transformation to the next, and being surprised at the result.

Here to the ordinary mathematician, as to Huntley's subjects, the psychological environment suddenly develops a different character from what he had expected. He is surprised.

(*e*) In Chapter VI (p. 153) is reported the author's investigation in which subjects discriminated geometrical figures projected on the back of a transparent mirror, when they did not know that actual images were there and thought they were doing a clairvoyance experiment. The same element of surprise was obvious when these subjects, who had known nothing of the purpose of the research, discovered that they had been receiving actual physical visual stimulation, and, looking at the mirror again, saw the outlines that had

[59] C. W. Huntley, Judgments of self based upon records of expressive behavior, *J. Abnorm. and Soc. Psychol.*, 35, 1940, 398-427; *cf.* especially 401.

[60] S. S. Stevens, Psychology and the science of science, *Psychol. Bull.*, 36, 1939, 238. By permission of the *Psychological Bulletin.*

been invisible before.[61] Subject *A* said: "I was positively amazed when the set-up was explained to me." Subject *B*: "I was very surprised when I saw it." And so on for each of the other subjects.

Observers watching the experiment were continually astonished that these naïve subjects did not see the images at the higher voltages of illumination, when it was perfectly obvious to them that the images were present, because they knew of the actual physical stimulation. Even an experienced subject who understood the set-up before beginning his observing, after discussing the experiment with other psychologists, declared: "I could not get that group to feel as surprised as I about the effect of cues that refuse to be available to introspection. Apparently my attitude is due to the fact that I was a subject." His environment had been different from what he had expected, and he felt surprise.

CONCLUSIONS

The "seat of consciousness" of the central nervous system is by no means omniscient. It often has no contact with other parts of the nervous system, let alone with the outside world. When no immediate danger threatens, and all seems usual and customary, lowered vigilance and inattention are the rule. That is the economy of the body. Suddenly an impulse from elsewhere in the nervous system or from the outside world through the sense receptors is strong enough to pass the threshold to the "seat of consciousness." Consciousness (ATTENDED) occurs and consciousness (INVOLVING INSIGHT) often follows. Surprise or startle behavior of some sort is the outward manifestation of the highest integrative center of the nervous system getting up to date with events. The attention and insight that accompany these outward manifestations increase the organism's efficiency in dealing with novel situations.

It is important to recognize that lower functional levels can temporarily get as much out of control of the highest integrative center as is the outside world. They may at times become princes of Serendip and return from the quest with their treasure before the highest

[61] J. G. Miller, Discrimination without awareness, *Amer. J. Psychol.*, 52, 1939, 574-5.

centers know that they have gone. Something of this sort occurs in a large part of artistic creation and problem solving.

It is conceivable that much of this theory is fable, but there is one fact: introspective evidence almost unanimously agrees that the final products of our own "higher mental processes" are often as unexpected to us as the morning headlines.

CHAPTER IX

FORGETFUL UNCONSCIOUSNESS

In its widest sense *memory* is the name for the influence of a person's past upon his present or future thoughts and behavior. How is the past represented in the present? What are the determinants of remembering and forgetting? Can the individual under any conditions report everything that has happened in the past? Is his behavior affected only by those parts of the past which he can report in the present? These are the problems of unconsciousness (UNREMEMBERED).

It has often been suggested[1] that consciousness would be impossible without memory, and many conditions commonly called *unconscious*, in one sense or other, are to be explained by abnormal function of memory. The drug scopolamine (which causes "twilight sleep") seems not to affect the sensation and perception of pain and other stimulation at the time, but memory of this stimulation does not persist. Therefore it is effective as an "anesthetic." Whenever memory does not last long enough to allow introspective report to be made, all the subjective evidences of consciousness disappear. Such immediate amnesia can be distinguished from anesthesia only by objective, physiological criteria. When patients come to the hospital after an automobile accident talking apparently sensibly but five minutes later cannot remember what they have said; when Janet's Irène (Case XIII of Chapter II, p. 63) forgets important episodes in her life; when psychoanalytic patients are unable to recount embarrassing or shameful experiences—in such cases *unconscious* (UNREMEMBERED) mechanisms are commonly said to be in operation. In the last century Solomons and Stein recognized[2] that the unconsciousness involved in acts of automatism and in cases of

[1] *E.g.*, E. G. Boring, *The Physical Dimensions of Consciousness*, New York: Century, 1933, 223-5.

[2] L. M. Solomons and G. Stein, Normal motor automatism, *Psychol. Rev.*, 3, 1896, 500-1.

dual personality cannot be distinguished introspectively from abnormal function of memory.

Ebbinghaus made the first significant experimental study of memory[3] a few years after Azam had begun[4] to investigate it clinically. These two streams, however, have rarely flowed together. There are several reasons for this: (*a*) The serious amnesias found in clinics are too dangerous to induce experimentally, even if they could be so induced. (*b*) In the "correct" laboratory tradition the chief experimental emphasis in studying memory has been on the conditions in the environment which affect memory in "typical human beings." Such research has usually evaded what is interesting to the clinic, individual differences in what is remembered or forgotten and in motivations for forgetting. (*c*) Clinicians have realized that practically anything learned under practically any circumstances may be forgotten if there are sufficiently sound reasons to forget it. In the clinical picture of abnormalities of memory, determinants varying from individual to individual far outweigh the external, environmental determinants of memory. For these reasons laboratory and clinical data on unconsciousness (UNREMEMBERED) are disparate and difficult to correlate.

CRITERIA AND TYPES OF FORGETTING

There are three sorts of criteria which indicate that the past is conscious (REMEMBERED) rather than unconscious (UNREMEMBERED). (*a*) The first is dependent upon communicability—if a person can communicate his knowledge of a past incident, he remembers it. This is the proof of memory most usually required. (*b*) One may be able to react to a situation with learned behavior and therefore be remembering, and yet be unable to describe or communicate what was learned. In Chapter I (pp. 40-41), Sapir's modification of the communication criterion of consciousness was mentioned, and it will be considered in more detail in Chapter XII. He suggested that,

[3] H. Ebbinghaus, *Memory* (1885), trans. H. A. Ruger and C. E. Bussenius, New York: Teachers College, Columbia University, 1913.

[4] M. Azam, Periodical amnesia, *J. Nerv. and Ment. Dis.*, 3, 1876, 584-612.

if an individual's behavior is obviously determined by learned cultural patterns but he apparently has no knowledge that they exist and cannot describe what they are, then this is an example of unconscious (INCOMMUNICABLE) behavior. It is, on the other hand, conscious (REMEMBERING) behavior. (*c*) Conditioned responses represent memory of something which has been learned. A person may be unconscious (UNABLE TO COMMUNICATE) that conditioned responses exist even though they can be elicited by the proper stimulation. Sapir's cultural patterns may be explainable by such conditioning. The usual basis for judging whether someone remembers something, however, is by his communication, especially speech, for many things that are learned, like the Gettysburg address, can be conveyed verbally but not acted out or demonstrated by conditioned response.

Three types of unconsciousness (UNREMEMBERING), amnesias, have been distinguished by Sears:[5] (*a*) amnesias of impression, which are really pseudo-amnesias, for the material supposed to be forgotten was never perceived or properly interpreted; (*b*) amnesias of retention, in which the material was impressed and then lost irrecoverably; and (*c*) amnesias of reproduction, in which the material might be remembered under specific conditions, but cannot be produced at the time under consideration.

Each of these sorts of amnesia deserves consideration in turn.

AMNESIAS OF IMPRESSION

Amnesias of impression are not unconscious in the sense of UNREMEMBERED, but rather of UNSENSED. In dealing with any apparent amnesia, the first step must be to determine whether it is a pseudo-amnesia of this sort, or whether an adequate impression was really received by the patient. Already reference has been made (p. 30) to Sears's list of acceptable sorts of evidence that a person has received an adequate impression:[6]

[5] R. R. Sears, Functional abnormalities of memory with special reference to amnesia, *Psychol. Bull.*, 33, 1936, 235-6.

[6] *Ibid.*, 232. By permission of the *Psychological Bulletin.*

(*a*) The fact of immediate recall of the experience before amnesia develops (as in the amnesias of murderers . . . or victims of dual personality); (*b*) eventual recall spontaneously or by aid of special methods (as with hypnosis, distraction, chloroform, emotional shock, or free association); and (*c*) agreement by competent observers that the external conditions were sufficient to provide an impression. The last criterion may be easily abused; perception depends on internal conditions as well as external and no observer is competent to judge the former as adequate.

Frequently, as in football games, a physical accident to a person has been succeeded by amnesia for events occurring during a certain period immediately before the trauma. Hess reported[7] three similar cases. He called attention to the fact that in many cases in which trauma had been associated with amnesia, the patients had been exercising more or less severely or drinking. He suggested that in such activity one becomes drowsy and the perceptions are diminished. Under these circumstances, he believed, there would have been no recollection of the period even if the injury had not occurred. He argued, therefore, that such cases often are amnesias of impression. This is interesting theory, but only one of his cases bears it out at all convincingly. This patient was a drunkard of thirty-six who attempted twice during drinking bouts to hang himself. After the second trial he was cut down and had no recollection of the attempt or of immediately preceding events.

Theoretically it might be expected that strong emotion could distract attention so that impressions which one would normally get would not be received. Actually all amnesias reported which might be explained this way have disappeared either spontaneously or as a result of the use of techniques which improve recall, like hypnosis or free association.[8]

Now that forgetting due to repression bulks so large in psychotherapy, every case of apparent forgetting must be carefully checked to eliminate the possibility that, like Bobby Burns's lady who had the louse on her hat in church, the patient did not adequately per-

[7] E. Hess, Retrograde Amnesie nach Strangulationsversuch und nach Kopftrauma, *Monats. f. Psychiat. u. Neurol.*, 15, 1904, 241-57.

[8] *Cf.* R. R. Sears, *op. cit.*, 235.

ceive what he was supposed to have forgotten, and so acted in ignorance of it. Freud set a good example, not always followed by psychoanalysts and psychiatrists, when he recognized[9] that errors originating from repression must be carefully distinguished from those actually based upon ignorance.

AMNESIAS OF RETENTION

Are there amnesias in which something once learned or experienced not only is, under the conditions of the moment, incapable of being reproduced, but is entirely lost by the organism? If conditioning is evidence of memory, the answer is most likely "No." Pavlov found[10] that, if a conditioned response is formed and then, as he says, "completely extinguished," so that the proper stimulus will no longer elicit it, it will after a certain interval spontaneously recover its full strength. Using communication as a criterion of the presence of memory, however, Störring has reported[11] that amnesia in which experience is immediately forgotten as it occurs and is not recoverable may result from gas poisoning, which presumably involves organic brain damage. On the other hand, Jones, employing the same criterion, has stated almost unequivocally[12] that no forgetting is amnesia of retention but all is amnesia of reproduction. It is indeed remarkable how long a thing may be apparently forgotten and then suddenly become conscious (REMEMBERED) again.

Rochon-Duvigneaud related[13] how once, leafing through a book, he came upon a picture of some flowers known as "mirror of Venus," and was suddenly seized with intense emotion. Over a period of a few days he repeatedly looked at this picture, with the

[9] S. Freud, *The Basic Writings of Sigmund Freud,* ed. A. A. Brill, New York: Random House, 1938 (*Psychopathology of Everyday Life*), 143.

[10] I. P. Pavlov, *Conditioned Reflexes,* ed. G. V. Anrep, Oxford: Oxford University Press, 1927, 58.

[11] G. E. Storring, Über den ersten reinen Fall eines Menschen mit völligem, isoliertem Verlust der Merkfähigkeit, *Arch. f. ges. Psychol.,* 81, 1931, 257-384.

[12] E. Jones, Remarks on a case of complete auto-psychic amnesia, *J. Abnorm. Psychol.,* 4, 1909, 233-5; also E. Jones, *Papers on Psycho-Analysis,* London: Baillière, Tindall and Cox, 1918, 104-20.

[13] A. Rochon-Duvigneaud, Émotion provoquée par un souvenir inconscient, *J. de Psychol.,* 33, 1936, 283-4.

same result, which he could not explain at all. Several days later an image came to his mind of fields of mirrors of Venus and other flowers near a place where he had spent vacations as a child. This image, however, was of fields in June, and he believed he had never been there at that time of year. Finally he remembered that he had stayed there the summer of the Franco-Prussian War, many years before, because events had altered his usual schedule. At that time he had seen this view of fields in bloom. There was apparently nothing traumatic about the memory, yet more than sixty years later the picture had this effect. He could not understand how a long-latent memory could be so provocative.

It has been said that Freud believed that there are no amnesias of retention, that all experiences of the past are indestructible and potentially recoverable. Such was not his position.[14] He did, however, emphasize strongly the importance of long-latent memories like Rochon-Duvigneaud's, and he believed[15] that whenever material becomes connected with some unconscious (PSYCHOANALYTIC MEANING) process it cannot pass from the organism unless that process is first brought to consciousness by psychoanalysis, hypnosis, or some other special technique. At present, except for the evidence mentioned in the preceding paragraphs, there are no conclusive facts known which could serve as grounds for deciding whether there are amnesias of retention.[16] Most true cases of forgetting are probably amnesias of reproduction—though some so interpreted may be amnesias of retention.

AMNESIAS OF REPRODUCTION

In amnesias of reproduction the memories can conceivably be brought back at another time, either spontaneously or by hypnosis, free association, and so forth, but are not at present available. Or, for numerous reasons, a person may deny remembering something even though his actions are demonstrably affected by it. There are

[14] *Cf.* S. Freud, *op. cit.* (*Psychopathology of Everyday Life*), 40.

[15] *Ibid.* (*The Interpretation of Dreams*), 518.

[16] *Cf.* K. Koffka, *Principles of Gestalt Psychology*, New York: Harcourt, Brace, 1935, 523-5.

said to be at least six different sorts of reproductive amnesias, which will be considered in order: "simple forgetting," alterative forgetting, retroactive inhibition, dissociation, suppression, and repression.

1. "SIMPLE FORGETTING"

When Ebbinghaus began the experimental investigation of learning and remembering, his method of memorizing nonsense syllables enabled him to determine a curve of forgetting.[17] During the first few hours after learning the syllables, forgetting was rapid and a large percentage of the material was forgotten, but thereafter forgetting was progressively slower. These results showed forgetting to be a function of the amount of time which had passed. It was natural that the traditional psychology should conclude that time wears away the memory traces in the brain, just as the elements wear away the rocks. Freud, even when promulgating his doctrine of repression, believed[18] also in this "simple forgetting" of academic psychology. Research mentioned throughout the rest of this chapter requires that so many provisos be added to the statement that forgetting results from passage of time that it is practically nullified.

The first proviso concerns the fact that, of two things which happened at the same time, one may be distinctly remembered and the other entirely forgotten. The traditional explanation of this fact has been that those events which leave the greatest impression at the time they occur will be longest remembered. It has been determined by repeated experiment[19] that, other things being equal, the first, the most recent, most frequently repeated, or most intense stimuli of a series will be longer remembered than the others. Laboratory psychology is beginning to recognize what the clinic has known all along, that the most important phrase in this statement is "other things being equal."

Primacy, recency, frequency, intensity—any of these characteristics makes a stimulus unlike other stimuli and will attract attention to

[17] H. Ebbinghaus, *op. cit.*, 62-80.

[18] S. Freud, *op. cit.* (*Psychopathology of Everyday Life*), 40.

[19] *E.g.*, A. Jersild, Primacy, recency, frequency, and vividness, *J. Exper. Psychol.*, 12, 1929, 58-70.

it, as was shown in Chapter VII (pp. 173-174). In line with the hypothesis of neural vigilance it may be suggested that the vigilance accompanying attentive consciousness imparts some special potency to the memory trace that makes it disappear less readily. Substantiating this suggestion is the work of von Restorff, who measured[20] the rate of forgetting of homogeneous and heterogeneous nonsense syllables. She discovered that the heterogeneous were more readily remembered. She also found that an object unlike those surrounding it is better remembered than one in homogeneous surroundings.

It is now generally recognized that the most important determinants of memory are the intraorganismic needs and interests of the individual. These selectively increase the effectiveness of certain of the sensations reaching the organism. An apple in a centerpiece on the dining room table is of slight interest to a young boy until he is hungry. Then, when he sees it, it is much more attention-compelling because it can satisfy his hunger. In the future, even if he does not spoil the symmetry of his mother's centerpiece by eating forbidden fruit, he will be more likely to remember that it was there. Forgetting is not simple, and it is only secondarily dependent upon time's passage. It must be explained primarily in terms of intraorganismic conditions, and this the most satisfactory theories of unconscious (UNREMEMBERED) processes do.

2. ALTERATIVE FORGETTING

When one is unconscious (UNAWARE OF DISCRIMINATION) of things which he is capable of remembering, where are they? Only the most metaphysical will not locate them somewhere in the nervous system. A favorite pastime of psychologists has been to give names to these neural residues. They have been called, among other things, *engrams*,[21] *neurograms*,[22] *neural schemata*,[23] *mnemic persistents*,[24]

[20] H. v. Restorff, Über die Wirkung von Bereichsbildungen im Spurenfeld, *Psychol. Forsch.*, 18, 1933, 299-342.

[21] R. Semon, *The Mneme*, trans. L. Simon, New York: Macmillan, 1921, 24.

[22] M. Prince, *The Unconscious*, New York: Macmillan, 1929, 2nd ed., 109-46.

[23] H. Head and G. Holmes, Sensory disturbances from cerebral lesions, *Brain*, 34, 1911, 186-9.

[24] C. D. Broad, *The Mind and Its Place in Nature*, London: Kegan Paul, Trench, Trubner, 1925, 359-60.

imaginal processes,[25] and *traces.*[26] The last word is now the most frequently used.

Traces are not yet accessible to direct observation, and so the term is an abstract noun representing a conclusion derived from many sorts of observations. First of all it seems certain that a trace is usually not located in one neurone or at any specific neural junction. Various researches, especially those of Lashley with rats,[27] indicate that all parts of the cortex are equipotential for certain sorts of memory and learning; other less complicated tasks seem to be more localized. It is most unlikely that a war veteran could have a hundred neurones extirpated and live from that moment in blissful amnesia of his experiences in battle. His memories are too widely distributed—possibly over the whole cortex.

The most cogent interpretation of the trace has been derived from study of the so-called time-error. The negative time-error is seen when two weights, *A* and *B*, are successively compared, *B* being heavier than *A* but sufficiently like it so that the difference cannot always be recognized. If *A* is presented before *B*, more right judgments will be made than if the order is reversed. Subjectively the difference between the two in the first sequence will appear greater than in the second. The theory of traces states[28] that, when two similar stimuli are compared successively, a potential gradient exists between the new excitation from the second stimulus and the trace from the preceding one. The judgment of the difference between the two is based on this potential gradient. If this is true, the accuracy of judgment depends upon whether the trace remains the same or undergoes a change. If the two successive stimuli were equal, and if the trace from the first remained the same until the second appeared, a majority of equal judgments would be expected, or at least neither difference would preponderate. If, however, the

[25] J. T. MacCurdy, *Common Principles in Psychology and Physiology,* Cambridge: Cambridge University Press, 1928, 14.

[26] *E.g.,* K. Koffka, *op. cit.,* 423-528.

[27] K. S. Lashley, *Brain Mechanisms and Intelligence,* Chicago: University of Chicago Press, 1929.

[28] *Cf.* K. Koffka, *op. cit.,* 467.

trace diminished during that interval, then a majority of overestimations of the second stimulus would be expected. On the basis of this interpretation it can be hypothesized that the negative time-error shows that traces diminish with time.

This hypothesis is susceptible of experimental confirmation, if it can be demonstrated that the time-error increases as the interval lengthens. Köhler used[29] clicking sounds as stimuli. He found that, for short intervals, the second of two equal clicks was more often called softer but that, as the periods between clicks became longer, the second stimulus was more often considered the more intense. The cause for the first, positive time-error has not been experimentally determined, so we shall consider only the longer-lasting negative time-error. Two possible explanations of the negative time-error can be given:[30] (*a*) Metabolic processes gradually destroy traces so that the trace of the first stimulus is of lesser magnitude than the second stimulus. This is "simple forgetting" in neurophysiological terms. Or (*b*) traces in proximity become assimilated with one another. That is, in the case of the clicks, the trace of the first click merges with the trace corresponding to the period of lack of stimulation, the background, and so is less than the second stimulus.

Lauenstein proceeded[31] to subject these alternatives to an experimental decision. His subjects compared successively two stimuli, for example, two successive light intensities appearing on a dark background at one time and two on a brightly illuminated background at another. In acoustic experiments they compared tones against background tones of the same frequency, sometimes lower and at other times higher in intensity than the critical tones being compared. In both sensory modalities Lauenstein found a positive time-error for short intervals, a negative time-error increasing with the length of the interval for tones compared against less intense backgrounds, and a positive one for tones against stronger back-

[29] W. Kohler, Zur Theorie des Sukzessivvergleichs und der Zeitfehler, *Psychol. Forsch.*, 4, 1923, 115-75.

[30] *Cf.* O. Lauenstein, Ansatz zu einer physiologischen Theorie des Vergleichs und der Zeitfehler, *Psychol. Forsch.*, 17, 1932, 152.

[31] *Ibid.*, 130-77.

grounds. This difference in the nature of the time-error depends upon the background, becoming more intense if the background has a higher intensity and diminishing if the background is less intense.

The important fact in these findings concerning unconscious (UNREMEMBERED) processes is that traces do not wear away with time, but change their nature by entering into functional relationships with other traces. Forgetting is alterative.

Further illustration of the active, integrating nature of traces is the discovery of Köhler[32] that, when the basic experiment on the time-error was continued over several days, the preponderance of negative time-error over positive diminished and disappeared, so that finally the positive time-error was preponderant. This result indicates that smaller trace systems often do not remain in watertight compartments but may form larger, organized systems which have definite influence upon newly formed traces. This organizing gives the appearance of being similar to the mechanism of serendipity, the unconscious (NOT INVOLVING INSIGHT and INCOMMUNICABLE) creativity examined in Chapter VIII.

The central tendency of judgments proves another fact about the kinematics of traces. Lauenstein reported[33] findings bearing upon this tendency, but earlier work of Hollingworth's[34] illustrates the mechanism better and makes for simpler exposition because it is less abstruse. He studied the *indifference point*, that stimulus within a graded series which is reproduced or recognized correctly while lesser stimuli are overestimated and larger ones underestimated. In one procedure the subject was shown for five seconds a square, the size varying from one trial to another, and five seconds later he chose from his memory of the first square one of the same size from thirty squares of different dimensions simultaneously presented. The sizes of small stimuli were often overestimated and large stimuli were often underestimated. Hollingworth found that the indiffer-

[32] W. Köhler, *op. cit.*, 159-60.

[33] O. Lauenstein, *op. cit.*, 170-7.

[34] H. L. Hollingworth, The central tendency of judgment, *J. Philos., Psychol. and Sci. Methods*, 7, 1910, 461-9.

ence point was not absolute, but depended upon the range employed. In a graded series of squares of five to seven centimeters on a side, a five-centimeter square might be overestimated, but it would be likely to be underestimated in a series of three to five centimeters. This work has been interpreted[35] to prove that the trace system in existence influences each new trace as it is formed and that there is a sort of averaging of traces within the system.

A descriptive knowledge of the sort of changes which traces undergo in time has been experimentally established. (*a*) Wulf investigated[36] how subjects redraw designs which they have been shown. This experimentation was repeated with slight variations by Allport[37] and Perkins,[38] who nevertheless adhered closely to Wulf's technique and achieved much the same results.[39] In general, reproductions were requested immediately after the subjects had seen the designs, and then at different intervals of days, weeks, and months thereafter. The variations in reproduction of the designs over these periods, which were taken to represent changes in the traces, were then studied. The figures were found to undergo three sorts of changes: normalizing, emphasizing (or pointing), and autonomous changes. Normalizing is the passing of a reproduction through various changes toward resemblance of a familiar form. Pointing or emphasizing is the successive exaggeration of some feature of the pattern which attracts the attention of the observer. The autonomous changes are determined by the nature of the figure itself, and are such processes as the smoothing out of sharp angles or the evolving of symmetry in the figure. The explanation advanced for these alterations in memory may be what Freud referred to[40] as "con-

[35] K. Koffka, *op. cit.*, 474-5.

[36] F. Wulf, Über die Veranderung von Vorstellungen (Gedächtnis und Gestalt), *Psychol. Forsch.*, 1, 1922, 333-73.

[37] G. W. Allport, Change and decay in the visual memory image, *Brit. J. Psychol.*, 21, 1930, 133-48.

[38] F. T. Perkins, Symmetry in visual recall, *Amer. J. Psychol.*, 44, 1932, 473-90.

[39] The following researches are earlier studies of aspects of this general problem: L. Hempstead, The perception of visual form, *Amer. J. Psychol.*, 12, 1901, 185-92; F. Kuhlmann, On the analysis of the memory consciousness, *Psychol. Rev.*, 13, 1906, 316-48.

[40] S. Freud, *op. cit.* (*Psychopathology of Everyday Life*), 174-5.

densation and distortion," the interactions between traces which cause modification in all of them.

(*b*) Gibson performed[41] a somewhat different experiment from the preceding researches, exposing two series of fourteen geometric figures each before his subjects, each figure being shown for two seconds. At the end of a series the subjects were instructed to draw as many figures as they could remember. Then the exposure was repeated, and a second reproduction made. Alterations in the figures occurred in reproduction which made the figures more like the objects which the subjects thought the designs resembled. The reproduction was also often made to fit a verbal analysis of the figure made during the perception of the figure.

(*c*) The effect of language on such reproduction is demonstrated in a more enlightening manner in work by Carmichael, Hogan, and Walker.[42] A series of twelve relatively ambiguous designs was shown to three groups of subjects in an exposure apparatus, and they were told they would be asked to draw them later. Each design somewhat resembled two different objects. Group *A* was told that the design resembled one of these objects, and Group *B* was told that it resembled the other. Group *C* was shown the designs without any comment. Afterward reproductions were made from memory. This procedure was repeated until the subject could make a recognizable representation of each of the twelve designs. The experimenters divided the reproductions into five groups according to the degree of resemblance to the original drawings, and those having the least resemblance were analyzed as indicating most clearly the factors producing discrepancies. About three quarters of the drawings of Groups *A* and *B* least resembling the design were more similar to the objects named than were the stimulus figures to which the name had been applied. Less than half of the drawings of the control Group *C* were similar to objects named for Groups *A*

[41] J. J. Gibson, The reproduction of visually perceived forms, *J. Exper. Psychol.*, 12, 1929, 1-39.

[42] L. Carmichael, H. P. Hogan, and A. A. Walker, An experimental study of the effect of language on the reproduction of visually perceived form, *J. Exper. Psychol.*, 15, 1932, 73-86.

or *B*. This result may be explained by saying that the traces of certain of the perceived designs had become interrelated with traces from the names suggested for the designs, and that this intermingling altered the reproduction.

(*d*) The most extensive experimentation in this line is the excellent work of Bartlett.[43] In one study he had some subjects read short passages and then they were asked to reproduce the contents from memory repeatedly at intervals of increasing length. The most immediate reproduction was given fifteen minutes after the first reading, and for one subject the last was as long as six and one-half years later. The form and style of the first, most immediate reproduction in general persisted in succeeding reproductions, but there was a progressive tendency to simplify, to omit details, and to transform them into more familiar and convenient form. Introspective report showed that the subjects were often unconscious (UNABLE TO COMMUNICATE) of the condensation that was going on. Bartlett's results show that as time passes details are forgotten, but they are not merely worn away—they are altered and reorganized, and often the subject does not recognize that this alteration is occurring. Memory is primarily reconstructive and not merely reduplicative. Bartlett explained[44] his theory in terms of Head's "neural schemata," but he believed that these schemata are not necessarily conscious, as Head seemed to hold. He was skeptical of the concept of trace because he thought that a trace as generally understood remained passively discreet and did not combine with other traces. His doctrine, however, is closely allied to the theory of actively organizing traces outlined in this chapter.

The Gestalt school believes that "tensions" are set up between traces, and that they operate to keep some traces unconscious (UNREMEMBERED and INCOMMUNICABLE) and to force others to consciousness. (*a*) The first work indicating that there are such tensions was Aall's,[45] which demonstrated the effect upon recall of the expecta-

[43] F. C. Bartlett, *Remembering*, Cambridge: Cambridge University Press, 1932.
[44] *Ibid.*, 197-214.
[45] A. Aall, Ein neues Gedächtnisgesetz?, *Ztschr. f. Psychol.*, 66, 1913, 1-50.

tions of the learner. One group of subjects was told that they would be tested the next day on what they had learned, and the other group was told that the test would be made at an indefinitely later time. The first subjects, however, instead of being examined the next day were told that circumstances were such that the test could not be carried out then as arranged. Both groups were then examined either four or eight weeks later. The material was better remembered when it was learned with the expectation of long-term retention rather than with the expectation of remembering it only until the next day. The dissimilarities in expectation had served to organize traces differently.

(*b*) It is said that Haydn, a sound and late sleeper, could be easily roused from bed by the playing of an unresolved chord downstairs. Soon the composer would be forced by the unrelieved tension so set up to come down and complete the unfinished sequence. Zeigarnik has demonstrated[46] that similar tensions cause unfinished tasks to be remembered better. She gave her subjects a number of tasks to perform, such as writing out a poem, molding animals from plasticene, drawing a vase and flowers, and solving mathematical and other kinds of problems. She allowed them to complete some of the tasks, but interrupted them in the midst of others. Later the subjects were asked to recount the assorted tasks which they had done. The unfinished problems were much better remembered. By control experiments Zeigarnik proved that this remembering could not be explained in any other way, either by the emotional shock involved in interrupting the task, or by Aall's effect, the expectation that the incomplete problem was to be resumed later. She therefore accepted the alternative explanation of her findings, that, when the task is presented, a tension is set up which drives toward the completion of the act and which will not be dissipated until this is achieved. The unrelieved tension in the interrupted act is transferred to the trace, causing it to be better remembered than a trace

[46] B. Zeigarnik, Das Behalten erledigter und unerledigter Handlungen, *Psychol. Forsch.*, 9, 1927, 1-85.

without such a tension. The Zeigarnik effect has been repeatedly confirmed by others.[47]

3. RETROACTIVE INHIBITION

If "simple forgetting" needed a *coup de grace*, it was provided by the incontrovertible clinical and experimental proof that succeeding events can inhibit previous events, causing them to be forgotten. Clinical evidence of this retroactive inhibition[48] is the amnesia for past events which has from time to time been reported as the result of emotional shock. Most of these cases show spontaneous recovery within a few hours. Under laboratory conditions experimental efforts to cause retroactive inhibition by emotional reactions induced by electric shocks and other unpleasant stimuli[49] have resulted equivocally, the general impression being that it can be done. It seems certain, though, that unpleasant feelings caused by various odors can produce retroactive forgetting.[50]

(*a*) The classic work on retroactive inhibition is that of Jenkins and Dallenbach.[51] Their subjects learned series of ten nonsense syllables. Ability to recall these was tested one, two, four, and eight hours later. Sometimes the subjects slept during these periods, and other times they remained awake. On the average more than twice as many syllables were reproduced after intervals of sleep as after waking periods. The superiority of intervals of sleep for recall became more pronounced as the length of the intervals increased. The conclusion by the experimenters who made these findings was[52] that forgetting is not caused by decay of traces and their associations so much as by interference of new impressions with the old traces.

[47] *E.g.*, M. R. Harrower, Organization in higher mental processes, *Psychol. Forsch.*, 17, 1933, 92-102.

[48] R. R. Sears, *op. cit.*, 236-7.

[49] L. M. Harden, The effect of emotional reactions upon retention, *J. Gen. Psychol.*, 3, 1930, 197-221; also J. A. McGeoch, The influence of four different interpolated activities upon retention, *J. Exper. Psychol.*, 14, 1931, 400-13; and M. M. White, Influence of an interpolated electric shock upon recall, *J. Exper. Psychol.*, 15, 1932, 752-7.

[50] *Cf.* J. D. Frank and E. J. Ludvigh, The retroactive effect of pleasant and unpleasant odors on learning, *Amer. J. Psychol.*, 43, 1931, 102-8.

[51] J. G. Jenkins and K. M. Dallenbach, Oblivescence during sleep and waking, *Amer. J. Psychol.*, 35, 1924, 605-12.

[52] *Ibid.*, 612.

The essential aspects of this research have been confirmed by other work.[53]

(*b*) Later events not only can inhibit reproduction of traces but also can alter the tensions which cause these traces to be remembered. Zeigarnik demonstrated,[54] for instance, that the tensions which cause unfinished tasks to be preferentially remembered are lessened by intervening occurrences. For eight subjects, the ratio of the number of incomplete tasks to completed tasks remembered immediately after the experiment was about two to one. Later they were given another series of tasks, half completed and half not, and then were asked to name the tasks after the lapse of a day. Under these conditions, the ratio of incomplete to completed tasks remembered was about nine to eight. That this lowering of the ratio was not a result of the mere passage of time, but was caused by interference from events that occurred in that time, was proved by Zeigarnik in another experiment in which six subjects, after a much shorter lapse of time—only ten to thirty minutes—which was, however, filled with emotional experiences unrelated to the tasks just done, actually remembered more completed than incomplete tasks, in the ratio of about three to two.

Experimental psychology today has shown that most, if not all, unconsciousness (UNREMEMBERED) results from active rather than passive processes. Traces are inhibited from reproduction by stimuli entering the nervous system. Under usual circumstances, without this intervening stimulation forgetting would not occur. The laboratory tradition has thus eschewed its past doctrines of "simple forgetting" and approached even closer to the clinical notion of repression. Though it is true that active conflict with the succeeding impressions forces earlier learned material out of consciousness (REMEMBERED), retroactive inhibition as envisioned by laboratory psychologists differs in important ways from repression. The content and significance to the personality of what is inhibited retroactively do

[53] E. B. Van Ormer, Retention after intervals of sleep and of waking, *Arch. of Psychol.*, 21, 1932, No. 137. Certain other studies may also be confirmatory; *cf., e.g.*, A. Dahl, Über ein Einfluss des Schlafens auf das Wiedererkennen, *Psychol. Forsch.*, 11, 1928, 290-301

[54] B. Zeigarnik, *op. cit.*, 71-7.

not affect the mechanism, but they are the essential determinants of what is repressed. Retroactive inhibition and repression are similar, however, in the significant feature of being active processes.

4. DISSOCIATION

All theories of forgetting conceived by case study and incubated in the clinic state that, when recall is not possible, it is because the memories do not dovetail with some drive, need, sentiment, or instinct of the organism. The two most outstanding of these theories, dissociation and repression, differ in their emphases, but are not necessarily conflicting. They have been used to explain different sorts of cases. It was stated in Chapter VII (p. 181) that dissociation is a doctrine of levels of attention—one process goes on at the focus, the other at the periphery. It was also shown that human beings can do two or more things at once, each independent of the other, and often not interconnected by memory. This is the fact of dissociation. The French school of psychology which developed the concept of dissociation found these two levels markedly present in hypnosis and hysteria. It was not particularly concerned with explaining *why* there are two levels, as are psychoanalysts in repression theory. Hypnosis was interpreted by the French school as a kind of dissociation in which the attention of the subject is focused so sharply upon the hypnotist that the rest of the world is temporarily dissociated; after the trance this relationship with the hypnotist is often forgotten because it was on a different plane from the ordinary life to which the subject returns. Hysteria also has been explained as a two-level phenomenon. Janet's case of Irène (Case XIII of Chapter II, p. 63), who showed alternation between prostration at her mother's death and disregard of it, with mutual amnesias between the two states, has served as a keystone supporting his theory. This case is sufficiently remarkable to justify a careful elucidation, and the theory of dissociation fits it well, but it is not an eminently satisfactory model for other kinds of amnesias.

Prince has reported several cases involving amnesia which easily

fit the model, and on the basis of them he has developed[55] a more adequate theory of dissociation than Janet's. It is more useful because it does not merely state that there is more than one functional level and stop there, but proceeds to explain the dynamics which give rise to this separation of levels. In so doing it approaches close to the Freudian doctrine of repression. The dynamic factor in Prince's explanation of dissociation is instinct, innate in the organism and innately allied with its own characteristic emotions and sentiments. If two instincts are aroused at the same time, Prince believed that the less forceful will be inhibited by the stronger and repressed. Sentiments are ideas, from his point of view, and those allied with the repressed instinct become subconscious but they retain their existence as neurograms and so carry on in the personality a dissociated, unconscious (INCOMMUNICABLE) activity. They may affect the conscious personality, causing neurotic symptoms like amnesias, but the patient does not recognize that the forgetting differs from other kinds, because the conflict of instincts is unconscious (INCOMMUNICABLE).

If the instincts allied with one group of sentiments are in strong enough conflict with other instincts, Prince believed that that group of sentiments may shift from unconsciousness (INCOMMUNICABLE) to coconsciousness. His famous case of Miss Beauchamp (Case XIV of Chapter II, pp. 64-65) is an example of what he considered to be such a shift. Prince never made a careful ostensive definition of the word *personality*, and without such a definition it is really impossible to distinguish multiple personalities from multiple types of behavior, sometimes conscious and sometimes unconscious (INCOMMUNICABLE or UNREMEMBERED), in a single personality.

Prince's belief that two or more streams of personality may go on together, one conscious and the rest coconscious, would not be tenable if it could be shown that two such processes, one conscious and the other unconscious (INCOMMUNICABLE), cannot be carried on independently and at the same time. A research by Messer-

[55] M. Prince, *op. cit.*, 446-87 and 508-17.

schmidt[56] was devoted to this question. She determined the normal rates at which her subjects did serial addition and read aloud. Then she gave a hypnotic suggestion that, when she spoke numbers to them after the trance was over, they would begin serial addition with those numbers and make a written record of the results. The subjects were also given the suggestion that they would not realize they were doing this automatic writing. After the hypnotic trance was over, the subjects' arms were put through a screen and they were given pencil and paper on the other side of the screen—a set-up for automatic writing. Then they began to read aloud and to do serial addition of the numbers given them. The rates of the reading and probably also of the adding suffered by mutual conflict between the activities, and the subjects, unconscious (UNABLE TO COMMUNICATE) of their addition, apologized for their slow and stumbling reading. Messerschmidt concluded that there is no true functional independence between conscious and unconscious (INCOMMUNICABLE) acts, and that Prince's doctrine of dissociated coconscious personality is hence open to question.

In reply Prince could say that Messerschmidt's subjects were not carrying on simultaneous conscious and coconscious activities resulting from conflict of instincts but, rather, conscious and unconscious (INCOMMUNICABLE) processes resulting from posthypnotic suggestion. He could insist with reason that the experimental situation was not comparable to the events of real life which give rise to multiple personalities. His coconsciousness, he might say, arises only under great stress, and he could point to the evidence reviewed in Chapter VII (pp. 165-168), which shows that two independent acts may be carried on, and even attended to, at the same time if there is sufficient necessity for it. If Messerschmidt's subjects had had as many conflicts of instinct as Miss Beauchamp, Prince could conclude, they too would have had multiple personalities which were independent and did not interfere with each other.

Even in its most defensible form, dissociation does not convinc-

[56] R. Messerschmidt, A quantitative investigation of the alleged independent operation of conscious and subconscious processes, *J. Abnorm. and Soc. Psychol.*, 22, 1927, 325-40.

ingly and completely explain amnesias and unconscious (UNREMEMBERED) behavior. The dissociated levels are said to be levels of attention, but what fact of attention leads us to believe that the margin is entirely forgotten when the focus is attended to? All the evidence seems to show that the periphery is always remembered, and that any change there immediately demands attention. Dissociative inattention, unless it operates together with other mechanisms, cannot satisfactorily explain unconsciousness (UNREMEMBERED).

5. SUPPRESSION

When a memory is said to be suppressed or repressed, no one means that it has been pushed to the margin of attention. According to the doctrines of suppression and repression unconsciousness (UNATTENDED) is not the same thing as unconsciousness (INCOMMUNICABLE or UNREMEMBERED). In that fact lies their superiority over the theory of dissociation as explanations of forgetting. Objectively suppression and repression are the same—lack of reproduction of something that was once conscious. Objectively, therefore, suppressed memories are unconscious (UNREMEMBERED). The distinction between them is entirely dependent upon subjective report. If we learn from his introspections that an individual is conscious (AWARE OF DISCRIMINATION) of a memory but is trying to keep it out of the focus of his attention or is merely unwilling to talk about it, then it is suppressed, but it is not forgotten. It is, however, unconscious (UNATTENDED or INCOMMUNICABLE).

When one of Al Capone's henchmen was on the witness stand, the prosecutor would often be exasperated to find that he had apparently forgotten practically everything he ever knew, including half a dozen of his own names. Under other conditions he might easily have remembered all that the state would have liked to learn. The distinction between suppression and repression is subject to all the uncertainties of introspective evidence which will be discussed in Chapter XII. If a person is simply not attending to a memory or will not communicate it, there is no available proof that he has

not forgotten it. Such suppression is usually indistinguishable from forgetting.

It was concluded, in Chapter V (pp. 118-119), that hypnotic subjects are unconscious usually in the sense of UNABLE TO COMMUNICATE or UNATTENDING, rather than UNAWARE OF DISCRIMINATION. In other words, hypnotic amnesia is frequently suppression. In the light of this fact an important experiment by Luria[57] is of interest here.

In all his extensive research Luria's method was to give a series of words to which the subject was to respond with the first word he thought of. The reaction time was taken. The subject's hands were on rubber tambours, and he was instructed not to move the left hand, but to press the right one every time he gave a verbal response. Luria had proved in earlier research that stimulus words with emotional connotations cause unusually strong depression of the right hand and tremor of the left hand, as well as increased reaction time and other indications of blockage of the verbal response.

In the experiment with which we are now concerned, Luria suggested to subjects under hypnosis that they had lived through an experience which he detailed to them, one that in real life would have left them with strong emotions. To one subject, for example, he suggested[58] that he went to a friend's room to borrow some money, which he needed badly, and found that the friend was not at home. While waiting in his room, he noticed a wallet of money and decided to steal it. He left with the stolen money and was afraid that it would be discovered that he was the thief.

After a specific emotional complex had been built up by such suggestions, the subject awakened and had amnesia for all events of the trance. Before the trance, series of stimulus words had been given the subject for response, according to Luria's technique. These series contained critical words which related to the complex that was going to be induced. After the trance these words were given again in the same way, then the subject was rehypnotized, the sug-

[57] A. R. Luria, *The Nature of Human Conflicts*, trans. W. H. Gantt, New York: Liveright, 1932, 128-49.

[58] *Ibid.*, 140.

gestions were countermanded, and the stimulus words were presented a third time in the same way as before.

Luria found from this technique that, although subjects were unable to report anything about the emotional complex situation of which they were unconscious (UNABLE TO COMMUNICATE and UNREMEMBERING—suppressing?), nevertheless the critical stimulus words related to that complex produced the sort of behavior, obviously associated with the scene suggested in the trance, which in earlier work he had found characteristic of conscious emotions. The only difference was that such after-effects as tremors of the hands continued on into the presentation of the next stimulus word or two when the emotion was conscious, but when it was induced by hypnosis all such signs ended before the next stimulus was given. The main significance of this research is that unconscious (INCOMMUNICABLE OR UNREMEMBERED—suppressed?) processes exert a definite influence on associations, which justifies the attempt to use an associative technique to recover forgotten events in psychoanalysis. The overt behavior caused by these unconscious processes was, furthermore, recognizably different from that caused by similar conscious processes, and perhaps this difference could serve as an objective method of distinguishing conscious complexes from unconscious (INCOMMUNICABLE OR UNREMEMBERED—suppressed).

McGranahan has developed[59] a theory that repression (as he calls it) is cognitive, constraining the activity of certain conscious processes rather than preventing unconscious (UNAVAILABLE TO AWARENESS?, PSYCHOANALYTIC MEANING?) processes from becoming conscious. He performed an experiment in which the subjects were given serially a list of one hundred names of objects, about one-fifth of which would be likely to give rise to color associations, and were instructed to report for each one the first adjective describing the object named that occurred to them. One group was informed that a strong electric shock would be given each time a color adjective was named, and this was done. No mention of color or of

[59] D. V. McGranahan, A critical and experimental study of repression, *J. Abnorm. and Soc. Psychol.*, 35, 1940, 212-25.

shocks was given to the other group. The shocks caused some subjects to give more color associations and others to give fewer than was normal in the second group of subjects. Further, a rather high correlation was found between the number of colors named by a subject in the shock-situation and the degree of disruption caused by shocks in his performance of a second, entirely different task. McGranahan concluded from this high correlation that the subjects most disorganized by fear during the second task were least able to perform cognitive repression, and those least disturbed were best able. He did not believe that most repression is caused by the mechanism which the psychoanalysts outline, an elimination from consciousness (AVAILABLE TO AWARENESS), but considered that most is merely a limitation of report. For that reason his research dealt with what has ordinarily been termed suppression, in which the individual is unconscious only in the sense of UNABLE TO COMMUNICATE, rather than repression, in which he is unconscious in the PSYCHOANALYTIC MEANING.

6. REPRESSION

The theory of repression has been said by Freud[60] to be the pillar on which rests the psychoanalytic edifice. One of Freud's major contributions to psychotherapy was[61] discovering that the hypnosis frequently used by psychiatrists to recover lost memories masks the fact that the patient normally has resistances to remembering these things and will often reforget them after the hypnosis. He believed that unconscious (PSYCHOANALYTIC MEANING) psychic activity continues to cause things to be forgotten even after they have once been brought to consciousness (COMMUNICABLE) by such procedures as hypnosis. This doctrine of unrelenting pressure acting to force certain sorts of thoughts into unconsciousness (UNREMEMBERED) is the mainstay of psychoanalysis.

Orthodox psychoanalysts tell us that the energy for the repression

[60] S. Freud, *op. cit.* (*The History of the Psychoanalytic Movement*), 939.

[61] S. Freud, *An Autobiographical Study*, trans. J. Strachey, London: Hogarth Press, 1935, 47-53.

comes from the instincts hiding in what they call the id. The psychoanalysts pay great attention to these motivational aspects of repression, but the main interest of laboratory psychologists in repression has been as an explanation of forgetting, one part of the general problem of memory. Although the majority of nonpsychoanalytic writers have rejected the Freudian concept of instincts, many adhere to the repression theory, interpreting the motivation for repression in other ways. The doctrine of instincts has received more severe criticism from academic psychologists than any other Freudian belief, and the theory of repression has suffered because of its dependence upon it. There is, however, no reason why repression cannot be interpreted in terms of any psychology of needs or drives.

Freud maintained[62] that repressive forgetting happens as follows. The actions which satisfy any instinct are inherently pleasant and are performed because of the pleasure principle, that is, the tendency to do what is pleasant and avoid what is unpleasant. However, the super-ego, which is the internalization of parental discipline, acts to thwart the expression of most instincts that well up from the id. Super-ego anxiety is aroused because of unpleasant experiences which occurred at other times when the instinct was satisfied. In infancy and early childhood this anxiety concerns only the danger of repetition of punishment, but later conscience develops. Thereafter the instinctive desires may not be allowed to rise to consciousness, because the individual can suffer much pain simply from realizing that he has the instincts. The satisfaction of instincts, which was innately pleasant, is now accompanied by painful anxiety, and the pleasure principle serves to cause repression of even the very fact that the instincts exist.

Two kinds of repression of ideas connected with instincts have been distinguished by Freud. The first is primal repression, denial of entry into consciousness of any thoughts related to instinctive desires; the second is after-expulsion, forcing into forgetfulness thoughts which have already been conscious. The goal of every sort of repression is to eliminate instincts entirely from having effect in action.

[62] *Cf.* S. Freud, *Collected Papers*, London: Hogarth Press, 1925, IV, 84-97.

This goal is rarely achieved, and the instincts frequently influence behavior, ideation, or emotion, although less than they would influence it if they were not repressed. Some of these modes of influence which psychoanalysis has stressed are dreams, slips of the tongue and pen, erroneous acts, symbolic behavior, neurotic symptoms, and forgetting. Repression is like law enforcement: if the guardianship of propriety is even momentarily relaxed, the antisocial instincts find some way to break and enter into consciousness or overt behavior.

A mass of clinical data is the source and backing of the theory of repression. Most of it is derived by psychoanalytic procedure, and the protocols are so lengthy that they are rarely published. This unavailability of the data makes evaluation of such evidence difficult. Enough anecdotes and portions of psychoanalytic records have been made public, however, to give a convincing argument. Case XII of Chapter II (pp. 61-62) is a clinical record relating the story of a woman with amnesia, who forgot a series of tragedies in her past, a past which must have been most unpleasant to remember. This case is not a report of a psychoanalysis, but the sort of situation with which every large psychiatric clinic deals frequently. Nevertheless it fits well into the scheme of repression, and it confirms the pleasure principle. This woman temporarily severed the one connection with her spectacularly unpleasant past, which was her memory.

Experimental psychology has made a serious effort to determine if none, part, or all of the repression doctrine is true. The result of the whole has been to verify the essentials of the clinical description of the mechanism of unconsciousness (UNREMEMBERED).

(*a*) Freud's pleasure principle, that what is unpleasant is forgotten, has been subjected constantly to experimental test. The majority of laboratory research related to the concept of repression is on this problem. It is analyzed in Chapter X.

(*b*) Flanagan[63] had subjects memorize two series of fifteen pairs of nonsense syllables. When associated syllables of one series were

[63] D. Flanagan, *The Influence of Emotional Inhibition on Learning and Recall*, unpublished thesis, 1930, on file at the University of Chicago Libraries (not viewed).

read together, a meaningful word with a sexual connotation resulted. In the other set the two syllables pronounced together gave a word with a rural connotation. Fifty-six university students, control and experimental groups, learned the two sets of associates until they were able to make one perfect repetition. Each subject worked alone, learning the syllables by repeating them aloud in the presence of a man and a woman. The salacious material required almost twice as many trials to learn as the rural material, and recall was significantly poorer for the sexual syllable combinations.

Sharp used[64] a similar procedure to investigate repression, and discovered that lists of associated syllables with religious and profane meanings took longer to learn and were more poorly recalled than lists with no emotional content. Both Flanagan and Sharp left one factor uncontrolled. Their subjects were embarrassed by repeating the sexual, religious, and profane words, and this embarrassment may have made them learn these words less efficiently and hence forget them more easily. The circumstances indicated, however, that the results would have been about the same if this criticism had been evaded, and it is likely that these researches show that feelings of shame and other emotions can inhibit learning and cause forgetting.

(*c*) Malamud and Linder discovered[65] an interesting confirmation of the Freudian belief that repressed material may reappear when the individual is unconscious (UNRESPONSIVE TO STIMULATION—ASLEEP OR DREAMING). Psychopathic patients of these workers were shown pictures which were chosen so that the patients might be expected to relate them to their own conflicts. Later the patients were asked to describe the pictures. Of course they forgot some details, and they also made alterations. It was found that these omissions and alterations often concerned the parts of the pictures which the experimenters had thought, on the basis of the patient's known condition, might be related by the patient to his own psy-

[64] A. A. Sharp, *The Influence of Certain Emotional Inhibitions on Learning and Recall,* unpublished thesis, 1930, on file in the University of Chicago Libraries (not viewed).

[65] W. Malamud and F. E. Linder, Dreams and their relationship to recent impressions, *Arch. Neurol. and Psychiat.,* 25, 1931, 1081-99.

chosis. On the following day the patients reported their dreams of the intervening night. Frequently aspects of the pictures that had been forgotten or altered the day before reappeared in the dreams. Similar findings resulted from work by Malamud[66] with a passage of prose instead of pictures. The parts of the stimuli presented which the subjects appeared to forget were repressed and reappeared when the restrictions of waking consciousness were removed. Earlier investigations by German workers[67] followed comparable procedures and resulted in much the same way.

(*d*) That pride and self-esteem can motivate repression has been suggested by experimentation of Rosenzweig.[68] One group of subjects was given a series of jig-saw puzzles to solve, purportedly in order to help the experimenter get some knowledge about the puzzles so they could be used in a future experiment. Another was given the same jig-saw puzzles to solve as an intelligence test. Both groups were allowed to finish only half of the puzzles. The first group recalled more of the unfinished than of the finished puzzles, so confirming the Zeigarnik effect which has been discussed previously in this chapter (pp. 224-225). In the second group, however, whose pride and self-esteem were involved because they thought they were taking an intelligence test, more of the finished puzzles were recalled. In these subjects repression of failures by pride and self-esteem overcame the Zeigarnik effect. Zeigarnik herself found[69] that when the tasks were interpreted by the subjects as tests of personal ability, she got the same sort of results as did Rosenzweig.

Evidence for the hypothesis of repression derived from these researches is slim, but what there is is favorable. The hypothesis is complex, and will require much more carefully worked out investigations than any yet performed to confirm or disprove it. Rosen-

[66] W. Malamud, Dream analysis, *Arch. Neurol. and Psychiat.*, 31, 1934, 356-72.

[67] O. Potzl, Experimentell erregte Traumbilder in ihren Beziehungen zum indirekten Sehen, *Ztschr. f. ges. Neurol. u. Psychiat.*, 37, 1917, 278-349; and R. Allers and J. Teler, Über die Verwertung unbemerkter Eindrucke bei Assoziationen, *Ztschr. f. ges. Neurol. u. Psychiat.*, 89, 1924, 492-513.

[68] S. Rosenzweig, in H. A. Murray *et al.*, *Explorations in Personality*, New York: Oxford University Press, 1938, 481-3; *cf.* also 472-80 and 484-90.

[69] B. Zeigarnik, *op. cit.*, 77.

zweig's procedure is the best so far, but it, like all the others, cannot escape important technical criticism. The present value of all this work is to show that this theory of forgetting is open to experimental trial. Indeed it has seemed to some so important to translate the doctrine into the frame of reference of the laboratory that at least two efforts[70] have been made to restate it in objective terms of stimulus, response, facilitation, inhibition, and conditioning.

CONCLUSIONS

Freud never demonstrated better his great acumen and ability to extract from many individual cases fundamental psychological principles than in a short footnote on unconsciousness (UNREMEMBERED). He wrote:[71]

> I can perhaps give the following outline concerning the mechanism of actual forgetting. The memory material succumbs in general to two influences, condensation and distortion. Distortion is the work of the tendencies dominating the psychic life and directs itself above all against the affective remnants of memory traces which maintain a more resistive attitude towards condensation. The traces which have grown indifferent, merge into a process of condensation without opposition; in addition, it may be observed that tendencies of distortion also feed on the indifferent material, because they have not been gratified where they wished to manifest themselves. As these processes of condensation and distortion continue for long periods, during which all fresh experiences act upon the transformation of the memory content, it is our belief that it is time that makes memory uncertain and indistinct. It is quite probable that in forgetting, there can really be no question of a direct function of time. From the repressed memory traces, it can be verified that they suffer no changes even in the longest periods. The unconscious, at all events, knows no time limit. The most important, as well as the most peculiar character of psychic fixation consists in the fact that all impressions are, on the one hand, retained in the same form as they were received, and also in the forms that they have assumed in their further development. This state of affairs cannot be elucidated by any com-

[70] T. M. French, Interrelations between psychoanalysis and the experimental work of Pavlov, *Amer. J. Psychiat.*, 12, 1933, 1165-1203; and R. R. Sears, *op. cit.*, 245-55.

[71] S. Freud, *op. cit.* (*Psychopathology of Everyday Life*), 174-5. By permission of Random House, Inc.

> parison from any other sphere. By virtue of this theory, every former state of the memory content may thus be restored, even though all original relations have long been replaced by newer ones.

These are the major points of this statement: Condensation and distortion occur—we have ample proof that memory is alterative. Traces grow indifferent and merge into others—this statement is almost verbatim the conclusion of the Gestalt school from a solid foundation of research. Fresh experiences act upon the transformation of memory content—experimentalists call this process retroactive inhibition. In forgetting there is no question of a direct function of time—in the light of present facts, "simple forgetting" is no longer a tenable theory. Repression occurs—the weight of experimental proof is in agreement with this statement.

Freud wrote the above paragraph in 1914, and more than a quarter of a century later it remains a good epitome of what is known about unconsciousness (UNREMEMBERED).

CHAPTER X

INHERITED UNCONSCIOUSNESS

> Which appetites do you mean?
>
> I mean those which are awake when the reasoning and human and ruling power is asleep; then the wild beast within us, gorged with meat or drink, starts up and having shaken off sleep, goes forth to satisfy his desires. . . . The point which I desire to note is that in all of us, even in good men, there is a lawless wild-beast nature, which peers out in sleep.

So spoke Socrates in Plato's *Republic*.[1] Throughout the centuries it has been recognized that these inborn appetites, often not represented in consciousness, motivate many of the actions of men. The philosophers have usually considered these primitive desires to be evil. Besides Socrates there were St. Paul,[2] St. Thomas Aquinas,[3] the Protestant reformers,[4] and many others who spoke of "original sin" long before Freud told us that the passions of the id are antisocial. These instincts, said to be the main denizens of the underworld of unconsciousness (PSYCHOANALYTIC MEANING), have been the subjects of more controversy and criticism than any other part of psychoanalytic theory. And this despite the common acceptance of the fact that the inheritance of bodily structure and a nervous system by any organism determines its behavior in ways that are unconscious (INCOMMUNICABLE and UNRECOGNIZED).

INHERITED PATTERNS OF ACTION

Fabre, who more carefully than anyone else has studied inherited action-patterns in insects and other animals, has termed instincts "unconscious" impulsions.[5] In so doing he might be accused of com-

[1] *The Dialogues of Plato*, trans. B. Jowett, *The Republic*, Book IX, Steph. 571-2.
[2] *Romans* 7:14-25.
[3] St. Thomas Aquinas, *Summa Theologica*, II, 1, Questions 81-3.
[4] *E.g.*, J. Calvin, *Institutes of the Christian Religion*, Book II, Chap. 1.
[5] J.-H. Fabre, *Souvenirs entomologiques*, Paris: Delagrave, IV, 65-6.

mitting the error of judging the privacies of animals without, of course, being able to get any communications from them. His argument, however, was not so fallacious. He believed that consciousness is discernment of the nature of situations, and, insofar as insects do not show such comprehension but follow set patterns of action blindly, they seemed to him unconscious (INSIGHTLESS). He described many complex instinctive actions of this sort which he observed, for example,[6] the complicated and inalterable routine of *Sphex* in arranging the cricket which will be food for the next generation in proper position near the eggs. Such acts the insects cannot learn, for usually the generations never meet. The physiological conditions, whatever they are, that determine this sort of behavior must be inherited with the neural and somatic structure rather than learned. One evidence of this is the preciseness of these action patterns, and the difficulty of altering them even when change would be to the animal's advantage.

In the Second Century A.D. Galen wrote[7] of taking an unborn kid from a doe by dissection, and, before it could even see its dam, allowing it to choose food from vessels of wine, oil, honey, and milk. It smelled them all and then lapped up the milk. Richter, Holt, and Barelare, long after Galen, studied[8] similar behavior by allowing rats to choose their diet freely from pure food substances—casein (for proteins), dextrose or sucrose (for carbohydrates), olive oil (for fats), inorganic salts, vitamin sources, and water. The rats made selections in proportions conducive to excellent growth. After the rats became pregnant, they changed their dietary selections so as to maintain a normal physiological equilibrium in pregnancy and lactation. The usual application of animal psychology to human is to argue by analogy from the rat to man, but in this case the argu-

[6] *Ibid.*, I, 174-9.

[7] Galen, De locis affectis, Lib. 6, Cap. 6, *Medicorum Graecorum Opera*, Lipsiae: C. Cnobloch, VIII (1824), 443.

[8] C. P. Richter, L. E. Holt, and B. Barelare, The effect of self selection of diet—food (protein, carbohydrates and fats), minerals, and vitamins—on growth, activity, and reproduction of rats, *Amer. J. Physiol.*, 119, 1937, 388-9; also C. P. Richter and B. Barelare, Jr., Nutritional requirements of pregnant and lactating rats studied by the self-selection method, *Endocrinology*, 23, 1938, 15-24.

ment can proceed in the opposite direction. Since most men do not know the normal proportions of the various components of diet required to carry on normal physiological activity, it is quite obvious that the behavior of these rats was unconscious (UNLEARNED and NOT INVOLVING INSIGHT).

The inherited patterns of action in man, the somatic structures, equilibria, and disequilibria which determine our acts in ways we cannot tell of—so-called "visceral unconsciousness"—have recently become the topic of experimentation.

(*a*) Young children in certain progressive schools, knowing nothing of proper nutrition, have been allowed to choose their diets from a selection of simple foods, much as did the rats of Richter, Holt, and Barelare. A beneficial choice has usually been made by the children. One exception, however, was a small boy who, never having been allowed at home to have hard-boiled eggs, the first day he was allowed to select for himself ate all the two dozen eggs that had been set out. These children, like the rats, were unconscious (ACTING INSTINCTIVELY, INSIGHTLESS, and UNABLE TO COMMUNICATE) of why they acted as they did. Their choices were governed by physiological disequilibria which affected a level of the nervous system high enough to result in adequate discriminatory action, but did not give rise to insight or communication about the reasons for the decision.

Shackleton related[9] that the members of his antarctic expeditions, when food ran low, could not keep their thoughts, fantasies, and dreams off the particular kinds of food of which they had been deprived. The specific physiological lacks, which in all likelihood the men could not report, had operated to bring to consciousness (COMMUNICABLE) thoughts of what was necessary to satisfy those wants. How this process operated, making them long for the deprived foods, the men could not have told. Why we feel hungry most of us do not know, but Cannon and Washburn have proved[10]

[9] E. H. Shackleton, *The Heart of the Antarctic,* Philadelphia: Lippincott, 1909, I, 333 and 356; also E. H. Shackleton, *South,* London: Heinemann, 1919, 108.

[10] W. B. Cannon and A. L. Washburn, An explanation of hunger, *Amer. J. Physiol.,* 29, 1912, 441-54.

that hunger pangs are temporally related to stomach contractions. The organism we have inherited is so constituted, however, that we are not aware of stomach contractions as such when we need food—we feel hungry and, if things get bad enough, we see images of what will satisfy us.

An unsolved problem is whether it is possible to have an unconscious (UNRECOGNIZED) need, or whether, when the need gets strong enough, the individual will become conscious of what will satisfy it. Had all of Shackleton's explorers experienced the same kind of hunger in lesser degree before their expedition, and so learned what sort of foods appeased it best? Or was this knowledge inherited and forced to consciousness by the great need? The first explanation seems the more likely, for there is no record of seamen suffering from scurvy and dreaming of lemons and limes before the curative powers of citrous fruits had been learned by trial and error. Until quite recently there has been no careful examination of this whole question of the inheritance of action-patterns that will satisfy needs.

(*b*) There are indications that the ability to judge time intervals either in waking or in sleep is grounded in a physiological pace setter, part of the inherited somatic structure. This mechanism of temporal judgment, like that of dietary choice, is not available to introspection. Research of Hoagland and others suggests[11] that the body's pace setter, by means of which periods of time are estimated, operates more rapidly at higher body temperatures. The change with temperature fits quite closely Arrhenius's law concerning increase of the rate of chemical reaction with heat, which implies that the pace setter is a physiochemical mechanism.

(*c*) A remarkable phenomenon of language behavior, which is unconscious (INCOMMUNICABLE) and may well depend on some inherited characteristic of the nervous system, because no one has suggested how it could be learned, has been discovered by Zipf.[12] He counted the frequency of every word used in many large samples of normal spoken and written speech. The most frequently used

[11] *Cf.* H. Hoagland, The physiological control of judgments of duration, *J. Gen. Psychol.*, 9, 1933, 267-87.

[12] G. K. Zipf, *The Psycho-Biology of Language*, Boston: Houghton Mifflin, 1935.

word in each sample, no matter what it was, was given rank order *one*, the second most frequently used rank *two*, and so on. Then the rank of the word was plotted against the number of times it was used. Zipf found that a curve of a definite type always results. Variations between individuals, between spoken and written speech, or between topics of conversation make little difference in the shape of the curve. This regularity of speech is unconscious (INCOMMUNICABLE), for certainly few persons in all the centuries of human language have ever guessed that the frequency of occurrence of the words they used had enough regularity to be fitted to any sort of curve.

It may be that this regular recurrence of words is a habit learned by the infant as he begins to speak, or inherent in the sentence structure of language. It has seemed to Zipf more likely that it is an inherited, quasi-biological rhythm. Such an explanation may be difficult for many psychologists to accept, but no tenable suggestion as to how it could be acquired has been advanced.

INHERITED VS. ACQUIRED ACTION-PATTERNS

Proving conclusively that a trait or characteristic of behavior is inherited rather than acquired is the chief difficulty of all considerations of unconscious (INHERITED) processes. It is nearly impossible to demonstrate that the unconscious (PSYCHOANALYTIC MEANING) aggressions of Freud or the ideas in the "collective unconscious" of Jung are innate rather than acquired.

This dilemma is the less soluble because of two facts: innate patterns of behavior may be modified by experiences early in life, and inherited effects on action may mature only long after birth. (*a*) The effects of infantile experiences on instinctive behavior have been emphasized by Freud[13] and Rank.[14] The latter has argued that the traumata of birth modify inherited temperamental characteristics. Birth, moreover, is merely an incident in a life that began months before, and intrauterine learning or conditioning undoubt-

[13] *E.g.*, S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill, New York: Random House, 1938 (*Three Contributions to the Theory of Sex*), 580-603.

[14] O. Rank, *The Trauma of Birth*, New York: Harcourt, Brace, 1929.

edly occurs. What part of "instinctual" behavior in a given case is dependent upon actual inherited somatic structures and what part is due to modification by experience is often a moot question. (*b*) Behavior patterns, first appearing months or years after birth, may be inherited and unmodified by experience, simply maturing late. Carmichael has shown[15] that the swimming habits of salamanders appear at a certain period in maturation of the organism whether or not the individual animal has any external stimulation during maturation or any opportunity to learn to swim. Presumably this finding indicates that part of maturation is an organization of the nervous system. Craig has shown[16] that the sexual behavior patterns and the nest calls of pigeons raised in isolation mature after puberty without any opportunity to learn them from other birds. Freud's emphasis on infantile sexuality has quite possibly come about because of his belief that sex, being the outstanding unconscious (INHERITED) drive in man, must necessarily be present throughout all the history of the individual. This assumption may be true, but it is also entirely conceivable that the sexual instincts could be innate and still not mature until puberty.

THE THEORIES OF INSTINCTS

The instincts were first conceived in psychology and psychotherapy as metaphysical forces, for example McDougall's[17] "gregariousness." It was generally admitted that many of these forces are "unconscious," but in what sense the word was used was usually not clear. It was uncertain whether this unconsciousness was the result of the forces being inherited and so never being consciously learned, or whether they had once been conscious and then had been repressed. Freud's original interpretation of the instincts was metaphysical; the depths of the id were believed to contain the sex, aggression, and death desires. He recognized from the first, how-

[15] L. Carmichael, A further experimental study of the development of behavior, *Psychol. Rev.*, 35, 1928, 253-60.

[16] W. Craig, Male doves reared in isolation, *J. Animal Behavior*, 4, 1914, 121-33.

[17] W. McDougall, *An Introduction to Social Psychology*, 20th ed., London: Methuen, 1926, 71-5.

ever, the central rôle of physiological processes in these instincts. The psychoanalytic school shows ever-increasing interest in this physiological basis. Indeed, no interpretation of inherited unconscious motivations is tenable today which does not ground them in the function of physiochemical systems of the nervous, endocrine, or other tissues.

As long as these systems remain in relatively good equilibrium, many of them do not arouse the vigilance of the nervous system and so are unconscious (INCOMMUNICABLE). When, however, disequilibria develop, giving rise to a change in proprioceptive stimulation, most, if not all, are capable of arousing such vigilance and entering consciousness.[18] Certainly, just because a drive is inherited is no reason why it is *unconscious* in any other sense except INHERITED. These systems are kept in equilibrium by proper satisfactions. Thirst is quenched by water, for example, and this inherited need is normally unconscious (INCOMMUNICABLE) unless it has not been gratified for a number of hours. Introspective reports of subjects during water fasts have shown[19] that, when mildly thirsty, one finds oneself automatically, unconsciously (UNATTENDING) going to get a drink. When one has a brisk appetite, such unconscious (UNATTENDED) motor reactions concerned with food have also been found to occur.[20]

Besides these somagenic needs, it may be asked, are there not less physical, psychogenic instincts which cannot be described in such crudely physical terms? Is McDougall's instinct of gregariousness, for example, merely a physiological state? The response must be that, if it is inherited (and there is little evidence that it is), it must be mediated by some part of the body—probably the nervous system. In that sense gregariousness is as grossly materialistic as hunger, although both have their subjective aspects.

The extreme contention that "mental content" is inherited is to

[18] *Cf.* J. Jastrow, *The Subconscious*, Boston: Houghton Mifflin, 1906, 7-15.

[19] E. G. Boring, Processes referred to the alimentary and urinary tracts, *Psychol. Rev.*, 22, 1915, 307-10.

[20] E. G. Boring and A. Luce, The psychological basis of appetite, *Amer. J. Psychol.*, 28, 1917, 443-53.

be found in Jung's defense of the "collective unconscious."[21] Even he, however, believed that the vehicle of this inheritance is the brain structure. Sometimes he described these unconscious (INCOMMUNICABLE) ideas which the individual has but could never have got from his own experience as if they result from being human, just as a mineral is phosphorescent because it is radium or as we walk as we do because we are bipeds. At other times he appeared to defend a sort of continual Lamarckian inheritance of acquired experiences from generation to generation. The nervous structures of our ancestors are altered by their experiences, and we inherit those modifications. To support his theory Jung referred[22] to dreams of children that resemble the fairy-tales which are common property of the race, and to identical beliefs about natural phenomena found in many lands and tribes.

This conception of inheritance of unconscious (INCOMMUNICABLE) knowledge is gaining acceptance among depth psychologists generally, though there is only meager clinical and no experimental foundation for it. Academic psychologists are likely to discount what data there are because of the many experiments of recent years which demonstrate the large effect of training on what was before thought to be inherited. Large alterations of intelligence ratings, for instance, can occur when living conditions are changed. Inheritance of the effects of experiences of ancestors has by no means been disproved, though, and it calls for adequate test more than almost any other enigma of unconsciousness (INCOMMUNICABLE).

This visceral unconsciousness is the depths of the depth psychologists. Our choice of words seems to be based on biological rhythms; our love affairs are firmly grounded in physiological processes; our decisions may be determined by the number of cups of coffee drunk the previous evening. Usually these underlying determinants are incommunicable and rooted in inherited structures. No explanation of behavior has gone far enough until it deals with such unconscious (INHERITED and INCOMMUNICABLE) phenomena.

[21] C. G. Jung, *Psychological Types*, New York: Harcourt, Brace, 1924, 616.

[22] C. G. Jung, *Contributions to Analytic Psychology*, trans. H. G. and C. F. Baynes, New York: Harcourt, Brace, 1928, 103-25.

THE PSYCHOANALYTIC DOCTRINE OF INSTINCTS

The Freudians and unconsciousness (EVERY MEANING) have risen together to popular fame with the psychoanalytic lore of hidden instincts which are responsible for every act of man. Because of this connection, too, the exploration of unconsciousness (EVERY MEANING) has suffered its greatest setback, for the opponents of the psychoanalysts have become opponents of unconsciousness (EVERY MEANING). It is not to be wondered at that scientists who wish to be hard-headed would eschew the underground wonderland of psychoanalytic instincts with its sex, aggression, death desires, and secret complexes with Greek names which have become playthings of the arts. In this field myth and allegory have made their greatest inroads into psychology. An illustration is the suggestion, made in all seriousness,[23] that the instinctual Oedipus situation is manifested in the accepted attitudes toward the different forms of sonnets, the Italian form representing the mother's body and the Shakespearean the father.

Nonpsychoanalysts who put the psychoanalytic theory to clinical test usually agree that, despite the unscientific character of many of the statements, the broad Freudian theory of instincts corresponds to actual phenomena. Sex and aggression are indeed exceedingly strong drives; the repression of these drives certainly occurs; the effects of authority in this repression are indubitably salient. Like Blake's "Tiger! Tiger! burning bright," however, the exact meaning of it all is elusive. As Pratt has said,[24] it will be a long time before this imaginative poetry is translated into the prose of science.

Freudian theory finds two inherited functions operating to limit the span of consciousness, forcing ideas, stimuli, and memories into unconsciousness (PSYCHOANALYTIC MEANING). These two have been named the utility principle and the pleasure-pain principle. Freud's utility principle refers to[25] "the production, distribution, and con-

[23] C. Rinaker, Some unconscious factors in the sonnet as a poetic form, *Internat. J. Psycho-Anal.*, 12, 1931, 167-87.

[24] C. C. Pratt, *The Logic of Modern Psychology*, New York: Macmillan, 1939, 164.

[25] E. Jones, Recent advances in psycho-analysis, *Internat. J. Psycho-Anal.*, 1, 1920, 175.

sumption of definite quantities of physical excitation or energy according to the economic principle of the greatest advantage with the least effort." It is essentially the same economic, conservative principle which was referred to in earlier chapters (*e.g.*, pp. 164-182), where it was suggested that many activities become automatic or pass from the focus of attention because that is the most efficient way for the organism to operate. In order for the organism to be vigilant of one process, it apparently must have its decks cleared for action, and for that reason it dispenses with all activities which may be accomplished automatically.

Much forgetting, or at least the neglect of many memories and stimuli, can be explained by the utility principle. If Paderewski, when he seated himself in his old fringed chair at the beginning of a concert, had been conscious of all the notes he was going to play all evening, it might well have been expected that his technique would suffer. This sort of forgetful unconsciousness, occurring under the utility principle, is suppression, what Freud would term "thrusting into preconsciousness."

Repressive forgetting, on the other hand, is said by the psychoanalysts to result from the operation of the pleasure-pain principle. Repressed memories are relegated, not to preconsciousness, but to the depths of unconsciousness (PSYCHOANALYTIC MEANING). Frequently the effects of the two principles are indistinguishable. A man may force painful thoughts of his divorced wife out of his consciousness while he is at the office because their haunting presence interrupts his work. Whether this is pleasure-pain repression or utilitarian suppression is hard to tell. Usually, however, it is possible to distinguish which of the inherited principles of the organism has effect. A football player may keep constantly in mind throughout the rest of the season his failure in the first game to tackle an opponent who rushed by his position. He does this in order not to make the same mistake again. Here the utilitarian principle obviously counteracts any action of the pleasure-pain principle. On the other hand, Darwin found that the latter principle

overcame the former, for he had no difficulty in remembering the arguments in favor of his theory of organic evolution, though he repeatedly forgot adverse facts. He had to take to writing down all contradictory evidence immediately.

THE PSYCHOANALYTIC BELIEFS ON PAIN, PLEASURE, AND FORGETTING

The differentiation between pleasurable and painful experiences is of fundamental importance to the organism, and if anything is inherited or instinctual certainly it is the ability to distinguish pain from pleasure. Freud discovered independently that as a result of the inherited ability to make this distinction, painful things tend to be forgotten and pleasant ones remembered. This fact, which Darwin found to be true in his own case, has been made explicit by a succession of wise men, of whom Freud's immediate predecessors were Schopenhauer[26] and Nietzsche.[27] Academic psychologists also have their *law of effect* concerning learning and remembering, a law enunciated by Thorndike.[28] It is a statement of psychological hedonism: "pleasure stamps in, pain stamps out." Thorndike did not, however, mean exactly the same thing by his principle as Freud did by his. His idea was that a connection between a situation and a response is strengthened if it is satisfying and weakened if annoying, and Freud's idea was that forgetting occurs, not by weakening connections that would have unpleasant effects, but by forcing the whole stimulus-response connection into unconsciousness (PSYCHOANALYTIC MEANING). Thorndike's and Freud's mechanisms, however, both operate retroactively, for the memory traces must last until the pleasant or unpleasant result of learning occurs to determine whether the trace will continue.

It has become apparent that when Freud said[29] that much forget-

[26] *Cf.* O. Juliusburger, Die Bedeutung Schopenhauers für die Psychiatrie, *Allg. Ztschr. f. Psychiat.*, 69, 1912, 622.

[27] F. Nietzsche, *Beyond Good and Evil*, trans. H. Zimmern, London: Good European Soc., 1907, 86, §68.

[28] *Cf.* E. L. Thorndike *et al.*, *The Fundamentals of Learning*, New York: Teachers College, Columbia University, 1932, 176-7.

[29] S. Freud, *op. cit.* (*Psychopathology of Everyday Life*), 96.

ting has been proved to be based upon a motive of displeasure, he did not agree with most experimentalists as to what pain and pleasure are, for the cases of psychoanalysts have shown that what most of us would call painful experiences, like the death of a close friend or the pulling of a tooth, are often remembered for an unusually long time and with especial clarity. An experience is painful in the psychoanalytic sense only if it entails shame to the individual or is repugnant to moral or social standards. If such an experience obtrudes into consciousness, psychoanalysts believe that it is masking even more painful ideas. Academic psychologists have not defined pain and pleasure with reference to ego injury or super-ego disapproval, and this difference is the chief reason why experimental research in regard to the effect of hedonic values on repression has been unsatisfactory.

In present psychoanalytic theory repression is only one, though the most powerful, of at least ten mechanisms for defending the ego in conflict situations. The ten have been listed as follows:[30] regression, repression, reaction-formation, isolation, undoing, projection, introjection, turning against the self, reversal, and sublimation. It is in this company of defenses of the ego that Freudian repression must be viewed, and it must always be recognized that it is only situations likely to be painful to the ego, or to affect personal integrity, which are involved in the working of the pleasure principle.

Because of the frequent changes in psychoanalytic theory, and because of an unfortunate tendency of theories of repression to slip from concrete actualities into abstract speculations, it is difficult to understand exactly how Freud thought repression occurs, and what to him was the rôle of the instincts in it.

In his earlier writings he stated that what are repressed are unpleasant thoughts or ideas capable of producing shame, guilt, or injury to self-esteem. More recently he insisted[31] that it is the ideas about the strivings of the id, about the primitive feelings and im-

[30] Anna Freud, *The Ego and the Mechanisms of Defence,* trans. C. Baines, London: Hogarth Press, 1937, 47; *cf.* also 45, 46, and 48-54.

[31] S. Freud, *Inhibitions, Symptoms and Anxiety,* London: Hogarth Press, 1936.

pulses, against which repression is a defense. This latter interpretation emphasized also the repression of the id impulses themselves. There has been much confusion as to what forces or agents do the repressing. All the following have been held responsible by at least one depth psychologist, according to McGranahan's tabulation:[32] the "censor," the "ego," the "ego ideal," the "super-ego," the "ego instincts," the "death instinct," "fear," "anxiety," the "pleasure-pain principle," "guilt feelings," "self-esteem," the "master sentiment of self-regard," and the "sex instinct."

EXPERIMENTATION ON PAIN, PLEASURE, AND FORGETTING

In considering the search of the laboratory for confirmation of the psychoanalytic doctrine about the rôle of pleasure and pain in forgetting, it is convenient to adopt two abbreviations. *Pleasantness* and *unpleasantness* in experimental psychology have rarely meant the same things as *pleasure* and *pain* have to Freudians, but the similarity of the terms has led to the widespread misapprehension that they have the same meaning. Fortunately, to differentiate the two sets of ideas, all that is necessary is to accept a symbolism that has been current for years among academic psychologists. They refer to pleasant stimuli as *P* and unpleasant as *U*.

Though there is a large number of investigations of the relation of *P* and *U* to memory, they are by no means in even general agreement. The extremes of the gamut of opinion are antipodal. On the one hand Tait concluded[33] that *P* impressions are better remembered than *U*, and on the other hand Wohlgemuth, after reviewing a large amount of research on the question, affirmed[34] that there is not the slightest evidence that *U* experiences are more easily forgotten than *P*.

To reach any conclusion on the general result of this research, one

[32] D. V. McGranahan, A critical and experimental study of repression, *J. Abnorm. and Soc. Psychol.*, 35, 1940, 216.

[33] W. D. Tait, Effect of psycho-physical attitudes on memory, *J. Abnorm. and Soc. Psychol.*, 8, 1913, 10-37.

[34] A. Wohlgemuth, *A Critical Examination of Psycho-Analysis*, New York: Macmillan, 1923, 37.

must work through a mass of findings. An inventory, which is probably complete, includes, up to 1940, fifty-one investigations which bear more or less directly on this question.[35] In these, the thesis that *P* material is better remembered than *U* was said to be upheld by thirty-three; thirteen either did not confirm or contradicted it; and the findings of five were indeterminate. There can be little doubt that in research showing relative lack of bias, the evidence has been strongly in favor of the beneficial effect of *P* feeling on memory. One is not warranted, however, in accepting all the experiments as of equal value, for many are subject to serious technical criticisms.

Though a large number of the investigators did not pretend to be subjecting the Freudian theory of repression to laboratory test, yet this whole body of research has time and again been held to bear on that theory. The assumed identity of *U* items with painful items which, according to Freudian theory, can induce repression is entirely false. The psychoanalytic theory maintains that material is repressed when it is capable of "wounding the ego," causing feelings of guilt, shame, or loss of self-esteem. The distinction between *P* and *U* experiences, on the other hand, is largely an esthetic preference. A subject may call an odor or a picture *P*, and yet it may be an ideal object for after-expulsion repression because it arouses associations with a guilt-inducing experience. Or, again, such mildly sexual stimulation as the words "girl-friend" or "embrace" or a love scene in a novel might be judged *P*, and yet arouse shame and super-ego disapproval, and so be repressed. Of course, in many cases *P* items may also be pleasurable and *U* items painful in the Freudian sense.

[35] Forty-eight of these experiments are listed in the following three articles: H. Meltzer, The present status of experimental studies on the relationship of feeling to memory, *Psychol. Rev.*, 37, 1930, 124-39; H. Cason, The learning and retention of pleasant and unpleasant activities, *Arch. of Psychol.*, 21, 1932, No. 134; and G. M. Gilbert, The new status of experimental studies on the relationship of feeling to memory, *Psychol. Bull.*, 35, 1938, 26-35. The other three researches are: P. T. Young, A study upon the recall of pleasant and unpleasant words, *Amer. J. Psychol.*, 49, 1937, 581-96; A. A. Sharp, An experimental test of Freud's doctrine of the relation of hedonic tone to memory revival, *J. Exper. Psychol.*, 22, 1938, 395-418; and L. I. O'Kelly and L. C. Steckle, The forgetting of pleasant and unpleasant experiences, *Amer. J. Psychol.*, 53, 1940, 432-4.

A second reason why most of these experiments do not apply to psychoanalytic doctrine is that usually the experience was classified as *P* or *U* at the time it happened rather than when recall of it was attempted. Certainly many events that were pleasant when they occurred (bathing naked in childhood) might later be thought shameful and repressed, while on the other hand a most distressing happening (forgetting how to end a waltz in a piano recital) often in after years is only an amusing anecdote to tell to friends. The *P* or *U* quality of an experience at the time it occurred may be important for the law of effect, but it is important for repression only if the nature of the feeling does not change with time.

A third reason why this body of research as a whole does not, as has been so often thought, deal with repression is that the difference between *P* and *U* feelings may be acquired after birth, while it is an essential tenet of psychoanalytic theory that the distinction between pain and pleasure is instinctual, inherited.

Two of the researches dealing with *P* and *U* feelings, one by Koch[36] and one by Sharp,[37] are significant tests of Freudian repression theory as it stands today. (*a*) Koch gave her subjects ten quizzes in a course in educational psychology. She returned these with a percentage grade and asked the students to mark on them whether they were discouraged, mildly discouraged, indifferent, mildly happy, or very happy about the grades. Several weeks later she asked them to remember all the grades they had received. More of the pleasant than of the unpleasant grades were remembered, and the indifferent grades were most poorly recalled. Since presumably self-esteem was directly affected by the grades received, this result seems to be proof of true Freudian repression. Other factors were operating in this situation, however, as Koch herself recognized.[38] For one thing, the course had not ended and bad grades could not safely be forgotten because of the danger to academic

[36] H. L. Koch, The influence of some affective factors upon recall, *J. Gen. Psychol.*, 4, 1930, 171-90.

[37] A. A. Sharp, An experimental test of Freud's doctrine of the relation of hedonic tone to memory revival, *J. Exper. Psychol.*, 22, 1938, 395-418.

[38] H. L. Koch, *op. cit.*, 185-6.

standing. Hence the impression left by discouraging grades would tend to be more vivid than that left by those giving "indifferent" or even "very happy" reactions. This adaptation to the present need probably accounts for the poor recall of indifferent grades, but makes the repression of the unpleasant grades the more remarkable, considering their importance to the subjects.

(*b*) Sharp used three groups of subjects. One learned fifteen *acceptable* phrases; the second, fifteen *unacceptable*; and the third, fifteen *neutral*. The *acceptable* phrases described acts which the case histories of 130 patients in a psychiatric clinic showed to be emotionally acceptable to them. The *unacceptable* and *neutral* materials were similarly chosen. This method appears satisfactory for choosing items which satisfy Freud's criteria for what are and are not repressed. Then recall was tested two, nine, and sixteen days later. After the last recall relearning was carried out. The unacceptable phrases were more poorly recalled and more difficult to relearn than the neutral. The acceptable were forgotten to a degree at the time of the first memory test, but showed enhanced recall (an actual increase in the number of items remembered) thereafter. In the long run, therefore, the acceptable phrases were better retained than the neutral. This research thus substantiates the Freudian doctrine of repression.

CONCLUSIONS

With the inheritance of our bodily structure, especially the nervous and endocrine systems, human beings inherit patterns of action. The operation of these unconscious (INHERITED) instinctual processes is often unconscious in other senses (INCOMMUNICABLE and UNAVAILABLE TO AWARENESS). Sometimes, however, an individual may become conscious (ABLE TO COMMUNICATE and AWARE OF DISCRIMINATION) of their effect in regulating his actions.

The Freudians have emphasized the importance of the instincts, which they hold to be unconscious in the PSYCHOANALYTIC MEANING. One of these inherited functions is the distinction between pleasurable and painful experiences, and upon this distinction the Freudian

doctrine of repressive forgetting is premised. Although some experimental research has substantiated this doctrine, the main contribution of the psychology of the laboratory to the general question has been to show that all pleasant or unpleasant feeling—not merely pain and pleasure in the restricted psychoanalytic sense—has an effect upon memory.

CHAPTER XI

INVOLUNTARY UNCONSCIOUSNESS

In his presidential address to the American Psychological Association in 1916, Watson made[1] what appears to be an attempt to forestall the criticism that the conditioned response which he had suggested as a substitute for introspection involved consciousness. He set about to demonstrate that the response is not necessarily or essentially a *voluntary* reaction. At that time *voluntary* and *conscious* were to some academic psychologists interestingly synonymous. Agerberg has supported[2] such a position more recently, stating that a conscious action must be a voluntary action.

The words *involuntary* and *unconscious* have repeatedly been equated. It has been pointed out by Koffka[3] that *voluntary* is commonly used in two different senses—voluntary acts are contrasted, on the one hand, with impulsive and instinctive acts and, on the other, with automatic acts. *Involuntary* thus means *unconscious* in at least two usages (UNLEARNED and UNATTENDED). Koffka held that these popular significances are full of suggestive meaning but that they must be used with reserve scientifically.

An important aspect of unconsciousness (PSYCHOANALYTIC MEANING), as viewed by Freud, is that it is not under voluntary control.[4] These functions proceed independently of all direction by the ego and cannot even be recalled to consciousness by it under ordinary circumstances. Hypnosis, free association, or some other special procedure is required for such recall. The effects on behavior of the

[1] J. B. Watson, The place of the conditioned-reflex in psychology, *Psychol. Rev.*, 23, 1916, 98-100.

[2] J. Agerberg, Consciousness as a physiological function, *Acta Psychiat. et Neurol.*, 4, 1929, 122.

[3] K. Koffka, *Principles of Gestalt Psychology*, New York: Harcourt, Brace, 1935, 417-8.

[4] *Cf.* A. A. Brill, in S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill, New York: Random House, 1938, 13.

repressed instincts are also involuntary in that neither ego nor super-ego desires or approves of such actions.

Remy de Gourmont, in a consideration of creative writing, has said[5] that composition is, even for the most ponderous and uninspired writer, continually enriched by words welling up from the reservoir of unconsciousness (INVOLUNTARY). He directly opposes these unconscious (INVOLUNTARY) processes to voluntary processes.

It is the lay, common-sense view, also, that volition is the essence of personal consciousness. The subjective experience of willing to perform some act is commonly accepted as characteristic of consciousness, and is the first experience to disappear as consciousness wanes. One of the reasons the academic psychology has seemed to many to be unrealistic is that it has cast off this view.

VOLITION AND DETERMINISM

A major explanation of the rejection of doctrines of volition is that any such theory has seemed to many psychologists to smack of vitalism and free will. In the nineteenth century, textbooks of psychology ordinarily contained several chapters on the psychology of the will. At present, comparable works devote scarcely more than a paragraph or two to the question, and this is likely to be mere polite acquiescence to a glorious past. Experimentation on volition is now practically never undertaken, mainly because of the psychologist's acceptance of determinism and a general feeling that somehow this rules phenomena of will out of consideration.

Determinism is an essential assumption of the method of science: If phenomena are not determined, they will not be predictable, and scientific laws cannot be discovered. Scientists, therefore, for the purpose of searching out the regularities of nature, must impose order upon the world; and some have concluded falsely that this necessity requires the denial of individual volition, which subjectively appears to be free. Because Freud was declaredly a determinist,[6] and followed carefully the principle of determinism in his

[5] R. de Gourmont, *La culture des idées*, Paris: Soc. du Mercure de France, 1900, 51.
[6] *Cf.* S. Freud, *op. cit.* (*Psychopathology of Everyday Life*), 150-1.

explanation of slips of the tongue and other lapses, references to volition have frequently been considered contradictions within his system. What he did, however, was to accept as a real phenomenon the individual's reported "illusion" or subjective impression of voluntary choice, and then proceed to try to find a deterministic explanation. This is a proper scientific procedure.

INVOLUNTARY FUNCTIONS OF THE AUTONOMIC NERVOUS SYSTEM

Physiologists describe as "involuntary" the bodily functions, usually controlled by the autonomic nervous system, which are not effected by the combined operation of striped musculature and a normally functioning central nervous system. The pulse rate, the systolic and diastolic blood pressures, the movements of body hairs, and the fluctuations of pupil size are examples of variables that are involuntary in this sense. All these, however, have apparently been brought under voluntary control by various experimenters.[7] Of course certain such alterations, such as raising the metabolic rate or raising the pulse rate, might be explained by indirect effects, like thinking of frightening experiences, but this sort of indirect stimulation was ruled out in the experiments. It is known, however, that the autonomic nervous system is connected through the communicating rami with the central nervous system, and is represented in the lateral horns of the spinal cord as well as in the hypothalamus and the medulla. This connection makes it seem plausible that autonomic functions could come under voluntary central nervous system control. What is physiologically involuntary thus may easily be introspectively voluntary.

In psychology these two senses of *involuntary* have often been improperly confused. Probably because Watson wished to disprove

[7] *Cf.* T. M. Carpenter, R. G. Hoskins, and F. A. Hitchcock, Voluntarily induced increases in the rates of certain "involuntary" physiological processes of a human subject, *Amer. J. Physiol.*, 110, 1934, 320-8; and D. B. Lindsley and W. H. Sassaman, Autonomic activity and brain potentials associated with "voluntary" control of the pilomotors (*mm. arrectores pilorum*), *J. Neurophysiol.*, 1, 1938, 342-9.

the position which many have maintained,[8] that conditioned reflexes involve consciousness, and because *voluntary* and *conscious* were often thought to mean the same thing, he attempted[9] to show that involuntary functions can be conditioned. He developed some degree of conditioning of pupillary contraction, and insisted that, since this contraction is mediated solely by the autonomic nervous system, the conditioning could not be voluntary. Some years afterward, Cason[10] strengthened the experimental basis of Watson's argument by conclusively demonstrating pupillary conditioning, and reported further that some subjects were unconscious (UNABLE TO COMMUNICATE) of the conditioning stimulus and that none was conscious of the pupillary changes. Later the same year he reported[11] conditioning of winking, which was involuntary in that the subjects all insisted that they were unconscious (UNABLE TO COMMUNICATE) of the winks until after they had occurred and that there were no accompanying introspective "images" or "affective elements," at least until after the winks.

By conditioning, Hudgins succeeded[12] in developing the pupillary reflex so that the subject's pupil would contract if he thought the word *contract.* This conditioning, he believed, was unconscious learning beyond voluntary control for two reasons: because ten of the subjects did not realize that their pupillary reactions were being conditioned (INCOMMUNICABLE) and because there are no afferent neurones passing from the iris (UNSENSED, STIMULI NOT REACHING THE CORTEX). Since such research on pupillary conditioning does not differentiate between what is conscious and what is voluntary, the confusion between the two is readily understandable. An experimental study by Yacorzynski and Guthrie[13] made a distinction

[8] *E.g.,* I. A. Hamel, A study and analysis of the conditioned reflex, *Psychol. Monog.,* 27, 1919, No. 118, 1-65.

[9] J. B. Watson, *loc. cit.*

[10] H. Cason, The conditioned pupillary reaction, *J. Exper. Psychol.,* 5, 1922, 108-46.

[11] H. Cason, The conditioned eyelid reaction, *J. Exper. Psychol.,* 5, 1922, 153-96.

[12] C. V. Hudgins, Conditioning and the voluntary control of the pupillary light reflex, *J. Gen. Psychol.,* 8, 1933, 3-51. *Cf.* also W. S. Hunter and C. V. Hudgins, Voluntary activity from the standpoint of behaviorism, *J. Gen. Psychol.,* 10, 1934, 198-204.

[13] G. K. Yacorzynski and E. R. Guthrie, A comparative study of involuntary and voluntary conditioned responses, *J. Gen. Psychol.,* 16, 1937, 235-57.

between them, however. These workers conditioned to the sound of a buzzer involuntary (automatic) withdrawal of the left hand from a shock and voluntary (instructed) movement of the right hand. They found that the two sorts of conditioning are different in various ways, but that either voluntary or involuntary conditioned responses can occur and the subjects be unconscious (UNABLE TO COMMUNICATE) of them.

THE SUBJECTIVE FEELING OF VOLUNTARY DECISION

From Penfield's[14] experimental faradization of the cortex of conscious (RESPONSIVE TO STIMULATION—NOT ANESTHETIZED) individuals is derived our best proof that an act may be unconscious (INVOLUNTARY) and still conscious (COMMUNICABLE). By stimulating the motor cortex Penfield was able to get motions of various parts of the body including the larynx, although no recognizable words were formed. The patients introspected upon their sensations when these movements occurred. The most revealing history which Penfield gave of such an experiment is Case XV of Chapter II (pp. 66-67). Throughout Penfield's study there are definite proofs that a subjective difference clearly exists between voluntary and involuntary actions. Electrical stimulation of the cortex, especially in the region of the fissure of Rolando, produced movements which the individual usually did not inhibit and could not prevent without serious effort, if at all. The patients did not feel these actions to be voluntary, but said "My leg moved itself," "It seems involuntary," and so forth. Stimulation sometimes produced, instead of motor activity, what was described as a desire to move a part of the body—a desire which could be suppressed. Penfield believed[15] that voluntary decision resulting in motor activity is a major characteristic of consciousness, but he admitted that a person can be conscious (in some other sense) and still not be acting voluntarily or at all. A patient, after an epileptic seizure, may say that he heard and saw

[14] W. Penfield, The cerebral cortex in man I., *Arch. Neurol. and Psychiat.*, 40, 1938, 417-42.

[15] *Ibid.*, 440-1.

all that was happening but could not give any outward sign of this consciousness.

Though subjects seem to be able to distinguish self-consistently between the feelings of voluntary and of involuntary activities, there is experimental proof that they can believe they are choosing freely and voluntarily when the conditions are such that their reactions are wholly determined by external factors. Ach reported[16] such an experimental investigation, in which "free" voluntary choices were as rigidly controlled as if elicited by Penfield's stimulation, and were correctly predictable in nearly one hundred per cent of the cases. Wright conducted[17] several experiments in which "voluntary" decisions were determined by factors of which the subjects were unconscious (UNABLE TO COMMUNICATE). In one, for example, desserts on a dining-hall serving-table were so arranged that, though the subjects were allowed to choose any of the plates, with great frequency they took one from a certain part of the serving-table. In all Wright's studies the subjects had a feeling of free, voluntary decision, but their acts were nevertheless determined by the circumstances of their environment.

Arguing from this and Penfield's work, we can suggest that, if stimuli reach a particular part of the brain or follow a certain path (areas not stimulated by Penfield), the resulting actions of the organism seem voluntary, whether they are or not. Vigilance here gives the subjective feeling of volition. If other regions are innervated, the resulting actions consciously seem involuntary.

THE COMMON-SENSE CRITERION OF VOLUNTARY ACTION

When the man in the street says that something he did was *unconscious*, he means primarily INVOLUNTARY, though he may use the word also in other senses, like UNATTENDED, NOT INVOLVING INSIGHT, or UNREMEMBERED. He therefore often judges that the behavior of someone else must have been unconscious (INVOLUNTARY), because

[16] N. Ach, Über die Entstehung des Bewusstseins der Willensfreiheit, in *Bericht u. d. X. Kong. f. exper. Psychol.*, Jena: Fischer, 1928, 91-7.

[17] H. F. Wright, The influence of barriers upon strength of motivation, *Contrib. to Psychol. Theory*, I, 1937, No. 3.

he is confident that the individual would not have performed it voluntarily. Such a judgment involves an evaluation of motivations for and against the act. In that lies its uncertainty, for there is no certain way to make an accurate evaluation of the strength of any motivation. Frequently when this criterion is used the judges of another's actions do not make allowance for covert or unrecognized needs of the other person, or for their own ignorance of what the other individual really desires. It might be argued, for instance, that a novelist who repeatedly describes his characters by a single phrase does it unconsciously (ACTING INVOLUNTARILY), because he never would allow such a recurrence if he recognized it. The *New Yorker* magazine has made a point in recent years from time to time of copying from novels by well-known writers phrases which are used over and over in this manner. One writer recently pictured almost every male character in her story with a nose that had once been broken. Any statement that this was involuntary assumes that the author accepted conventional styles of diction, and did not repeat for a specific effect, was not employing a *Leitmotif*. If such alternative explanations can be ruled out by making a probability judgment of their likelihood, this common-sense criterion becomes scientifically valuable.

No experiments employing this common-sense criterion of unconscious (INVOLUNTARY) processes have been published, but it was used incidentally in one research of Newhall and Rodnick's.[18] These experimenters studied the threshold under circumstances in which it was necessary at various times to use various amounts of pressure to signal the presence of stimuli. They found that even moderate differences in the required pressure altered the data obtained. They concluded that this result indicated[19] "that the so-called principle of least effort may operate unintentionally or unconsciously." They assumed that this alteration was unconscious (INVOLUNTARY), because the subjects presumably wished to make as accurate judgments

[18] S. M. Newhall and E. H. Rodnick, The influence of the reporting-response upon the report, *Amer. J. Psychol.*, 48, 1936, 316-25.

[19] *Ibid.*, 325. By permission of the *American Journal of Psychology.*

of the threshold as possible, and would have tried to allow for the bias resulting from the necessary increased pressure if they had realized that it existed.

Significant use of this same sort of argument was made in work done by Cabot, an undergraduate at Harvard, under the direction of Barker.[20] A spot on a table at which they were sitting was shown to children who were subjects. They were then blindfolded and asked to place tokens on the table as near the spot as they could. They were told that if they achieved a certain high score they would be given in reward something they desired a great deal, as a pair of skates. The reward was shown to them, and then, with apparent carelessness, put down on one side of the table or the other. Under various pretenses the reward was moved, from time to time, from one side of the table to the other. It was found that the subjects erred from the center in the direction of the reward, *i.e.*, to the left if it lay on the left side of the desk. It is obvious that, if the subject were conscious that he was making this error, he would have allowed for it. The erring action, therefore, was unconscious (INVOLUNTARY); also, since the subject could not report that his behavior was affected by the location of the reward it was also unconscious (INCOMMUNICABLE).

This work has some similarities to the studies of involuntary movements with the automatograph, the scientific Ouija board, carried on by Jastrow and West[21] and by Tucker[22] in the 1890's, and by many others since. The subject's hand rested on the movable horizontal board, which he tried to keep steady. A pen attached to the platform recorded all movements. It was constantly found that the subject's hand moved the board slightly toward whatever he attended to, and that this movement was involuntary. Jastrow said[23]

[20] A. T. Cabot, *The Influence of Changing the Position of a Primary Valence upon the Path of Approach to an Induced Valence*, 1938, thesis for honors, on file at the Department of Psychology, Harvard University.

[21] J. Jastrow and H. West, A study of involuntary movements, *Amer. J. Psychol.*, 4, 1892, 398-407.

[22] M. A. Tucker, Comparative observations on the involuntary movements of adults and children, *Amer. J. Psychol.*, 8, 1897, 394-404.

[23] J. Jastrow and H. West, *op. cit.*, 407. By permission of the *American Journal of Psychology.*

that the consensus of the subjects' reports in his research showed that sometimes they suddenly recognized that their hands had moved, and that "the movements are sometimes unconscious but always involuntary, there is often great surprise at the result." This is introspective support for the distinction between *unconscious* (INVOLUNTARY) and *unconscious* (INCOMMUNICABLE OR UNAVAILABLE TO AWARENESS).

Any evidence to the contrary notwithstanding, it is still generally believed that, if an act is conscious, it is voluntary and, if it is not conscious, it is involuntary. Recently, for instance, a professor, not of psychology, was heard to say, "Whether or not he did it consciously is not the problem. The difficulty is that the damage was done." The context of this remark made it apparent that *consciously* to him meant having the communicable subjective feeling of free voluntary choice in the matter.

Our laws, as well as our common speech, reflect the equation of volition and consciousness. The fundamental maxim of old Anglo-Saxon law was that a man acts at his peril and only his acts and their consequences can be taken into account in meting out justice. Today our courts are concerned with determining what the defendant intended as well as what he did, for, if a man commits a homicide without intending to do it, he can properly be regarded as less of a menace to society than a wilful murderer.

In the legal proof of intent, of voluntary decision to commit a crime, it has become necessary to show that the person was fully conscious when the decision was made. In the case of Hopt *v.* People,[24] the United States Supreme Court decided that the jury may consider evidence that the defendant was intoxicated at the time of the crime in deciding whether he was capable of deliberate premeditation. An implication of this decision seems to be that under ordinary circumstances what is conscious is voluntary.

Perhaps this is the best practical attitude for the law to take, but psychology has shown that a great deal of behavior that is conscious (COMMUNICABLE) is demonstrably involuntary in the sense that it is

[24] Hopt *v.* People, 104 U. S. 631.

determined by external rather than intraorganismic stimulation. Subliminal stimuli or the general character of the situation (as in the study of the choice of desserts in the cafeteria) have been experimentally proved to be such extraorganismic determinants. It may be that subjects report a conviction that they are making free choices when the objective facts of the case prove they are not, but such convictions are often illusory. Perhaps always.

CONCLUSIONS

From the layman's point of view the capacity for voluntary decision is the chief subjective characteristic of consciousness. Many psychologists have agreed with him, but there is little modern research on consciousness (VOLUNTARY) and unconsciousness (INVOLUNTARY). It has been shown that there is a reliable subjective difference between voluntary and involuntary acts, and that there is a workable common-sense criterion for judging what behavior of others is voluntary and what is involuntary. There is also proof of a definite distinction between unconsciousness (INVOLUNTARY) and unconsciousness (UNAVAILABLE TO AWARENESS OR INCOMMUNICABLE).

Chapter XII

INCOMMUNICABLE UNCONSCIOUSNESS

Throughout the preceding chapters the most frequently employed criterion to differentiate conscious and unconscious (SEVERAL MEANINGS) states has been communicability. Usually, if an act or thought can be verbally reported, it is supposed to be conscious, and otherwise it is not. Communication comprehends more than verbalization, for it includes gestures and even the telltale, involuntary expression of the thief who in the police line-up recognizes the man he robbed. If behavior indicates what a person knows, it is communication. Immediate verbal report is the most important sort, however, and will be discussed in this chapter more than other kinds.

Many of the experiments which have been recounted in previous chapters have involved the assumption that, if the subjects when questioned say they do not perceive a certain stimulus, they are unconscious (UNABLE TO COMMUNICATE) of it. This is true of many determinations of psychophysical limens, reports on the span of attention, or recalls of memorized material. Throughout all of psychology immediate verbal report is the most widely used index, and probably the most satisfactory,[1] of what is in another person's con-

[1] The scientific usefulness of this index of verbal report is illustrated by the following examples of significant experiments chosen at random from those discussed in this book, in which introspective communications have been used effectively to produce important results: Penfield's electrical stimulation of the cortex in a conscious patient (*cf.* pp. 66-67), demonstrating that there is a subjective difference between voluntary and involuntary behavior. Cushing's similar experiments (*cf.* p. 101) in stimulating the brains of conscious patients. Dorcus's comparison (*cf.* pp. 118-119) of the subjective feelings and objective physiological signs in subjects to whom it was suggested under hypnosis that they were being rotated and carrying out other activities. Jacobson's study (*cf.* p. 133) of the effect of muscular relaxation upon reverie. Bressler's work (*cf.* p. 151) on the Muller-Lyer illusion using arrows subliminally different from the background. Baker's experiment (*cf.* pp. 151-152) on the influence of subliminal stimuli upon verbal behavior. Huntley's investigation (*cf.* pp. 156-157)

sciousness (AWARE OF DISCRIMINATION). Many of the senses of *unconscious*—for instance, UNSENSING, SUBLIMINAL STIMULI AFFECTING ORGANISM, UNATTENDING, UNREMEMBERING, ACTING INVOLUNTARILY—which have been reviewed in previous chapters are dependent upon verbal report. Unless the individual will communicate without long reflection, and do so in a reliable manner, it is impossible for anyone else to ascertain whether or not he is unconscious in these usages. If, for example, a subject will not tell promptly when the light before him becomes bright enough to see, his limen can never be determined.

Hundreds of experimental investigations have studied the effects of factors, concerning which the subjects have no communicable knowledge, upon their actions. The sheer mass of this research forbids any analysis of it here, although it has led to the statement of many laws about unconscious (INCOMMUNICABLE) behavior. Much of it deals with the alterations in attitudes and activities which result from unrecognized social suggestion, from the presence of other persons in the environment. The work explores, among other things, the control of conduct by suggestion or hypnosis; the influence of prestige, majority, and expert opinion on supposedly "unbiased" judgments; unrecognized imitation and emulation; and the effect of membership in various sorts of groups upon the rate and efficiency of completing tasks. In the table on pages 270 and 271 of this chapter, a few characteristic researches of this sort are summarized.

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of judgments of one's own forms of expression. Pauli's attempt (*cf.* pp. 167-168) to show the mutual exclusiveness of conscious processes. Newhall's study (*cf.* p. 169) of the effect of attention on discrimination. Guratzsch's work (*cf.* pp. 170-171) on clearness in various parts of the visual field. Lauenstein's findings (*cf.* pp. 219-220) on the time-error. Bartlett's work (*cf.* p. 223) on reproducing memorized passages at various intervals. Aall's study (*cf.* pp. 223-224) of the effect on recall of the expectation of the learner. Zeigarnik's demonstration (*cf.* pp. 224-225) that unfinished tasks are remembered better than finished tasks. Sharp's research (*cf.* pp. 254-255) on repression of *unacceptable* phrases. Wright's experiments (*cf.* p. 262) on the determination of "voluntary" decisions by unconscious (INCOMMUNICABLE) factors. Sherif's researches (*cf.* p. 271) on the effects of social suggestion in setting frames of reference for perception.

COMMUNICABILITY WIDELY ACCEPTED AS EVIDENCE OF CONSCIOUSNESS

The diversity of the theoretical positions of those who support communicability as an index of consciousness is remarkable. Some question that consciousness has a demonstrable existence aside from the actual act of communication. Others inquire whether one may not be aware of something he cannot put into words. There is, however, general agreement that one is almost always aware of what one puts into words. The agreement about communicability, though, has been more apparent than real, for the interpretations of this criterion have differed markedly.

Watson has said:[2] "In the place of the Freudian unconscious the behaviorist substitutes the *unverbalized*. He has a contrasting term, too—the *verbalized*." Here he was maintaining that the only sense in which it is significant to use the adjective *conscious* is to describe that which is overtly communicated or, as he limited the statement, verbalized.

The original stand of the behaviorists that consciousness is verbal behavior was later modified by the recognition that all sorts of behavior are equally indicative of consciousness. Markey represented[3] this later belief, and concluded from evidence that there is not always motion of the tongue in thought, that the motor activity of consciousness may temporarily drop out and thought be carried on through central nervous short cuts and connections. He thought it likely, however, that overt language habits have to be organized before this can occur. Hunter came[4] as close as any behaviorist to equating verbalization with consciousness when he said that, if a sensory process leads to language response, that is consciousness.

In his definition of consciousness the behaviorist is a strict empiricist, taking nothing for granted: There must be behavior to indicate consciousness. In deviating from this dictum many have erred.

[2] J. B. Watson, The myth of the unconscious, *Harper's*, 155, 1927, 503.

[3] J. F. Markey, The place of language habits in a behavioristic explanation of consciousness, *Psychol. Rev.*, 32, 1925, 390-1.

[4] W. S. Hunter, The symbolic process, *Psychol. Rev.*, 31, 1924, 478.

REFERENCE	TOPIC	SUBJECTS	METHOD	FINDINGS AND REMARKS
J. W. Bridges, An experimental study of decision types and their mental correlates, *Psychol. Monog.*, 17, 1914, No. 1.	Effects of suggestibility on decision	10 psychologists	The subjects had to make 100 decisions between two objects, mainly esthetic judgments. Later the judgments were repeated, the subjects being first told which object in each pair had been considered the better by the majority of subjects.	The suggestion about the majority's preference was frequently effective in modifying preferences, especially in certain individual subjects. The experimenter noted that suggestible subjects sometimes thought their decisions were unbiased or remembered that their decisions had been the same before, although they were really accepting the suggestion, about which they were UNABLE TO COMMUNICATE.
G. W. Hartmann, A field experiment on the comparative effectiveness of "emotional" and "rational" political leaflets in determining election results, *J. Abnorm. and Soc. Psychol*, 31, 1936, 99–114.	Effect of emotional and rational appeals upon political judgments	Voters of Allentown, Penna, in 1935	The voters were divided into three groups geographically. One group was given an "emotional" pamphlet propagandizing the Socialist ticket; one group was given a pamphlet with a "rational" appeal for the same ticket; the third control group was not circularized.	The "emotional" pamphlet accomplished its purpose more effectively than the "rational," but they both produced more support for the Socialist party than was shown in the control group. Presuming that voters in general conscientiously wish to make a rational decision as to the best candidates, these results show that voters can have their judgments swayed by irrational, emotional arguments in a manner about which they are UNABLE TO COMMUNICATE.
D. H. Kulp, II, Prestige, as measured by simple experience changes and their permanency, *J. Educ. Res.*, 27, 1934, 663–72.	Effect of prestige in print on liberal-conservative judgments	343 graduate students in educational sociology	The subjects first took a test in which they gave either liberal or conservative judgments about various social problems. Then answers to these questions supposedly approved by educators were shown one group of the subjects, answers supposedly by social science experts to another group, and answers supposedly by lay citizens to a third group Then the subjects rechecked their answers to the test	Although the subjects thought they made independent judgments, the prestige of the groups whose answers the subjects saw definitely affected the second judgments. The educators had the greatest prestige suggestion effect. The subjects appeared to be UNABLE TO COMMUNICATE about this prestige effect.
G. C. Myers, Control of conduct by suggestion: an experiment in Americanization, *J. Applied Psychol.*, 5, 1921, 26–31	Effect of suggestion on voluntary activity	Uneducated soldiers in wartime army schools of reading and writing	Instead of sentences ordinarily used in teaching reading and writing, the subjects learned sentences speaking favorably of education, the army, and America. Then letters voluntarily written home by the subjects were read by the experimenter and analyzed.	The subjects wrote home much of the propaganda they learned in class. They gave other evidences of believing it and acting upon the basis of it They appeared to be UNABLE TO COMMUNICATE about the way this propaganda affected their behavior
D. Starch, Unconscious imitation in handwriting, *Psychol. Rev.*, 18, 1911, 223–8.	INCOMMUNICABLE imitation of handwriting	106 university students	The subjects were given four paragraphs to copy: one typewritten, one in vertical script, one in slanting script, and one in unusually large script. They copied each in longhand.	Of the 103 subjects who said they wrote as they always did, all were affected to some degree by the different forms of script copied. The majority of subjects reported that they had no opinion as to what was the purpose of the experiment. The effects of the different forms of script were therefore unconscious (INCOMMUNICABLE).

M. Sherif, An experimental study of stereotypes, *J. Abnorm. and Soc. Psychol.*, 29, 1935, 371–5.	Effect of attitude toward author on judgments of literary excellence in passages	224 American and Turkish college students	The subjects were asked to arrange a list of 16 authors in order of preference At another session various passages from Robert Louis Stevenson were given, each credited to one of the 16 authors Controls were instituted to maintain the various passages equal in literary value, or at least rule out variations in intrinsic value. The subjects were asked to judge the excellence of the passages Each subject was asked if in making the judgments he had tried to discount the effect of the authors' names A similar procedure was carried out using Turkish subjects and authors.	Average correlations for the subjects between the rank order of preference for the authors and of preference for passages attributed to them were high, between + 30 and + 53 Therefore stereotyped attitudes toward authors affect judgments of their work, even when the subjects are UNABLE TO COMMUNICATE about the effect. This was true in this experiment even in the case of some subjects who were disturbed by the presence of the authors' names on the passages to be judged.
M. Sherif, A study of some social factors in perception, *Arch of Psychol*, 1935, No. 187. *Cf* also M. Sherif, An experimental approach to the study of attitudes, *Sociometry*, 1, 1937, 96–8.	Effect of social suggestion in setting frames of reference in perception	Male university students between 19 and 30, psychologically naïve—19 in first procedure; 4 in second procedure; 40 in third; and 36 in fourth	A minute, unmoving source of light was presented to each subject in a darkened room According to the autokinetic effect such a light seems to move In Procedure 1 the light was shown 100 times and each time the subject told how far (apparently) it moved In Procedure 2 this was repeated on three separate days In Procedure 3 half of the subjects did this individually and then in groups of 2 or 3, and the other half did it first in groups and then individually. In Procedure 4 the subjects worked individually and it was suggested by the experimenter before the light was shown whether it would move to the left or to the right.	Procedure 1 showed that each subject established his own range of distance for the illusory movement and then maintained that range Procedure 2 showed that this range was maintained in subsequent sittings Procedure 3 showed that subjects judging the distance first individually and then in a group developed their own ranges which then were modified in the group to approximate the ranges of others in the group. When the subjects judged first in a group, a group range was established which the members afterward maintained when judging individually Procedure 4 showed that in general suggestion was effective in determining the direction of the movement of the light Only about a quarter of the subjects thought that their judgments were influenced by those of others in the group, and the experimenter concluded that one does not have to be conscious (ABLE TO COMMUNICATE) of the effect to be influenced by the group.
P. M. Symonds, *Diagnosing Personality and Conduct*, N.Y.: Century, 1931, 111–3.	Effect of general impression about a person on judgments about his specific traits	2 teachers and 40 pupils	The teachers rated the pupils separately on seven traits A "general impression" of each child was determined by adding the ratings on the seven traits of a single teacher Partial correlations were computed, keeping the general impression of each of the raters constant The resulting partial correlation was thus statistically freed from the "halo effect," which is the tendency of the general impression to spread to judgments of specific traits or abilities of the person.	By this statistical procedure a large effect of the general impression upon judgments of specific traits was found. This "halo effect" of course operated unconsciously (INCOMMUNICABLE) because the teachers were trying to make unbiased estimations of each trait in each child separately.

A student of physics, asked to explain the operation of a gas meter, mentions the necessity of applying the gas laws of Boyle and Gay-Lussac in the computations. He hopes that on the grounds of this vague reference the teacher will assume that he knows what those laws are. The teacher will not be a good empiricist unless he asks the student what they are. One may not assume communicability without testing it by communication.

Behaviorists are wrong, however, in insisting that crude communication, rather than communicability, is a test of consciousness. A spy may not tell anyone what the secret naval treaty he stole contains, but that does not mean he does not know its terms. While one may not assume that, because a stenographer who is applying for a job knows how to multiply two by three, she also knows how to multiply nineteen by seventeen, the reverse judgment is certainly legitimate. In most situations—for example in a clinical examination—it is not practically feasible to discover everything a patient can report. A sampling method must be used, and, on the basis of relatively few communications, judgments as to what is communicable must be made. It is the potentiality that is important.

This broader notion of communicability, rather than mere communication, is what most psychologists not of Watson's school have defended as a criterion of awareness. The classical introspectionists, for instance, frequently postulated communicability of consciousness. Their introspective method was an attempt to obtain a complete description of consciousness during various activities, but they did not appreciate the importance of the practical limitations upon report.

Psychoanalysts also consider communicability a significant index of consciousness.[5] The body of Freudian statements bearing upon this question must be interpreted to hold that the potentiality of communicating some fact, rather than the actual communication of it, is the indication that the fact is conscious. Unlike the introspectionists, moreover, the psychoanalysts recognize that there are social

[5] *Cf.* S. Freud, *The Basic Writings of Sigmund Freud*, ed. A. A. Brill, New York: Random House, 1938 (*The Interpretation of Dreams*), 542.

forces which limit communications. The super-ego is the agency that determines what the individual dare say and what he may not report. It is the representation within him of the taboos he has learned from other people, his parents, teachers, leaders, and acquaintances.

Many who have a practical, clinical approach to the problems of consciousness and unconsciousness are unable to agree wholly with behaviorists, introspectionists, or psychoanalysts. A clinician of this sort is Murray, a self-styled "dynamic psychologist." He explained in the following paragraphs what he meant by *unconscious*:[6]

> Whatever a subject can report upon is considered conscious; everything else which, by inference, was operating in the regnancy ["a dynamically organized temporal segment of brain processes"] is considered unconscious. According to this convenient pragmatic criterion, consciousness depends upon verbalization. Thus, conscious facts (for the experimenter) are limited to those which the subject is able to recall. Consequently, in all organisms below man every regnant variable, being unverbalizable, is treated as if it were unconscious.
>
> . . . The manifestations of unconscious needs are usually rationalized or "explained away" by the subject. They are attributed to another need or to some other factor: habit, convention, imitation, bad influence, etc. As a general rule, unconscious needs are in opposition to the social personality. Together they constitute what has been called the *alter ego*, a partly dissociated self, composed of tendencies that are not "let out" in everyday life. . . .
>
> In the present study we became less interested as time went on in conscious overt behavior—it was obvious and the subject knew about it—and increasingly absorbed in the exploration of unconscious complexes.

In this statement we find at the beginning that communicability is the criterion advanced to define what is conscious. In order to show how objective was his approach and in order to adhere to his definition, Murray stated that all regnant variables in animals below man must be considered unconscious, because unverbalizable. (Like Watson, he restricted his criterion to verbal communicability.)

[6] H. A. Murray *et al.*, *Explorations in Personality*, New York: Oxford University Press, 1938, 113-4. By permission of Oxford University Press, New York.

Later he said: "As a general rule unconscious needs are in opposition to the social personality." He thus recognized that social forces are important limiters of communication, which fact is in no way contradictory to his former criterion of verbalizability. At the end, however, he seems to imply that one knows about conscious overt behavior but that he does not know about unconscious (INCOMMUNICABLE) behavior. This conclusion reflects a belief that no trouble is encountered in getting a subject to tell all he knows.

Such an assumption, that what they are unable to get the patient to verbalize is therefore not in his awareness, appears frequently in the utterances of practical clinicians. While they recognize the part of social factors in repressing material entirely below the level of consciousness, they appear to neglect the consideration that these factors frequently keep information, of which the patient is conscious and upon which he acts knowingly, from being communicable even in the psychiatric interview. In evaluating communicability as a means of distinguishing what is conscious from what is not, we must consider, then, the social limitations upon it. Neither behaviorist nor introspectionist has allowed for them, and psychoanalysts or clinicians have by no means always evaluated them properly.

DIFFICULTIES OF THE COMMUNICABILITY CRITERION

The widespread support of the ability to communicate as a sign of consciousness (AVAILABLE TO AWARENESS OR OTHER MEANINGS) does not signify that this criterion is foolproof or all-sufficient. In many specific instances this sense of consciousness is diametrically opposed to all other meanings. For example, a girl may blush at a statement unawares, but her companion will nevertheless have fathomed the secret betrayed by her behavior. In any ordinary use of the word she was *unconscious* (*e.g.,* UNAWARE OF DISCRIMINATION), still, because one sort of act that conveys meaning may not be called communication while another is not so considered, the young lady's blush must be called *conscious* (COMMUNICABLE). This dizzying

inversion of the usual understanding of the word may well make one wonder just what sort of communication is a criterion of consciousness. Again, patients under such anesthetics as scopolamine make communications which they cannot remember a little later. This circumstance also occurs to a degree, as has already been seen, in cases of dissociation like Janet's Irène (*cf.* p. 63) and of abnormalities of memory following upon blows on the head (*cf.* pp. 127-128). In all these cases the criterion of communicability as evidence of unconsciousness (UNAVAILABLE TO AWARENESS) conflicts with the criterion of memory, and whether one, the other, or both are "true" tests is a hard problem.

When a person has aphasia and is unable to use speech or understand it properly, usually because of neurological lesions, he is unconscious (UNABLE TO COMMUNICATE) if verbalization is to be the basis of judgment. It would be difficult to convince even those who have advocated this criterion that these patients are unconscious in any usual meaning of the word. Case XVI of Chapter II (pp. 68-69) is one of Head's famous aphasia patients. He was able to do all sorts of things people cannot do when they are UNDISCRIMINATING, UNSENSING, UNATTENDING, INSIGHTLESS, UNREMEMBERING, or UNAWARE OF DISCRIMINATION. Certainly in the kingdom of the deaf, dumb, and blind an intelligent aphasic like Major X would be king.

Head also reported[7] that several of his patients could indicate by gestures the ground plan and location of furniture in a room familiar to them, but could not express in words the spatial relationships between these objects. Alford told[8] of a man who had the characteristic signs of a jargon aphasia, mumbling unintelligibly but with apparent purpose, as if in a foreign language. He could perform many acts, though impulsively, such as feeding himself. He was alert to his surroundings; he would greet a friend with bodily activity and attempts at speech; he would contort his face when told to put out his tongue; and once he was able to find the name of his

[7] *E.g.*, H. Head, *Aphasia*, New York: Macmillan, 1926, I, 264, 339, and 393.

[8] L. B. Alford, Localization of consciousness and emotion, *Amer. J. Psychiat.*, 12, 1933, 792-3.

stock in the financial section of the daily paper. Concerning this man Alford wrote[9] that if "awareness pure and simple" were the criterion, this patient appeared to him to be conscious, for he could scarcely believe that the patient could otherwise do what he did.

The aphasias demonstrate better than any other phenomenon the major fault of the communicability index. It is not a special sign of consciousness (DISCRIMINATING), for any behavior whatsoever signifies discrimination. Rather communication is the act of conveying some meaning as subjectively understood from one person to another. The potentiality implied by the word *communicability* involves a subjective reference, for there can be no objectively observed potential act—if it is observed it is not potential but actual. If communicability is, then, a criterion of consciousness in the subjective sense, it is supposed to be a sign of the presence of consciousness (AVAILABLE TO AWARENESS) which has been seen in Chapter I (p. 43) to be the fundamental introspective meaning for *consciousness*—what Alford in the reference mentioned above called "awareness pure and simple." Speech is certainly not always being carried on when consciousness (AVAILABLE TO AWARENESS) is present, as the aphasias show, nor is any other simultaneous act of communication necessary. Neither communication nor the possibility of communication is in itself subjective consciousness or even an infallible sign of the presence of such consciousness. In the light of the facts of aphasia any denial of this dictum is merely one of the "extravagances in the motor theories of consciousness."[10] Any sort of behavior is only the "outward and visible sign" of an inward, subjective AWARENESS OF DISCRIMINATION.

Another of the faults in the equation of communicability and consciousness (AVAILABLE TO AWARENESS) is based upon the inadequacy of words to convey thought. Bergson,[11] Whitehead,[12] and many others have made note of the unsatisfactory description of

[9] *Ibid.*, 793.

[10] *Cf.* H. C. McComas, Extravagances in the motor theories of consciousness, *Psychol. Rev.*, 23, 1916, 397-406.

[11] H. Bergson, *Time and Free Will*, New York: Macmillan, 1910, 162-3.

[12] *E.g.*, A. N. Whitehead, *Adventures of Ideas*, New York: Macmillan, 1933, 209-10.

the rapidly flowing, complex stream of consciousness which words convey. Language is an inexpert stenographer, lagging always behind the dictation of subjective experience, often omitting items or making mistakes. Because their only resource was language, the introspectionists were forced to divide into several parts their subjective reports on even such a simple reaction as a judgment between two lights. In some trials they would introspect on conscious experience which occurred at the time of expectation of the stimuli; in other trials, on that at the time of the stimulus; in others, on that at the time of the judgment; and so forth. Even by this method of fractionation their descriptions were far short of what could be desired. In the ways that speech, the best of all methods of communication, is unsatisfactory, the criterion of communicability is also limited.

The subject-object logic has persisted in our grammar, which Aristotle first formalized, and all our verbalization must be fitted into that logical format. The general uncomprehending reception of "stream of consciousness" literature as exemplified by James Joyce indicates that we find great difficulty understanding communications in any syntax form more "irrational" than our usual form. The difficulty which is commonly manifested in putting into words private experience as it occurs (which is the problem of the "stream of consciousness" writers) shows that uncommunicated experience is not ready-made in subject-object relationships. The necessity of employing grammatical structures whenever verbalization is used to tell what is conscious from what is not is a further limitation upon the criterion of communicability. The fact, moreover, that many vague feelings and sensations have no generally accepted words to convey them is still another drawback.

SOCIAL DISTORTION AND LIMITATION OF COMMUNICATION

The pressure continually exerted upon the individual to make his private experience part of the public experience is one of the major factors tending to distort his communications. This force

exerted upon him to relate things which he does not wish to share often results in distortions of his communication, so that it no longer mirrors his experience. "Ask me no questions and I'll tell you no lies." For a multitude of reasons the exigencies of communal living require some to try to penetrate the private experience of others by questions. The common code requires some sort of answers to these questions, but it can never force the truth. In this fact lies the retreat of the individual and the final balking of social endeavors, one of which, incidentally, is science. Other members of his society may and usually do brand him abnormal—a hermit, a schizophrenic—but they cannot force him, if ostracism does not break down his solitude.

The witness swears that he will tell the truth, the whole truth, and nothing but the truth. Unless he is reporting events which others saw also, there can be no check other than internal consistency upon whether he keeps his oath. If others must know the truth, motivational probabilities must be considered, and perhaps motivations increased, as by the rack of the Inquisition. Communication forced by the third degree has, of course, long been recognized to be unsatisfactory. Which, if either, of two conflicting confessions by the same person is true can be discussed interminably and remain forever unanswered, for the private experience of each individual is inviolate except with his co-operation.

A court tries to get a newspaper reporter to tell the source of his story. He refuses and goes to jail for contempt. A government tortures captured prisoners for information about the troop movements of their country. On the other hand, society considers it best that priests and lawyers be allowed to keep confidences sacred. Many problems of government deal with the question of just how much of private experience can legally be outside and how much within public knowledge, presuming that the individual will accede to law or to force.

The excitement of the detective's chase and the reflected glamour of detective novels lie in discovering what is hidden in someone's private experience. Demands for action on the part of society, to

protect itself from its criminal members, force it to act on probabilities rather than direct evidence. If the accused will not let society into his privacy, there are no effective tactics but siege. When he does speak, if he cannot be checked no one can be certain that he has told the truth. Private experience is forever nonscientific, unless introspective communications can be so controlled as to be scientifically admissible.

If a conqueror tries to enforce co-operation from the vanquished, sabotage frequently results instead. Similarly the individual, to protect his own integrity, may readily sabotage the attempt of others to pry into his affairs, whether in court or in the most private psychiatric interview. Communications of a patient or a subject, which he might possibly think would prejudice his integrity, are not reliable. As yet we have no "lie detector" which can indicate at all satisfactorily when deviations from fact occur or what kind they are. It will probably be a long time before there is found a weapon adequate to breach the individual's wall of privacy. Long practice in dealing with people may enable some wise men to make a shrewd guess about what the private facts are, but this is never certainty.

THE FITTING OF COMMUNICATIONS TO THE CULTURAL MOLD

Each culture develops its own norm for what may and may not be communicated. One may say that brothers look alike in America, but may not in the Trobriand Islands.[13] Mekeel has told[14] of a boy in a large city who attacked his father with a knife because he was told to by spiritual voices. The attending psychiatrist thought these facts made the diagnosis of the boy's condition obvious until he learned that the boy's whole family heard the spirits. They were American Indians, and the hearing of voices was an accepted occurrence in their tribe. All the members of a culture are restrained from saying certain things and encouraged to express others, and

[13] *Cf.* B. Malinowski, *The Sexual Life of Savages,* London: Routledge and Sons, 1929, 174-5.

[14] H. S. Mekeel, Clinic and culture, *J. Abnorm. and Soc. Psychol.,* 30, 1935, 292.

so develop characteristic verbal habits. The restrictions caused by these habits modify their communications.

Sherif has shown experimentally[15] that other members of a group, the social environment, can determine the perception of the individual—of what he will be conscious and on what he will report. Social groups decide by convention what interpretations will be put upon the environment and natural phenomena, and the individual must see them thus or else. . . . Galileo did not verbalize the universe as did the Church, and the Church was not satisfied until he conformed. What his private experience was thereafter no one could tell. If communicability is to be the sole criterion, most individuals interpret things as their society sees them. In the Anuak tribe of the Sudan, if a man faints or is knocked unconscious and returns to normality, he is automatically a medicine man. From then on he must talk to spirits under the buffalo rug, or be ostracized or killed. There is little question that spirits would be in the "consciousness" of most people under these conditions. There are intercultural differences in the degree of variation from the norm which is tolerated without stigma. A scientist would have been unhappy in the Middle Ages, because his oversuspicion of the dicta of the Church would have put him in Galileo's company.

As a culture gains organized power, it not only serves as a frame of reference for what the individual will communicate, but it also begins a censorship which is in many ways similar to modern wartime censorship. Such a cultural censorship inhibits the individual from behavior—words and acts—which he would otherwise perform. There are at least three possible reasons for such a check to activity: (*a*) The majority obtain a common advantage by protecting certain rights, and therefore rules for deciding between conflicting desires among different persons are established. (*b*) Certain racial or cultural inhibitions exist which, approved or not by the majority, give the ruling minority certain advantages. Or (*c*) taboos

[15] M. Sherif, A study of some social factors in perception, *Arch. of Psychol.*, 27, 1935, No. 187. *Cf.* also table in this chapter, p. 271.

that no longer give anyone any advantages persist because of the inertia of custom.

A child raised by apes on a desert island would be able to communicate different things from a child raised in America. The island child when grown would have fewer or at least different restrictions, so if it developed language it would make explicit many more of its desires than an American child, especially a child of the Victorian period.

Freud has an anthropomorphic censor in his theoretical unconsciousness (PSYCHOANALYTIC MEANING). He recognizes mechanisms in human behavior which parallel the functions carried on by the socially appointed censor. Just as it is difficult to discover a person's true thoughts from a letter which has passed through censorship, so it is difficult to discover his true motives when he is subjected to social stress. Freud said[16] that this discovery can be made when one knows what the censor wants to repress, for then one can read deductively between the lines. This statement is not strictly true, because one can never be sure that the material of which the censor would have disapproved ever had been written so that it could be blue-penciled. The blocking of communications by social barriers is not so easy to circumvent as Freud seemed to believe.

In psychoanalyses the analyst often meets with periods of resistance and blocking of the verbal communication. Freud frequently insisted[17] that such resistance is practically certain indication that something is being repressed, something which must be allowed to break through before the analysis can proceed satisfactorily. It is difficult to see how one can be sure when there is something to be repressed. The absence of a policeman at a busy intersection does not in itself prove that an officer has been forcibly detained and prevented from going there. No policeman may have been detailed to that corner, and a patient may have nothing in a certain region of his personality to conceal. If there is, perhaps, something in that region of the patient's personality, it may be perfectly conscious

[16] S. Freud, *op. cit.* (*The Interpretation of Dreams*), 223-5.
[17] *E.g.*, S. Freud, *op. cit.* (*The History of the Psychoanalytic Movement*), 939.

(AVAILABLE TO AWARENESS) and even communicable to a friend closer than the analyst.

Psychoanalysis is a social phenomenon, and in it, as in all social relationships no matter how intimate, some cultural censorship, super-ego inhibitions, remain to suppress communication. The censor of the culture can insinuate himself into the analyst-patient relationship as he does into any other. A certain patient was psychoanalyzed and promised to tell the analyst everything. In spite of his promise he systematically concealed one part of his life from the analyst. Later he told the whole story (?) to someone else, and it seemed apparent that what he had concealed was the key to the distortion of his personality. It is vain to hope that the two levels of organization of personality, conscious and unconscious (PSYCHOANALYTIC MEANING), may be adequately differentiated merely on the basis of whether or not the material is communicable in the analytic session. One can never be certain in any given case that the social barriers have been broken through.

THE DEMAND OF WESTERN CULTURE THAT COMMUNICATION BE RATIONAL

Social groups also establish set forms in which whatever expression is allowed must be formulated. Just as the Mikado must never be looked down on from above and must never suffer the indignity of having others turn their backs to him, so, as many theorists have said, the Western culture, as well as certain others, specifies that whatever one says must be *rational.* (*Rational* as used here and elsewhere throughout the chapter means having a logical format. Any series of statements which does not assert both a proposition and its opposite, or violate other such rules of logic, is *rational* or *logical. Rationalization* as commonly used means making a logical explanation of how certain of one's acts or statements follow from specific desires or purposes.)

Various psychologists have frequently insisted that this enforced rationality makes the communicated greatly different from the

uncommunicated. Whether it is the act of communication that shapes thought into rational form, or whether only rational material is communicable and what is irrational must forever remain unconscious (INCOMMUNICABLE and PSYCHOANALYTIC MEANING), these theorists do not agree. It is the Freudian doctrine that unconscious (PSYCHOANALYTIC MEANING) processes are irrational, but are clothed in seeming logicality before being communicated. Freud said:[18]

> Thus, the psychic agency which approaches the dream-content with the demand that it must be intelligible, which subjects it to a first interpretation, and in doing so leads to the complete misunderstanding of it, is none other than our normal thought. In our interpretation the rule will be, in every case, to disregard the apparent coherence of the dream as being of suspicious origin and, whether the elements are confused or clear, to follow the same regressive path to the dream-material.

Delacroix has commented[19] that this interpretative process occurs in the waking state as well as during dreaming, for everyone continually makes a logical co-ordination of his own sensations. Particularly apt is Ellis's description of the rationality of consciousness:[20] "Sleeping consciousness, we may even imagine as saying to itself in effect: 'Here comes our master, Waking Consciousness, who attaches such mighty importance to reason and logic and so forth. Quick! gather things up, put them in order—any order will do—before he enters to take possession.'"

Freud, Delacroix, and Ellis are three of many who state that the uncommunicated is irrational, while the communicated is rational. As will be suggested in succeeding pages, they are incorrect in considering that the uncommunicated is irrational, but they have realized the important truth that in the Western culture one must be able on demand to communicate an explanation of the causes of his

[18] S. Freud, *op. cit.* (*The Interpretation of Dreams*), 463. By permission of Random House, Inc.

[19] H. Delacroix, Sur la structure logique du rêve, *Rev. de Métaphys. et de Morale*, 12, 1904, 926.

[20] H. Ellis, *The World of Dreams*, Boston: Houghton Mifflin, 1911, 10-1.

deeds. If the individual is to live at peace with his fellows, moreover, his explanations of his acts must be framed so as to make them appear to arise logically from standards or purposes which are considered proper in his society. In order to protect himself from the wrath of this group, the individual often does not tell all he knows about his desires, purposes, and acts, simply because he cannot make them appear to follow rationally from the accepted principles of his culture.

Why does communication in a social environment concerning the reasons for one's actions assume a rational form consonant with accepted usages? Is it because individual private experience and behavior are likewise logical, or are the outward forms only chic clothing for illogical nakedness? In answering these questions consideration must be given to the arbitrary character of conditioning, which is one factor engendering the false appearance that the uncommunicated is irrational and is poured into a rational mold whenever it is communicated.

THE ARBITRARY NATURE OF CONDITIONING

The fallacious presumption that a person knows and can tell why he acts as he does is almost universal. One can get into hazardous straits with his fellows or with the law by admitting that he does not know why he performed some act. Usually the explanation of behavior is that one is responding to conditioning set up at some forgotten time in the past—conditioning of which he has no longer any inkling at all. If the original situation in which this conditioning was developed is not clear, then the connection between the stimulus and the conditioned response will appear entirely arbitrary.

The parable of the Pavlovian's young laboratory helper illustrates this point. This boy of eight earned his board and room by caring for the professor's dogs. He relished the dogs' meat and would always eat a little while he was giving it to the dogs. Thus he became conditioned to salivate to a bell, just like the dogs. One Sunday when visiting his family he went to church with them. When

the church bells began to ring, he began to salivate. His mother upbraided him for it. Not realizing that the church bells were the cause, he tried to explain that the thought of his coming Sunday dinner had made him do it. His mother was not appeased, and, when it happened another week, she punished him.

It is quite possible to become conditioned, to have that conditioning determine behavior, and yet be unable to report that the conditioning exists or what the conditioned stimulus is. After this manner our affections often develop. An employer likes a girl applying for a position, but would not be able to tell why. He hires her, however, and may never realize that he gave her the job because she resembles his sister. Had he been able to report this fact, he might, as a conscientious executive, not have hired her for fear of being prejudiced. Again, suppose a woman overhears her physician telling another doctor in consultation that her father took the gold cure for alcoholism. Despite the truth of the statement and the woman's sincere desire to be fair-minded as well as to benefit from the consultation, she feels herself becoming angry. Her deep-seated habit of admitting only pleasant connections with her father has been disturbed.

The conditioning experiments of Jones have illustrated the genesis of such "irrational" behavior. In one of these[21] the subject was a little boy about three years old. For some unknown reason he was afraid of rabbits and of other objects which seemed to him to resemble rabbits. At first a rabbit anywhere in the room would make him show fear, but then he saw the rabbit when he was eating food he liked, when he was with a man he liked, and when he was with children who were not afraid of the animal. Step by step his fear was deconditioned and finally he would fondle the rabbit affectionately and allow it to nibble his fingers. His attitude toward objects which he thought resembled rabbits changed markedly also.

These alterations in emotion are entirely arbitrary. If the food had been unpleasant instead of good, the fear for the rabbit would have been increased. It all depends on the concomitants of the situa-

[21] M. C. Jones, A laboratory study of fear, *Pedagog. Sem.*, 31, 1923, 308-15.

tion, a relationship which, incidentally, is one factor explaining the effectiveness of "pretty girl" advertisements. When the original circumstances of conditioning have been forgotten, the pertinacity of the conditioning makes the resulting behavior seem irrational and inexplicable, but, as Anderson has said,[22] though in its final form it appears difficult to explain, understanding of its origin makes it comprehensible.

THE EFFECT OF RATIONALIZATION IN ALTERING REPORT

The social necessity for rationalization often causes a person to report falsely the origins of his actions.

A child sitting at table begins to lose his balance because his chair leg cracks. To keep from falling he grabs the table cloth, and so pulls it toward him a few inches. A cup and saucer close to the edge of the table fall off and are broken. The child's mother sees the whole affair and slaps him so that he begins to cry. The father reproaches the mother for slapping the child, and the mother retorts, "He must learn to be more careful." It is obvious to the "neutral observer" that the mother slapped the child because she was angry that the cup and saucer were broken, and because the only thing she could do about it was to punish the luckless, unresponsible human instrument of the calamity. It was socially unacceptable for her to admit this feeling of anger and resultant aggression, so she explained her action in a socially acceptable form, however transparently false her words were.

Why is this an effective mechanism? Because of the unassailability of private experience. Whatever one says about this region must be accepted as true or as meaningless, because no one can prove or disprove it. Everyone accepts the fact that there are individual differences, and that some queer and incomprehensible things are to be found in the privacies of some persons. There is, moreover, a civilized convention that it is not courteous to question reports of individuals about this region. When, therefore, the mother

[22] J. E. Anderson, in C. M. Child *et al., The Unconscious: A Symposium,* New York: Knopf, 1929, 88.

offers her explanation, her husband must accept the reply in good faith if he is a gentleman and abides by the rules of the game. If he is a run-of-the-mine husband or a scientific "impartial observer," he will say that the situation seemed to be more typical of anger and assault than of detached punishment. To this the mother might reply, "Well, I told you why I did it; prove it isn't so." She might bolster this challenge with a reference to the common fallacy: "I did it; I should be able to report what goes on in my body and should know more about it than you." She knows the extreme difficulty of dislodging her from such a position. Should she be coaxed into admissions which finally sum up to show that she slapped the child because she was angry at the breaking of the dishes, she can still fall back to second-line trenches and insist, "Well, you don't really understand why I did it. If you think I'm queer, you do some peculiar things yourself."

THE IRRATIONALITY OF THE UNCOMMUNICATED AND SOCIAL UNACCEPTABILITY

The mother has rationalized. Because of social demands, she has quickly put her "unverbalized" into order—and "any order will do," as Ellis said (*cf.* p. 283). This sort of situation is explained by Murphy, Murphy, and Newcomb in true psychoanalytic tradition as follows:[23]

> As one confronts a social situation requiring thought, the logical and the autistic are blended. The words are reasonable, but the tune is the irrational melody of desire. One tries, for example, to see a "tempting offer" as if it were a sound proposal. One says with half a smile that he "hopes to rationalize" his decision to take a two months' vacation. The despot proves that his control is necessary to the welfare of his people.

But where in the illustration of the mother and the child is the evidence for this "irrational melody of desire"? The attack on the child is perfectly logical, granted a basic desire to preserve one's

[23] G. Murphy, L. B. Murphy, and T. M. Newcomb, *Experimental Social Psychology*, rev. ed., New York: Harper, 1937, 223. By permission of Harper & Brothers.

property. The mother simply would not admit that her act was motivated by this desire, because society would not approve such savage egoism. *Rationalization* is not, as so many hold, bringing pseudo-logical order out of a suppressed chaos which is an irrational mass of contradictions. From the analysis of the illustration, rather, the following redefinition can be obtained: *Rationalization* is the description in culturally acceptable terms of an act arising from motives not approved by the members of society, or from motives which one is unwilling to admit publicly. It may also occur if one has to explain actions whose motivation is based on conditioning of which one never knew or which one has forgotten.

As a matter of fact most psychoanalytic case histories seem to show that, far from being unaccountable, unconscious (PSYCHOANALYTIC MEANING) activity is pretty shrewd in getting what the individual wants. If Freud interpreted correctly why the woman in Case XVII, Chapter II (pp. 70-73), suspected her husband of infidelity, her unconscious (PSYCHOANALYTIC MEANING) processes operated most rationally to satisfy her desires. Unconsciousness (ANY MEANING) is not irrational in the sense of being irreconcilable to man's reason. If, however, the usual meaning of the word *irrational* is forgotten and another substituted, "based on socially unacceptable premises," we approach Freud's meaning. When motivated by such desires a person is likely to find himself in difficulty unless he is particularly ingenious in making his actions appear to follow from culturally accepted bases. Psychoanalysts insist that all actions originally derive from asocial motives and so must be rationalized.

It has already been said that a major reason why the kind of communication labeled *rationalization* occurs so frequently in Western culture is that pressure is repeatedly brought to bear on one to explain one's acts. An American barber, unlike Mohammedan barbers, cannot excuse his having cut off too much hair with a blithe "Allah wills it." Like the defendant in court, a person is in a vise. If he tells the truth as required by the rules, he will suffer from other laws of the society. He therefore perjures himself, taking

advantage of the fact that there were no witnesses of his private experience to corroborate or disprove his testimony. The jury must be guided in deciding by the credibility of his story or by sympathy. Indeed it is at law that the part of society in forcing rationalization is most obvious.[24] An important difference between legal procedure and real life is that the law does not require the defendant to give evidence against himself, and so saves many from the nasty necessity of perjury. Often, if the defendant stands on his rights and refuses to testify, a jury feels that he has something to hide and is therefore guilty. This inference circumvents the realism of the law. The jury then is the culture clamping its vise on the defendant.

Why are cultural premises different from the "irrational," individual premises, so giving rise to all this distortion of communication? Rousseau, long before Freud, answered[25] this question. He said that the nature of sovereignty, determined by the social contract, is that individuals must give up to the sovereign some of their rights in order to live in peace and safety with each other. This reasoning is a platitude often repeated by students of government. The society, through its government, has the right to decide arguments between its members, limit individual freedom drastically for purposes of common welfare, and so forth. If the individual lives in the society, he must accept these restrictions, whether he likes them or not. What psychologists have frequently misnamed "irrational" unconscious (INCOMMUNICABLE) principles are those autonomous desires for independence and pleasure which care nothing for the rest of the world. Such anarchic wishes of the individual to have what he pleases, no matter what others may suffer as a result, are entirely comprehensible in terms of somagenic and psychogenic drives. They are "irrational" only in that they are antisocial. They are often sufficiently anarchic that the requirements of the culture limit drastically the communications describing the reasons for acts motivated by them. Communication is a social act, and the most powerful limitations of it, which must be taken into account

[24] *Cf.* J. Frank, *Law and the Modern Mind,* New York: Tudor, 1936, 22-31.

[25] J. J. Rousseau, *The Social Contract,* Book 1, Chap. 6.

when using it as an index of consciousness, are the social influences which have just been considered.

THE WARRANT FOR SKEPTICISM ABOUT INTROSPECTIONS

The necessity for an eternally vigilant doubt about the truth of all communications, especially subjective reports, is the main shortcoming of this social criterion of consciousness. The danger that the subject may be suppressing something of which he is conscious is present in every experiment and every clinical case where this index is used. In Chapter V (pp. 118-119), for example, reference was made to research of Dorcus on modification by hypnotic suggestion of some vestibular and visual responses. He suggested to the subjects that they were being rotated, and then watched them to see if they developed nystagmus and falling reactions; he suggested that the light was dimmed and then watched their pupillary reactions; he suggested that they were seeing colors and then studied what after-images they reported. Though the subjects reported that they experienced what was suggested, their nystagmus and falling reactions were physiologically incorrect; their pupils did not dilate upon suggestion that the light had been dimmed; and the subjects who did not know the laws of after-images did not see the correct hues. It seems likely from this result that only the verbal reports of the subjects were affected by the hypnosis, that the physiological states remained unaltered, and that the consciousness (AVAILABLE TO AWARENESS) dependent on them was also unaffected. The communications of the subjects probably did not correctly picture their conscious (AVAILABLE TO AWARENESS) experience.

In Chapter III (pp. 81-83) it was observed that the weakness of the introspective technique is that the private experiences of anyone are unassailable without his co-operation. This limitation is also the chief flaw in communicability as a criterion of consciousness. We shall always be hard put to it to discover of what subjects in situations like Dorcus's experiments are conscious (AWARE OF DISCRIMINATION).

THE DIFFERENCES BETWEEN COMMUNICABLE AND INCOMMUNICABLE BEHAVIOR

It is a salient, though often overlooked, fact of human psychology that behavior whose determinants are communicable is usually different from that which cannot be made public. A jovial, swaggering sailor is spending his day's shore-leave at Coney Island. He comes to a concession where he finds he can win a monkey made of one hundred per cent Angora wool. He must choose a number from one to ten and bet a dime on it. He gets the monkey if the roulette wheel turns up his number. The concessionaire has discovered that, owing to mechanical imperfections, the wheel practically never stops at the number six. Knowing that behavior can be determined by subliminal cues,[26] he has decided to apply this fact to his advantage. He has had a phonograph record made which whispers the word *six* just below the limen. The sailor chooses six, loses, and goes away thinking luck was against him.

Two observations on this incident can be made with a good deal of certainty: (*a*) If the number had been whispered supraliminally, the sailor would not have chosen it. (*b*) If several of the sailor's shipmates choose six, lose, compare notes, and become suspicious, they may return to the booth. Should they discover the phonograph, they will break up concession and concessionaire. When a person can report the stimuli that elicit his actions, his behavior is different from when he cannot report them.

If the phonograph whispers the word *six* below the limen of the sailor's auditory sense receptors, it can never affect his behavior. If it is loud enough to be above this limen but not loud enough for him to report it, he is likely to bet on the number six. If it is so loud that he can report it, his behavior will be different. Any stimulus which sends an impulse along the auditory nerve is potentially capable of affecting the behavior of the organism as a whole. There is, however, another limen—*the limen of consciousness* (COMMUNI-

[26] *Cf.* J. G. Miller, Discrimination without awareness, *Amer. J. Psychol.*, 52, 1939, 562-78.

CABLE)—separating levels of organization of the organism.[27] If the sound is loud enough to pass this latter limen, it passes to a level of the nervous system at which it is reportable. Then it is a matter of common observation that sailors, as well as all other persons, act differently. The law holds them responsible for what they do under such conditions, as was seen in Chapter XI (p. 265), and they themselves feel that they are acting consciously (ACTING VOLUNTARILY). Whether or not it is an illusion, it is a datum of social psychology that under these conditions people feel that their egos are involved and behave differently on that account. Behavior mediated by the central nervous system when neural vigilance is at this level is different from other sorts because of this social reference.

CONCLUSIONS

The use of the ability or inability to communicate in differentiating consciousness (AVAILABLE TO AWARENESS) from unconsciousness (UNAVAILABLE TO AWARENESS) is not an infallible criterion, and it is surprising that such diverse schools have put their faith in it; nevertheless it has practical value as the index of consciousness (AVAILABLE TO AWARENESS) most frequently employed. Its greatest limitation is that if a person does not wish to reveal what, if anything, he is experiencing, no one can force him to. Because in Western culture a person frequently has to explain why he acted as he did, and because he is often motivated by antisocial drives or by conditioning which he forgot or never knew about, rationalization often occurs, lessening the degree of correspondence between consciousness (AVAILABLE TO AWARENESS) and communication. There are also other difficulties with the criterion of communicability, arising chiefly from the imperfections of language. Despite all these faults, and despite special conditions like aphasia in which it breaks down, communicability is a useful index for distinguishing consciousness (AVAILABLE TO AWARENESS) from unconsciousness (UNAVAILABLE TO AWARENESS), and it has been the means for proving that behavior in these two states is different.

[27] *Cf.* W. S. Hunter, The problem of consciousness, *Psychol. Rev.*, 31, 1924, 14-6, on this general question.

Chapter XIII

INVENTORY OF UNCONSCIOUSNESS

Throughout the discussion in the preceding chapters it has been emphasized repeatedly that one may be unconscious in one sense while conscious in others. In taking inventory of the entire problem of unconsciousness, the specters of these apparent conflicts must insistently arise. Two possible solutions of these problems present themselves. One possibility is that each meaning represents a different criterion of a single phenomenon, none of which is entirely adequate, because none is an invariable concomitant of that phenomenon. One might, for instance, define a United States army officer as a man who wears a khaki uniform with insignia, or a man who graduated from West Point, or a man who knows secret American military plans, but, though each of these definitions would be satisfactory under many conditions, they all have exceptions, and so they would sometimes conflict. The second possibility is that each meaning of *conscious* refers to a different state or function of the organism, and naturally all these states need not be present at once. It is important to decide, if it can be done, which of these alternative explanations accounts for the numerous meanings of *conscious* and *unconscious.*

THE VIEW THAT CONSCIOUSNESS IS A SINGLE PHENOMENON

The independent variation of the several criteria of consciousness illustrated in previous chapters is by no means a disproof that they all refer to a single process or state. Biologists have found themselves in a similar situation in attempting to define protoplasm—living matter. The distinctive characteristics of protoplasm are metabolism, reproduction, excretion, and irritability. It is questionable, however, whether the tobacco mosaic virus can fulfill all these requirements, though it certainly can fulfill some. The existence of such borderline cases does not mean that the distinction

between living and dead matter is not significant and will not assist in predicting the activity of any specific portion of matter under consideration. It means simply that no single criterion of differentiation is always adequate. Likewise most, if not all, of the significances of *consciousness* may refer to aspects of an identical phenomenon, but all those aspects are not necessarily present at the same time.

Cough is a sign of tuberculosis, but a patient may be tubercular and still have no cough. The presence of tubercle bacilli giving rise to the pathognomonic tubercles in a person is tuberculosis. Viewing these is the ultimate and incontrovertible evidence of the disease, but often the tissue suspected of containing the tubercles cannot be made available for study without endangering the patient. The absolute proof is hidden in the "privacy" of the patient's body, and only indirect clues of its existence are available—cough, bacilli in the sputum, pathological X-rays of the lung, abnormal signs on percussion and auscultation of the chest, and so forth. Not all are present in every case; sometimes none may be observed, but the tubercles are nevertheless present.

To most nonbehaviorists AWARE OF DISCRIMINATION OR AVAILABLE TO AWARENESS is the fundamental meaning of *conscious*. Introspection gives the incontrovertible evidence of consciousness (AVAILABLE TO AWARENESS) or unconsciousness (UNAVAILABLE TO AWARENESS), but this evidence is concealed from the world in the "privacy" of the individual. There are outward criteria of conscious states, but they all are not always present. Sometimes none is observable.

From various introspective reports and one's own experience one may conclude that, subjectively, consciousness (AWARE OF DISCRIMINATION) can be likened to a meter which registers what is going on in certain parts of the organism. It is as if the processes occupying consciousness at any specific time, those processes, say, resulting from the red visual stimuli which lead to pressing the foot on the automobile's brake, were traveling through a main circuit. The meter is in a second-order circuit, tapping the main circuit and susceptible to changes in it. Other neural circuits are operating at the same time, but they are insulated from the meter circuit or are

not strong enough to affect it, and so they are not registered by it.

There are many who have pictured consciousness as a mysterious and useless accompaniment of certain activities, which does not go along with others. The analogy of the meter suggests this interpretation, but suppose that such a meter operates as a governor controlling the main circuit. That would be an entirely different situation. It was seen in Chapter XII (pp. 291-292) how something of this sort occurs. Unconscious (UNAVAILABLE TO AWARENESS and INCOMMUNICABLE) behavior is different from conscious. If the meter is able to record what is going on in the main circuit, the function of the main circuit is altered. This result occurs, for one reason, because the operation of consciousness, on account of the imposition by the social group of its code upon its members, is considered by each member to be integrally bound up with his own pride and reputation, his ego. Our social group holds us responsible for those of our actions of which we are conscious; for, whether or not one believes that there is voluntary action, it is a fact that our conscious actions are thought generally to be under our voluntary control. This belief, even if false, can modify our actions. Hartmann expressed this generally accepted principle as follows:[1] "I may be proud of the work of consciousness, as *my own* deed, the fruit of my own hard labour; the fruit of the Unconscious is as it were a gift of the gods, and man only its favoured messenger."

Our social conditioning is thus one factor making conscious behavior unlike unconscious, for, as soon as behavior becomes conscious, it is modified in order to avoid disapproval by society.

THE STRATIFICATION OF BEHAVIORAL ORGANIZATION

Like other meters, consciousness (AVAILABLE TO AWARENESS) is limited in what it can report. Stimulation too weak to pass the threshold of the conscious system will not affect it, just as small potentials will not swing the needle of a voltmeter. There may, moreover, be other independent, isolated centers or levels of neural

[1] E. v. Hartmann, *Philosophy of the Unconscious*, New York: Harcourt, Brace, 1931 (Vol. II, Chap. 11), 40.

organization in the organism which will not be registered, just as an ammeter records the flow in the circuit to which it is attached, but in no other.

Why some processes are incapable of passing the threshold of consciousness or can proceed independently of it is a further problem. A sensory stimulus may reach low levels of the nervous system and so affect behavior, but nevertheless be insufficiently intense to attain the conscious neural organization. Also, processes may be suppressed to subliminal strength or made part of independent neural systems after they have been conscious.

The chief fact to be learned from introspective distinctions between conscious (AVAILABLE TO AWARENESS) and unconscious (UNAVAILABLE TO AWARENESS) acts is that there is a hierarchy of levels of behavioral organization dependent upon a similar neural functional stratification. The organism may operate normally at the discriminatory level and still be unable to function at the verbal level. It may be attentive and yet be unable to remember.

There are functional strata of the nervous system. Such stratification is illustrated by the orderly disappearance of first one and then another function, reflex, or sensation as the concentration of a general anesthetic agent in the blood increases. First the ability to walk will disappear, then the ability to stand, then the ability to maintain the head in the upright position, and so on.

These strata operate as units, as a classical experiment with the pithed frog illustrates. An electrical stimulus applied to the muscles of one leg has to be of a certain strength before it has any effect at all. Above that magnitude, the impulse will make the leg move. If the strength is increased gradually, finally an intensity will be reached at which the opposite leg moves. With further increase suddenly the forelegs also will be activated, and finally the whole body. The intensity of stimulation may increase imperceptibly, but the reaction of the organism to it develops stepwise. Each level of the nervous system has its own threshold. In like manner, as was demonstrated in Chapter VI (pp. 151-158), there is a threshold of consciousness, and only when stimulation is strong enough to cross it

can behavior characteristic of consciousness (AVAILABLE TO AWARENESS and COMMUNICABLE) be elicited.

From time to time throughout the preceding chapters reference has been made to Head's descriptive conception of neural vigilance, a state of "high-grade physiological activity" which is accompanied by consciousness. All the evidence reviewed in Chapter IV (pp. 93-115) seemed, when analyzed, to show that consciousness is not mediated by any specific part of the nervous system. It is best to picture the greatest neural vigilance, which gives rise to consciousness (AVAILABLE TO AWARENESS), as migrating from place to place, being present in whatever region of the nervous system is at that time the location of the highest integration of the total behavior. (This integration must be pictured vaguely, because the facts which would be necessary to describe it more explicitly are not available.)

THE UTILITY PRINCIPLE AND THE PLEASURE PRINCIPLE

Often, as in fantasies or while dreaming, the highest degree of vigilance is not dealing with the motor activities of the body in response to stimulation from the environment. These actions are automatic, unattended, and all conscious (AVAILABLE TO AWARENESS) thoughts are far from them. Two principles have previously been considered upon which determination seems to be made of what processes are in the focus of consciousness, with what functions the greatest neural vigilance is related. These are the economic utility principle and the pleasure principle.

The first of these principles is that in general nothing more is in the center of consciousness than is necessary for the business at hand. It has been seen (pp. 165-172) that consciousness (ATTENDED) directed toward many sorts of activities improves their accomplishment, and that two cannot usually be done well together. Introspective reports indicate that consciousness wanders from the task in hand as soon as it has been repeated enough to involve no novelty. As long as the environment is understood and under control, as well as changeless, consciousness tends to shun monotony and turn from these things to others, often to pleasurable fantasies. Whenever a sudden change

in surroundings occurs, however, any intense, sudden stimulus or motion or contrast with the past, then the various kinds of startle or surprise behavior appear. There is a rapid flash-back to consciousness of the change, which may perhaps affect the individual's welfare. Everything extraneous is submerged in unconsciousness (UNAVAILABLE TO AWARENESS).

Forgetting and remembering, as well as attention, are regulated according to this utility principle, although the pleasure principle is also of importance. One would not be able to concentrate upon one particular present activity if he were at the same time conscious of everything in his memory. At any one time a large part of the available traces, therefore, is stored away out of direct contact with the highest neural organization. Yet these traces are not merely filed away, but, as has been often demonstrated (*cf.* Chapter IX, pp. 216-239), they are continually interacting, combining, being modified.

No one's memory of the past is complete, and a chief rule for what is retained and what forgotten is the utility principle. Other things being equal, those items are remembered best which are likely to be important in the future, and those items are forgotten in which there is no interest, for which it appears there will be no later demand. This utilitarian thrift of memory is not unlike the wisdom of the collector who keeps whatever postage stamps are likely to be valuable or interesting to him in the future and gets rid of the others.

The pleasure principle, which also is important in determining what shall be conscious (AVAILABLE TO AWARENESS) and what not, has been defended particularly by Freud. That what is painful is repressed into unconsciousness (UNREMEMBERED) is an integral part of his conceptual scheme, for repression is the mechanism by which he tries to explain most types of unconscious (PSYCHOANALYTIC MEANING) behavior. In the Freudian distinction between *unconscious* and *preconscious* may be seen the differences between the ways the pleasure principle and the utility principle operate. *Unconsciousness* (PSYCHOANALYTIC MEANING) is normally incommunicable, according to Freudian tenets, because recognizing what its

contents are would cause the individual to suffer super-ego anxiety. Repression occurs because these contents are related to the instinctual, inherited drives the free expression of which in Western society would lead to punishment painful to the individual. The contents of preconsciousness, on the other hand, can be easily recalled for they are not socially taboo, and hence are not repressed according to the pleasure principle, but are merely not attended to or are ignored because they are at the moment unimportant. This is a case of the operation of the utility principle.

Introspective report gives no justification for the distinction between preconsciousness and unconsciousness (PSYCHOANALYTIC MEANING), for both of them are beyond consciousness (AVAILABLE TO AWARENESS). The depth psychologists have, however, adduced convincing behavioral proof that the two states are different. They have shown that repressed contents continually break forth into a distorted expression in symbolic acts, slips of the tongue and pen, and so forth. Since there are no barriers restraining the contents of preconsciousness from expression in consciousness (AVAILABLE TO AWARENESS), they do not appear in such distorted expression. In many concrete situations it is difficult or impossible to determine whether it is according to the utility principle or according to the pleasure principle that the highest integration of neural organization is being regulated in order to bring into focus those aspects of the environment or those functions which are conscious (AVAILABLE TO AWARENESS) at the moment. Frequently examples of inattentiveness or forgetting, which could reasonably be explained by the utility principle, are contorted by complicated and imaginative argument, especially by depth psychologists, in order to show that the Oedipus situation or some other instance of the pleasure principle was really in operation. On the other hand, there are psychologists, especially academics, who prefer to strain every possible explanation by the utility principle before falling back upon the pleasure principle.

Of the two explanations as to why some behavior is unconscious (UNAVAILABLE TO AWARENESS), the pleasure principle can be regarded

as a special case of the utility principle. In general, pleasurable activities are useful to the organism and painful activities are harmful. Sweet things in nature are likely to be good food, and eating them is pleasant; bitter things in nature are often poisonous, and they are unpleasant, often eliciting vomiting that rids the body of them. There are good grounds for speculating as to whether the instincts of psychoanalytic theory, especially sex and aggression, whose satisfaction is pleasurable, are not likewise of great utility to the individual. Certainly the wish to evade the pain of punishment by other members of one's society has utility.

The first of the two suggested explanations for the many meanings of *conscious* and *unconscious*—that they are all criteria of a single phenomenon called "consciousness"—may be summarized as follows: From the point of view of subjective experience, there is only one sort of consciousness (AVAILABLE TO AWARENESS). This is characteristic of whatever process or processes are at the moment under the control of the level of the nervous system with the highest integration of neural vigilance. The principles of utility and pleasure determine what functions or parts of the environment will be conscious (AVAILABLE TO AWARENESS) at any time. All these conclusions are based upon facts derived primarily from introspective report, though to a degree corroborated objectively.

THE VIEW THAT EACH SENSE OF CONSCIOUS REFERS TO A FUNCTION

The alternative explanation of the many meanings of the words *conscious* and *unconscious* is that each sense refers to a different state or function of the organism, all of which are not necessarily present at once. For such a position introspective evidence is much less vital. It appears to an observer watching the behavior of another person that he acts differently when he is conscious (ATTENDING) from the way he acts when he is conscious (REMEMBERING or UNABLE TO COMMUNICATE, etc.). In fact it is difficult to tell by such observation what these various actions have in common that have caused them to be called *conscious.* They appear to be many sorts

of discrimination, and it is not obvious to unaided extraspection that consciousness (AVAILABLE TO AWARENESS) exists at all, much less that it accompanies some discriminations and not others. From outside the organism, then, the various types of conscious behavior seem independent, and there appears to be little reason for classifying them together.

In the cases of Chapter II the dissimilarities among the various sorts of conscious behavior are apparent. Surely the unconsciousness (PSYCHOANALYTIC MEANING) of the woman in Case XVII (pp. 70-73), who suspected her husband of infidelity but did not realize the character of her own desires, was greatly different from the unconsciousness (UNSENSED) of the man in Case VI (p. 52), who did not feel the fifth finger in the phantom hand that appeared after his hand was amputated. Certainly the unconsciousness (SUBLIMINAL STIMULI AFFECTING ORGANISM) of minute changes in the position of birds' wings, reported by Hankin in Case VII (p. 53), is entirely unlike the unconsciousness (UNATTENDED) of Ellen J. (Case VIII, p. 54) that she had drunk the tomato juice and taken the aspirin tablets. It is indeed a wide range of acts that have been classified as *unconscious behavior.*

In certain studies several of these dissimilar phenomena are interchangeably called *unconscious,* and often the convincing appearance of these researches depends upon this substitution of meanings in midstream. Messerschmidt's experimentation, considered in Chapter IX (pp. 228-229), for instance, suffered from such verbal capers, though it nevertheless was a suggestive study. Under hypnosis her subjects were instructed that, when they returned to the normal waking state, they were to do serial addition as rapidly as they could, beginning with a number which would be given them. Each was to write the totals of these additions with one of his hands, which was to be placed under a screen. Each was told that his "subconscious mind" was to direct his mathematical activity. Posthypnotic amnesia for the occurrences in the trance was suggested, and the subject was awakened. Thereupon, without further directions, he went and put his hand under the screen. Then he was

given a book and told to read it aloud as rapidly as possible. At the same time he was also given additions to do.

Messerschmidt found that the performance of the two tasks simultaneously, even though one was "conscious" and the other "unconscious," slowed down each activity and made it less accurate. She apparently subscribed to a systematic theory defining unconscious acts, but the reasons for her calling serial addition "unconscious" varied from time to time. Her first reason was that the addition was performed as a result of a suggestion to "the subconscious mind" while the subject was unconscious (HYPNOTIZED, UNRESPONSIVE TO STIMULATION). Second, the subjects were considered unconscious (UNREMEMBERING) because they had posthypnotic amnesia for the directions to perform the addition. Third, the mathematics was unconscious (UNATTENDED) because the subjects consciously paid attention to something else—reading aloud. Finally, the calculation was unconscious (INCOMMUNICABLE) because the subjects could not report that they had been doing addition, and they frequently were disturbed by the fact that their reading was halting. Messerschmidt skipped lightly from one of these criteria of unconsciousness to another, presumably believing that they are equivalent, and apparently not recognizing how often they can be at variance. Such easy assumptions will hamper any investigation unless it is first proved that under the circumstances studied the various sorts of unconsciousness are always covariable.

A DAY WITH DR. CRAIG

The great differences between the various meanings of *unconscious* and the frequency with which they are in conflict may be portrayed by spending a mythical day with a legendary interne in a general hospital, young Dr. Craig.

On arising early in the morning, Dr. Craig snatched a little breakfast and went to visit each of the patients in the ward which was his personal responsibility. One of the first patients that he saw said that overnight he had developed a "sort of pain" in his abdomen. He was unable to explain exactly what sort of pain it was, even

when Dr. Craig suggested various descriptions which he might use. Dr. Craig promised to see him again later. [This man was conscious (SENSING and ATTENDING) of his pain at the same time that he was unconscious (UNABLE TO COMMUNICATE) of its nature.] Several beds down the ward a man of thirty-five was speaking to his wife and ten-year-old son before going to the operating room for an operation on a brain tumor. Both he and his wife understood the extreme seriousness of the situation, but as Dr. Craig passed by them to the next bed he noted that they gave no hint of their knowledge to their son, but talked in banalities until time for them to part. [These parents were conscious (INSIGHTFUL) of the father's condition, but, so far as their son was concerned, they were unconscious (UNABLE TO COMMUNICATE) of it.] Dr. Craig sat down for a moment beside the bed of an aged invalid who had been on his back for more than a year, and who was almost blind in both eyes, because of developing cataracts, as well as being nearly deaf. He did not recognize people, but he enjoyed telling anyone who would sit with him about his youth on the farm. [He was conscious (REMEMBERING) but at the same time unconscious (UNDISCRIMINATING and nearly UNSENSING).]

Because one of his patients, the thirty-five-year-old father, was to be operated on that morning, Dr. Craig next went to the room where the operation was to take place. A nurse was counting out three dozen hemostats, preparing the instruments for autoclaving, and when Dr. Craig spoke to her she did not reply for half a minute. Then she said, "Did you speak to me?" [She was conscious (AWAKE, RESPONSIVE TO STIMULATION, as well as ACTING VOLUNTARILY) but unconscious (UNATTENDING) of his remark.] Passing a little later into an adjoining operating room, Dr. Craig found another brain operation in progress. The patient's cortex had been exposed under local anesthesia, and the patient was able to talk to his nurse and doctors. The surgeon electrically stimulated various parts of the cortex much as Penfield did (*cf.* pp. 66-67), and different groups of the patient's muscles moved. The patient reported that he felt the stimulation and the movements. [He was conscious (NOT ANESTHE-

TIZED, RESPONSIVE TO STIMULATION, as well as ABLE TO COMMUNICATE and AWARE OF DISCRIMINATION) at the same time that he was unconscious (ACTING INVOLUNTARILY).] In a third operating room a patient under deep ether anesthesia was being prepared for operation. An orderly touched the patient's leg, and it moved markedly in response. [The patient therefore was conscious (DISCRIMINATING) although he was also unconscious (ANESTHETIZED, UNRESPONSIVE TO STIMULATION, and probably UNSENSING, STIMULI NOT REACHING THE CORTEX OR THE "SEAT OF AWARENESS" OF THE NERVOUS SYSTEM).]

As Dr. Craig left the operating floor he went out through the recovery room. Here a nurse told him that a patient who had come from an operation while apparently still under anesthesia, or certainly asleep, had remembered being wheeled from the operating room. [The patient had been conscious (REMEMBERING) while he was still unconscious (ANESTHETIZED OR ASLEEP, UNRESPONSIVE TO STIMULATION).]

There were a few minutes left before time for grand rounds to begin, and Dr. Craig went to the laboratory to make a count of a patient's red blood cells. Another doctor was in the room, and he began to talk with him about a patient in whom he was much interested, while counting the cells under his microscope. Engrossed in his conversation, he forgot all about the blood counting until he looked down at the paper beside the microscope and found the totals for four chambers written there in his own handwriting. [While doing this counting he had been conscious (AWAKE, RESPONSIVE TO STIMULATION, and DISCRIMINATING) but also unconscious (UNATTENDING and UNAWARE OF DISCRIMINATION).]

About this time grand rounds began, and Dr. Craig joined the group of other doctors and nurses to go around the wards with the physician-in-chief, seeing interesting patients. The physician-in-chief in a half hour had finished discussing the second case of the morning, and he moved on to the next patient, talking as he walked. He had left his stethoscope on the bed of the patient he had just seen, and several of the onlookers obviously noticed this occurrence, but they did not think it wise to mention it because of the impropriety

of interrupting the speaker in the formal discussion. [The onlookers were conscious (AWAKE, RESPONSIVE TO STIMULATION, and SENSING) of the physician-in-chief's memory lapse but also they were unconscious (UNABLE TO COMMUNICATE) of it.]

Dr. Craig was interested in an episode that occurred somewhat later. One of the senior physicians, who had not been with the group on rounds, came into the ward, and the physician-in-chief for his benefit gave a short *résumé* of the history of the patient under consideration. He then asked the newly arrived doctor what diagnosis he would make. He replied that he thought the patient had an aleukemic leukemia, but when asked for his reasons he had to consider some time before he could begin to give them; and after he had done so, he added that an important factor in his decision was his "general impression" of the patient. The patient's subsequent course confirmed his diagnosis. [In making his diagnosis the physician had been conscious (DISCRIMINATING, ABLE TO COMMUNICATE, and AWARE OF DISCRIMINATION) but he had been unconscious (INSIGHTLESS) of his discrimination and reasoning (*cf.* p. 185).] The physician-in-chief later in the morning spent more than half an hour discussing the case of a patient with a high fever. After the group finally passed on, the patient summoned Dr. Craig, who was among the last to leave, and asked him to give her a drink of water. She said that she had been very thirsty all during the consideration of her illness, but had not dared to ask for a drink. [She was conscious (RECOGNIZING) of her need for water but unconscious (UNABLE TO COMMUNICATE) of it at the time.]

It was now time for lunch, and Dr. Craig went to the internes' dining hall. While waiting for the soup course to be served, he began day-dreaming about his vacation in his family's summer home. When the soup arrived, he commenced eating automatically, and he was so wrapped in his thoughts that a friend sitting next to him had to address him twice before he answered. [He was conscious (REMEMBERING and SENSING) but unconscious (DAY-DREAMING, UNRESPONSIVE TO STIMULATION, and UNATTENDING).] This friend told him of a difficult problem that had arisen in his ward that morning.

He had been ordered by the physician-in-chief to arrange to send a patient to a tuberculosis sanitarium, but he was not to tell him that he had tuberculosis until the family had been informed. The patient heard from a nurse that he was to be sent to another hospital, and demanded most insistently from the interne what was wrong with him that he had to be sent away. Because of his orders, the interne could not tell him of the application he had made to the sanitarium. [The interne was conscious (ACTING VOLUNTARILY) in making the application for transfer, but also he was unconscious (UNABLE TO COMMUNICATE) of it.]

Since it was Saturday, Dr. Craig had no responsibilities in his ward that afternoon, but had to remain on call somewhere in the hospital. He decided, therefore, to visit various other parts of the hospital to see the patients. As he was hurrying through the halls toward the neurological ward, he passed quite a number of men and women coming into the hospital, for it was the beginning of visiting hours. Suddenly he heard a woman call out, "Doctor," and turned to see her walking toward him. The woman gave him a slip of paper and said, "I think this is yours." He recognized it as the piece of paper with the totals for the red cell count which he had made earlier in the day. He asked her where she had got it, and she said, "I just passed you and saw it fall out of your pocket." He thanked her and passed on, thinking to himself that he had not remembered her face, although he had looked at everyone who passed him. [He had been conscious (SENSING) but unconscious (UNREMEMBERING).]

The neurological ward had several patients who interested Dr. Craig that afternoon. One was a prize fighter who had come into the hospital after being knocked out in a fight. He recovered, acted sensibly, and appeared to be oriented adequately to the environment. He could not, however, remember events of the period since his knock-out, or even what happened five minutes before (*cf.* pp. 127-128). [He was conscious (DISCRIMINATING), but from another point of view he was unconscious (UNREMEMBERING).] There was an aphasic on the ward who appeared to understand simple directions,

but was unable to speak in an intelligible manner (*cf.* pp. 68-69). [He was therefore conscious (DISCRIMINATING, SENSING, ATTENDING, REMEMBERING, and ACTING VOLUNTARILY) but also unconscious (UNABLE TO COMMUNICATE).] Another neurological patient was a boy who was subject to epileptic seizures in which he showed uncontrollable muscular movements and spasm, but who afterward said he knew everything that was going on during the attack. [In such a seizure he was conscious (SENSING) as well as unconscious (ACTING INVOLUNTARILY).] The next patient Dr. Craig saw on the neurological service was a spastic paralytic who had great difficulty in walking or in moving his hands because he was unable to coordinate these movements, and often his arms or legs would move in unexpected directions. He understood that these acts resulted from a neural lesion, and was doing the best he could to control them. [This patient was thus at the same time conscious (AWAKE, RESPONSIVE TO STIMULATION, as well as ATTENDING and INSIGHTFUL) and unconscious (ACTING INVOLUNTARILY).]

As he left the neurological ward for the psychiatric, Dr. Craig noticed an exceedingly near-sighted woman having her vision tested with a letter-chart. She could not see even the largest letter, and the surprised examiner asked if she had not learned her alphabet. She replied with some vehemence that she had, but simply could not see the letters. [She was conscious (ATTENDING and ABLE TO COMMUNICATE) but unconscious (UNDISCRIMINATING and UNSENSING, SUBLIMINAL STIMULI AFFECTING ORGANISM).] In the psychiatric ward Dr. Craig saw, but was unable to set up a conversation with, a catatonic schizophrenic who sat all day without moving and had to be fed forcibly. Despite the apathy of this man at the time, Dr. Craig knew that weeks or months later, when he came out of the state, he would probably say that he had known everything that was going on and would be able to remember much of it. [He was, therefore, conscious (REMEMBERING) although he was unconscious (UNRESPONSIVE TO STIMULATION).]

From the neurological ward Dr. Craig went to the out-patient department, which was having a busy afternoon. The police brought

in a man who had just lost his job and was so much affected by that unexpected turn of affairs that he dazedly crossed the street at a busy intersection without taking due care and was brushed by an automobile. [While crossing the street he had been conscious (AWAKE, RESPONSIVE TO STIMULATION) but unconscious (UNDISCRIMINATING).] An unmarried woman in her late fifties came up to Dr. Craig in the hall and said that since she had been made to wait over an hour she was going to force him to listen to her troubles. She said she had a left earache that woke her up at night, low back pain, twinges in her right leg, and "indigestion something awful." She wanted some medicine to cure all her illnesses. Dr. Craig thought to himself that probably nothing short of marriage would solve her problems, for it was obvious to him that she had no understanding of what her real needs and desires were. Since he could scarcely prescribe the only adequate therapy, he referred her to the gastrointestinal clinic. [This woman was conscious (AWAKE, RESPONSIVE TO STIMULATION, and most certainly ABLE TO COMMUNICATE) but for all that she was unconscious (UNRECOGNIZING) of her needs.]

Another out-patient came to the hospital with a third-degree burn on one finger which resulted from her touching the side of a hot oven. She said, in describing the accident, that her hand had jerked the whole way out of the oven before she felt any pain. [For an instant she was conscious (DISCRIMINATING) but also unconscious (ACTING INVOLUNTARILY and UNAWARE OF DISCRIMINATION).] In the room where this woman's finger was being dressed, Dr. Craig overheard an interne explaining to a not-too-intelligent patient how to prepare a poultice. She listened carefully, but was unable to repeat the directions. [While the interne had been talking to her she had been conscious (ATTENDING) but unconscious (UNREMEMBERING).] About this time a taxicab brought to the hospital a man who was breathing heavily, and who said that he felt so dizzy he could not tell one thing from another, and therefore had not dared to drive himself to the hospital. [He was conscious (SENSING, ACTING VOLUNTARILY, and ABLE TO COMMUNICATE) but unconscious (UNDISCRIMINATING).]

A patient appeared with a fractured tibia to be set. He said that the back steps of his house had been taken away to be rebuilt, and he had temporarily forgotten about this fact. He stepped out of the door and fell to the ground, breaking his leg. [When he stepped out he was conscious (ACTING VOLUNTARILY) although he was also unconscious (UNREMEMBERING).] As Dr. Craig was watching the preparations for setting the leg, an interne came to him and asked if he would be willing to take care of two patients whom he did not have time to see. Dr. Craig agreed, and found the first one to be a 260-pound woman on an obesity diet. She assured him that she paid no attention to butter on the table and tried not to think of fatty foods, but that she always knew that nothing would make her happier than pork chops and French-fried potatoes. [She was conscious (RECOGNIZING and ABLE TO COMMUNICATE) of her desires but at the same time unconscious (IGNORING) of them.] Dr. Craig commended her fortitude and gave her an appointment to return in a month. The second patient was a boy of thirteen who said he had a "stomach ache." He had eaten some chocolate cookies, and Dr. Craig could find no abnormality on physical examination. He did not feel that the boy acted as if he were well, however, although he did not know why he thought so. He admitted the boy to the hospital and sent him to the children's ward, although he had often refused to admit other children with exactly the same story. [In this decision he was conscious (ACTING VOLUNTARILY) but also unconscious (INSIGHTLESS and UNABLE TO COMMUNICATE).]

Dr. Craig wished to go to the children's ward to see about the boy he had just admitted, so he left the out-patient department. On his way out he met a social worker who was going the same way, and so walked along with her. She said that she had just been talking to a patient with a long police record, but that she made no mention of the record to the patient, and moreover did the best she could to put it out of her mind. As a result she felt that she had developed a much better mutual understanding between herself and the patient than she would have otherwise. [She had been conscious (AWARE OF DISCRIMINATION) of the police record but unconscious

(UNATTENDING) of it.] The two of them then passed a blind orderly walking down the hall. Dr. Craig remarked that he was able to find his way about the hospital exceptionally well considering that he could not see. The social worker was astonished to learn that he was blind, for she had never realized it. [The orderly was conscious (AWAKE, RESPONSIVE TO STIMULATION, and REMEMBERING) but unconscious (UNSENSING, SENSORY TRACT INCAPABLE OF CONVEYING STIMULI).] They then came to the children's ward, and Dr. Craig noticed the clock over the door as he entered. Suddenly it shot through his mind that he had made an appointment with another interne for an hour before, and had completely forgotten it. Then, however, it was too late to do anything about it except call and make his apologies. [All afternoon he had been conscious (AWAKE, RESPONSIVE TO STIMULATION) and at the same time unconscious (UNREMEMBERING) of the appointment.]

In the children's ward his thirteen-year-old boy was in bed happily working on a jig-saw puzzle. Dr. Craig explained to his mother, who was sitting beside the bed, that there was probably nothing at all seriously wrong with the boy, but that he ought to be observed overnight. The boy was too much interested in his puzzle by this time to pay any attention to what the doctor was saying. [He was conscious (AWAKE, RESPONSIVE TO STIMULATION, and ACTING VOLUNTARILY) but unconscious (UNATTENDING) of the conversation.] In another part of the ward Dr. Craig met the mother of a child who had just had infantile paralysis, but was to go home that afternoon. A nurse was telling her that she would have to bring her child back to the orthopedic clinic regularly so that she could be taught how to walk properly with the muscles that were still functioning. The mother did not believe that returning was necessary, for she thought she could teach her child to walk. To prove to the mother that she could not, Dr. Craig asked her to point to the muscle she used to move her knee, but she was unable to do it. [She had, therefore, for many years been conscious (AWAKE, RESPONSIVE TO STIMULATION, and ACTING VOLUNTARILY) although she had always

been unconscious (INSIGHTLESS) of how she performed the everyday act of walking.]

Dr. Craig then went to the maternity ward. In the incubator room he saw a premature baby nursing from a bottle, and noticed that he began to make sucking movements as soon as the nurse touched his cheek with the nipple. [The baby was conscious (AWAKE, RESPONSIVE TO STIMULATION, as well as DISCRIMINATING and SENSING) but unconscious (ACTING INSTINCTIVELY).] In the ward Dr. Craig spoke to a young mother whom he had seen in the labor room the day before, apparently suffering from pain and complaining of it. She had been given scopolamine. She said now that she had had no pain and remembered nothing of the affair (*cf.* p. 210). [She had been conscious (DISCRIMINATING) but also unconscious (perhaps UNAWARE OF DISCRIMINATION but more likely UNREMEMBERING).] By now it was time for dinner, and Dr. Craig went to the dining room.

In the evening it was his duty to visit each patient in his own ward. One of the first patients he saw admitted to Dr. Craig that, in the afternoon when she saw the nurse coming to give her medicine, she pretended to be asleep, because she did not like the taste of the medicine, and the doctor had directed the nurse not to wake her to give it to her. [When the nurse came with the medicine, according to her story, this patient was conscious (AWAKE and SENSING) but also unconscious (UNRESPONSIVE TO STIMULATION).] Dr. Craig arranged to have the medicine given intravenously. A woman in a near-by bed was sitting up and reading a novel. Dr. Craig noticed while speaking to her that she had put cotton in her ears in order not to hear the sounds of the ward. [She was conscious (ATTENDNG and ACTING VOLUNTARILY) but unconscious (UNSENSING, SUBLIMINAL STIMULI AFFECTING ORGANISM).]

As soon as he had seen all the patients, the nurses turned out the lights in the ward. Dr. Craig wrote some orders for the care of certain patients, and while doing it made a slip of the pen. One of the patients that morning, angry at not being allowed to go home, had told him that he was a "poor doctor." As he was writing on her record, "This woman must get a good night's rest, even if she

has to be given a private room," he made a mistake and wrote, "This woman must get a poor night's rest." [As he wrote this he was conscious (AWAKE, RESPONSIVE TO STIMULATION, and ACTING VOLUNTARILY) but also unconscious (PSYCHOANALYTIC MEANING).]

As he was writing out orders, a student nurse came to him and said that she had forgotten to take the temperatures of the patients until forty-five minutes too late. She asked him not to tell anyone, and he agreed. Later it happened that the head nurse asked him if he knew when the temperatures had been taken, and he replied that he did not pay attention to such trivial things. [In giving this answer he was conscious (REMEMBERING) as well as unconscious (UNABLE TO COMMUNICATE) of what the head nurse wanted to know.] The head nurse said that half a dozen times while she was sitting at her desk recording temperatures and pulse rates, the call bell of one patient had rung. She thought that, since the patient was not very ill, it would be best to refuse to answer it any more. Dr. Craig agreed, and for the rest of the night the bell rang unheeded. [The nurse was conscious (AWAKE, RESPONSIVE TO STIMULATION, as well as SENSING, ACTING VOLUNTARILY, and AWARE OF DISCRIMINATION) but unconscious (IGNORING).]

Dr. Craig looked around the ward once more before going to bed, and he found that one of the patients was talking distinctly in his sleep. Only with difficulty was he awakened, so that he would stop and not disturb others. [This patient was conscious (ABLE TO COMMUNICATE) but unconscious (ASLEEP, UNRESPONSIVE TO STIMULATION).] After this Dr. Craig went to his room and to bed. As always, the amplifier of the call system was turned on. He would sleep soundly, however, awakening only if his name were called. [Thus he spent the night, conscious (DISCRIMINATING) but unconscious (ASLEEP, UNRESPONSIVE TO STIMULATION).]

CONCLUSION

The fable of Dr. Craig illustrates a few of the many conflicts that exist between the meanings of *conscious* and *unconscious*. Be-

haviorally each sort of consciousness seems to be a separate phenomenon, a separate kind of function of the individual. Introspectively, however, most observers agree that all the kinds have in common the characteristic of awareness.

The solution to this whole problem is certainly not to be found by tying either hand behind one's back, by neglecting either objective or subjective observation. It is becoming increasingly apparent that often behavior which is accompanied by subjective awareness of discrimination differs observably from behavior which is not. On the other hand, it is obvious that processes accompanied by this subjective awareness are so diverse that there is little reason for considering them to be a peculiar and separate class of phenomena. In the future psychological science must study each process as an individual function determined by intra- and extraorganismic factors, possibly having among its other characteristics such a neural organization that it is accompanied by a subjective awareness of discrimination. This awareness or its absence is frequently an important aspect of behavior, but it is only one aspect, and as such it deserves exactly the same kind of study as do all the others.

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