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EDITORS
GEORGE P. ADAMS
J. LOEWENBERG
STEPHEN C. PEPPER

REASON

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THE APPEAL TO REASON

BY

WILLIAM R. DENNES

THE APPEAL TO REASON

WILLIAM R. DENNES

THE AGE in which we live has seen advances in nearly every field of science. Yet it is an age in which devices of propaganda are being used more brazenly and more effectively than ever before to shape men's opinions and the patterns of their conduct, and often with little respect for the findings of science. When propagandist activities appear to be diminishing men's knowledge, destroying their respect for truth, and imperiling other human values, it is customary (at least in democratic societies where a considerable freedom of inquiry and discussion prevails) to appeal to reason for vindication of the threatened values.

The validity of such appeals to reason is challenged today from many influential quarters. We are told, for example, that when men go through the motions called "appealing to reason" it is generally because they have no relevant or sufficient reasons to offer for their convictions, just as men commonly "appeal to experience" in support of their views when they are stumped for relevant empirical evidence. An appeal to reason, we are warned, is a good indication that he who makes it is himself passing from reasoning to what is better called rhetoric or "propaganda" or even incantation. When we appeal to reason, critics tell us, we are generally "rationalizing" our interests and appetites, our habits and prejudices; we are, indeed, pretty likely to be treating the term "reasonable" as if it were an implicate (if not actually a synonym) of the adjectives "mine" and "ours," or of whatever is the object of the phrase "I want."

Such criticisms are familiar. They have been made in most historical epochs, though never more forcefully than today. There is unquestionably a great deal in them. Some try to drive them home by arguing that the use of discourse to influence men's behavior, rather than to express, report, or communicate anything, is our inescapable predicament. Whatever we think, say, or do will only

be a variation that leaves the status of our activity, as a reshaping of the behavior of ourselves and others, still the same. Therefore, they conclude, although we ought to condemn as deceptions theories that pretend to offer escape from this predicament, we cannot condemn the predicament itself, since we have no alternative but silence, unconsciousness,—or death.

It is very easy to point out that if such statements as these last are not themselves true or probable descriptions, but are only one sort of influential rhetoric, then those who make them can claim no superiority for them over other sorts of influential rhetoric, including those which, naïvely taken, contradict them. It is also easy to point out that the reduction of thought, statement, and perhaps of everything else to practical operations is a senseless contradiction unless all the distinctions ostensibly annulled are actually reintroduced within what are called practical operations. If they are so reintroduced, the "reduction" of thought and discourse to practical operations is not a theory, but only an example of the unusually vague and comprehensive use of words like "practical operation." Many of us call twenty-four hours a day, but we do not thereby alter or cancel any one of the differences between the stretches of events within the twenty-four hours which others may distinguish as day and night.

It is also easy to point out that those who argue these issues either do or do not make distinctions of meaning between the various terms they employ; and further, that if they differ in their opinions about the relations which hold between what is meant by such terms, then they do, or do not, support these different opinions by evidence. We find, as a matter of fact, that most of the influential critics of appeals to reason have made very careful use, as evidence, of psychological and historical findings. Now the making and examining of distinctions of meaning, the making of inferences from evidence, and the examination of methods of securing evidence and of making inferences from it—all these procedures (upon which serious critics of appeals to reason as mere rationalizations themselves rely) are excellent examples of what most scientists and a good many philosophers have practiced and defended under the name of reason. We might therefore conclude that all criticism of reasoning either justifies reason by carrying it on more

effectively than has otherwise been done, or, at the very least, presupposes it and employs it as its own method.

But dialectical triumphs and countertriumphs of this sort may be piled up *ad libitum;* for a critic, such as Professor H. D. Lasswell, can always answer that casting one's discourse in logically defined terms and as report of, and inference from, evidence simply happens nowadays in democratic countries to be the effective propaganda technique to use on learned and semilearned audiences, and also on all unlearned persons who, because they admire and enjoy the radio, the automobile, and the aeroplane, are so conditioned as to be favorably impressed by jargon that sounds to them scientific. In other, perhaps more gracious, civilizations, and even for exceptional groups within our own, another terminology would carry more prestige. The smart man would then employ that other terminology, and every bit as sincerely as we employ our sacred scientific symbols and exploit the folkways associated with them.

In earlier papers I have tried to deal with this predicament, and have argued that we can, and in certain situations should, distinguish differences between: (*a*) various sorts of definitions; (*b*) acts of believing and asserting; (*c*) what we believe or assert, that is, the facts whose occurrence or nonoccurrence makes the beliefs and assertions true or false; (*d*) the factors that constitute knowledge of the truth, falsity, or probability of beliefs; (*e*) the structure or logic of the media of assertion; and finally (*f*), the causes, the motives, and the effects which acts of believing and asserting may have. Nothing in human history is plainer than that the last-named factor (the causes, motives, and effects of beliefs and assertions) varies with extremely little dependence upon the truth, or the evidence for the truth, of those beliefs and assertions. One could cite endless examples. But it is enough to remind ourselves that those who deny that there ever was truth, or evidence for belief, in the legends about Prometheus, or in the Old Testament accounts of the Creation and of miracles, cannot therefore deny, and do not deny, that those beliefs and assertions about Prometheus' exploits, the Creation by Jehovah, and the miracles performed by Moses and others, have had—and still do have—tremendous effects (some probably bad, some perhaps good) upon human tastes and human conduct.

If we do make the distinctions just outlined, we have on our hands several different inquiries, all of which have been considered to be philosophical or scientific or both. There are problems of symbolism—of the structures of languages, particularly of mathematics and logistics. These problems have been dealt with by mathematicians and logicians—whether or not called philosophical mathematicians and logicians depends on the definition of the adjective, which all have coveted when it has been fashionable, and shunned when (as to some degree at present) it has been opprobrious. In contrast with the mathematicians and logicians (although employing mathematical language where convenient, but not as if logic or mathematics established, or in any way contributed to the establishment of, hypotheses about matters of fact), the natural and historical scientists have been mainly occupied with two tasks: (1) discovering, by increasingly ingenious and elaborately controlled experiments and searches of documents, what evidence there is for and against the beliefs about the physical world and the course of human history, held at a given time by "plain men" and by fellow scientists; and (2) trying to develop more adequate beliefs (not before entertained, perhaps), and checking these by further experiment, observation, and research.

What, besides logic and natural and historical science (including, of course, as history nearly always has, the study of human tastes and attitudes and thought and arts, as well as institutions)—what, besides such logic and science, is there for philosophy to do? Well, among other problems, the like of which Aristotle said he knew not who but philosophers would study, there are these: (*a*) Can scientific procedure justify itself? Or does scientific method require justification by reference to norms of reason, or by activities called philosophical reasoning, that are distinct from the procedures of science? Or is it unreasonable to ask whether present scientific methods are valid or desirable? (*b*) Is there an interplay between logic, on the one hand, and facts, and scientific and historical hypotheses about facts, on the other, on the basis of which reason can determine some of the limits of, and some of the traits universally necessary to, facts or scientific hypotheses about them? (*c*) If the justification of scientific procedure should turn out to be moral, then can either logic or scientific procedure itself deter-

mine what is good, what bad, what practices are right, which wrong? Or is this a task for a kind of reasoning which, whether you call it philosophical or not, is something more than (while of course it does not violate) either science or logic or both?

Besides their central rôle in philosophical tradition, these problems are at the present time (as Dewey might say) pressing problems of men. For, in societies roughly described as liberal (whether intellectually, politically, or in both these respects), appeals are continually made to reason as establishing, or as capable of establishing, the superiority, the greater reasonableness, of political principles and measures which are based upon disinterested scientific findings and hypotheses, *and which are themselves scientifically experimental,* as against political principles and measures (which *we* call irrational) based upon such scientifically unsupported opinions (*we* call them superstitions) as those that truth is national (or even racial) insight, or that war (in itself and in its consequences) is the supreme agency of moral and physiological improvement. Benito Mussolini has written, not in a political address, but in his article on "Fascismo," section "Dottrina Politica e Sociale," in the *Enciclopedia Italiana,* that Fascism "believes neither in the possibility nor in the benefits of perpetual peace." "War alone brings up to the highest tension all the energies of man and puts the seal of nobility upon the peoples who have the strength to face it.... Fascism carries this antipacifistic spirit also into the life of the individual."[1] Marshal De Bono, in a recent book on the conquest of Ethiopia, which begins with an approving introduction by Mussolini, writes: "A dangerous lot they are and always will be, those who reckon in terms of 'the good of the country' (sic), who know nothing of the joy of risk! Better a thousand times those who throw themselves headlong, even with their eyes shut. I, if I may boast, belong in spite of my years to this second

[1] *Enciclopedia Italiana,* XIV:849. The original passage: "Anzitutto il fascismo, per quanto riguarda, in generale, l'avvenire e lo sviluppo dell'umanità, e a parte ogni considerazione di politica attuale, non crede alla possibilità né all'utilità della pace perpetua. Respinge quindi il pacifismo che nasconde una rinuncia alla lotta e una viltà—di fronte al sacrificio. Solo la guerra porta al massimo di tensione tutte le energie umane e imprime un sigillo di nobiltà ai popoli che hanno la virtù di affrontarla. Tutte le altre prove sono dei sostituti, che non pongono mai l'uomo di fronto a sé stesso, nell'alternativa della vita e della morte.... Questo spirito antipacifista, il fascismo lo trasporta anche nella vita degl'individui."

category. And woe to me if I had not in the present case—the Duce would have kicked me out, and he would have been right."[2]

In liberalistic circles men appeal to reason in their attempts to establish the superiority of experimental policies formulated in the light of objective science, over against such attitudes as these quotations express, and the policies that go with them. But the critics of liberalism believe they can cut under all such appeals by challenging scientific procedure and scientific hypotheses themselves. Thereupon the defenders of scientific procedure usually appeal to reason to vindicate it. Now since what we call rational moral and political attitudes, and rational theoretical procedures, are precious to many of us, it is important to make out just what we are doing when we thus appeal to reason in their justification. Are we thus choosing a reasonable way—or the likeliest practicable way—of understanding, advancing, and defending what we prize?

These questions cannot be dealt with in the large, for until we have made out just what a man is appealing to under the name "reason" we cannot begin to investigate the relevance or the results of the appeal. It is a commonplace of history that some men have meant by "reason" the order found or inferred in nature, or that intelligible order (as if that order could be some *particular* order that excluded any others as unintelligible!) that may be made out as mathematical or logical. Again, men have meant by "reason" such animal activities (to speak as Aristotelians), such reasonings, as (1) the construction and verification of theories about the large-scale pattern of distribution in existence of the traits and relations that are empirically found in comparatively small areas of existence; such reasonings as (2) the development (not of mathematical orders, but) of theories of mathematical order; and such reasonings as (3) the analysis and criticism of the devices by which we symbolize the orders which we suppose to hold in nature, and also these supposings of ours themselves. Again, men have meant (or have said that they meant) by "reason" something very different

[2] Emilio De Bono, *La Preparazione e le Prime Operazioni* (quarta edizione, Roma, 1937), XV:13: "Che gente pericolosa sono e saranno sempre questi calcolatori 'per il bene del Paese' (sic) che non sentono la gioia del rischio! Meglio mille volte coloro che ci si buttano a capo fitto e magari ad occhi chiusi. Io, mi si permetta il vanto, non ostante i miei anni, appartengo a questa seconda categoria. E guai se non fosse stato così nel fatto stante; il Capo mi avrebbe spedito altrove a pedate ed avrebbe avuto ben ragione."

from either configurations in existence, or symbolic structures, or the animal activities of exploring and supposing the first and developing the second—namely, the faculty or power or transcendental substance, agent, or unity-of-apperception which is said either to ground, to control, to make possible, or actually to perform the exploring, the supposing, the constructing, but is not itself this performance, or at least is not merely such performance. Again, some men have said they meant by reason, or by reasoning, the activity of criticizing material supposals by "applying the results of logical analysis"; and still further, the determination, logically independent of tastes and feelings, of what is intrinsically excellent and what actions and attitudes are properly incumbent upon us as men. And sometimes "reason" has been used as a name for *all* satisfactory human living, as in certain passages in Aristotle and Spinoza, and in familiar phrases of Santayana's.

Of all these notions of reason, let us examine those according to which reason is said (*a*) to determine the truth of opinions about existents, or (*b*) to determine the structure and the validity of scientific methods for establishing truths about existents, or (*c*) to determine the nature of excellence, of good and of evil.

If we take reason to determine the truth or falsity of opinions about existents, and to determine these by the methods of observation, hypothesis, experiment, and further observation—in other words, if we mean by reason what is ordinarily meant by scientific study (as Descartes, Leibniz, and Spinoza often did, and Hume also),—then no philosophical problems rise until we ask questions about the validity and the fruitfulness of such scientific methods.

When we do ask such questions, we are likely to think at once of Plato and of Aristotle, for Plato's doctrine of reason as establishing truth superior to opinions based upon perception, and Aristotle's doctrine of reason as formal but creative, have influenced all subsequent Occidental thought and speech on these subjects. I may here summarize, for whatever they may be worth, the results of a study of those doctrines, although space is lacking to offer here the supporting texts and arguments.

(1) Plato sometimes uses ὁ λόγος to mean the structure of nature, or of the Forms which are its reality. He conceives that structure as in no way influenced or determined by occurrent reasoning

or theoretical activity. Mathematical theorems are, for Plato, true, and are examplars of valid knowledge, not because we have rationally demonstrated them, but because they state the actual structure of mathematical objects. Even dialectic is described by Plato, not as establishing the validity of the final insight into the Good, but as a method (for most educated men the best method) of discovering the most important Form, or character of the Forms. The validity of any opinion or of any theory, from the humblest to the most sublime, is only determined by reason in the sense that reason (when conceived as the structure of nature) is what the theory aims to represent. A theory is true if it represents that structure as it is. "To conceive things as they are is to possess the truth."[3]

(2) In Aristotle's account of reason as active form, about a third of the passages mean by "reason," not pure form, but substantial processes (which, like all substances, realize form), namely, the ongoing human activities of cognition, which have a material factor in them. So far as reason is conceived (in another third of the passages) as pure form, it is described as creating life and thought, but in the sense in which universals generally create or cause, namely, that without form these (like all other functioning substances) could not exist—would be just nothing at all; and without the specific forms of human functioning they would not be human life and thought. Pure form is also, for Aristotle, a factor in generation whenever (and he thought this was always the case) a substantial, and therefore not purely formal, agent develops or operates with a formal purpose. But the activity is then strictly an activity of the operating substance, and can only by the very loosest synecdoche be called an activity of the pure form towards which the activity may address itself as its end. Only of God does Aristotle perfectly explicitly and almost perfectly consistently teach that form, as pure form, is activity. But unfortunately, Aristotle has not distinguished the activity of God from the mere self-identity which *any* form or character, indeed any entity whatever, enjoys. In almost a third of the passages on the activity of νοῦς, Aristotle seems to be claiming to eat his cake and have it too—to distinguish form from process, and yet to identify the two. These passages have fascinated later thinkers of various schools who

[3] *Republic,* 413 A.

have felt in them some intimation of an entity (Reason, God, or Form) which is distinct from all temporal process, yet (unlike the principles of logic which, as Aristotle saw, are equally tolerant of all temporal processes, exclude none, and enjoin none) operates upon, and is creative of, temporal existents and our theories about them.

Finally (3), some of the sophists and the Greek naturalists in the tradition of Leucippus taught the relativity, in the sense of functional correlation, of physical, physiological, and psychological processes. But not that any of these, or any other πράγματα, were in any respect constituted by reasoning as the theoretical interpretation of them.

We have inherited from the Greeks various theories of the structure of nature, and various accounts of the functions of logic, mathematics, observation, and induction in the human activity of constructing such theories. We have inherited from them a doctrine that reason makes the theories true—but only so far as we mean by "reason" the structure of nature, which the theories in question are about. We should have, then, to know nature in order to determine whether or not any particular theory is true of nature. If we wish to understand ourselves and the world and act reasonably in it, we are still left with the problem, Does anything (called Reason or by another name) offer us either an alternative to, or an addition to, or a theoretical justification for, scientific observation, induction, and experiment, on the one hand, and the development of tastes, desires, and habits of action in the light of the results of such science, on the other? Is scientific study simply one of the sorts of things animals like us do, with various degrees of absorption and persistence and with various effects upon ourselves and our environment, or is there some way to establish that we ought to do it, and to determine how we ought to do it (e.g., to establish the principles which properly distinguish reasonable from unreasonable scientific hypotheses)?

At the height of the so-called "Age of Reason," David Hume offered a set of answers to these questions, and of arguments in support of them. For all knowledge of matter of fact, he maintained, we have but one method: Experience; that is, experiment, observation, and comparison of things noticed, joined with the

supposition (never infallible) that similar entities have stood and will stand in similar relations—like effects, like causes. This procedure of observing, comparing, supposing, and experimenting, Hume commonly calls reasoning.[4] For convenience we shall label it Reason in sense I. It can establish no necessary connection.

By reasoning in a sense we shall number II, Hume meant mathematical demonstration,[5] including much that we now consider, but which Hume did not consider, logic; for he generally used "logic" as the name for the procedures of formulating, and determining appropriate tests for, inductive hypotheses. Reason in sense II gives us what Hume often called necessary truths, but they are truths of a peculiarly restricted sort. For example, if we accept the ordinary definitions of cardinal numbers, equality, roots, powers, and division, then we need no experiment to establish that the cube root of 64 is not equal to the half of 10, for to say anything else would be *not to accept* those definitions, and we cannot simultaneously accept and not accept anything. The truth in question is necessary in the same sense that it is a necessary truth that X has a wife if X is a husband; and that sense is the sense in which "being a husband" is defined to mean what is meant by "having a wife." But no matter of fact is thus established, or could be thus established. There need be no such entity as X, and if there is one,

[4] Many passages in the *Treatise* plainly describe our reasonings about matters of fact, which can never establish any necessary connection (pp. 463, 466), as nevertheless passing by inference from present impressions to beliefs about their causes and effects (pp. 56, 87, 97 n., 236, 336). Sometimes (as on pp. 88–89, 97, 172, 183, 265) Hume says that such "belief is more properly an act of the sensitive than of the cogitative part of our natures," an affair of imagination or of custom rather than of understanding or reason (p. 405). But in such passages (1) he is contrasting such beliefs, not with what he has called "not only a true species of reasoning, but the strongest of all others" (p. 97 n.), but with the demonstrative reasoning (which we shall label Reason II) that deploys analytical or tautological necessities. And (2) he is contrasting imagination with understanding as transitions which differ from one another, not in kind, but only in the degree of their steadiness and usefulness, as is made abundantly clear in such passages as that on page 267, where Hume refers to "the understanding, that is, to the general and more establish'd properties of the imagination." *Both* reasoning from causes to effects, or from effects to causes, *and* "the suggestions of the fancy," are equally distinct from Reason II. On Reason I see also *Treatise*, pages xx, 28, 48, 69, 73, 94, 124, 149, 155, 193, 225, 371, 405, 458–459, 463, 466, 610; and *An Enquiry concerning Human Understanding*, pages 25, 28, 32, 35, 44 n., 68. The edition of the *Treatise* referred to is that of L. A. Selby-Bigge, Oxford, 1896; and of the *Enquiry*, that of L. A. Selby-Bigge, Oxford, 1902.

[5] Cf. *Treatise*, p. 166; *Enquiry*, p. 25.

he need not have a wife. Whether any X exists, and, if he does, whether he has a wife, are undemonstrable matters of fact. Thus, none of the necessary truths established by Reason in sense II could either be violated by,[6] or could in any way determine, what Reason in sense I (as experience and induction) will find and suppose.[7] Unfortunately, Hume vacillates between describing all "knowledge and certainty" as confined to those tautologies that result from the comparing of ideas in the practice of Reason II,[8] and the frank recognition that identical propositions express no insight[9] and that "all knowledge resolves itself into probability, and becomes at last of the same nature with that evidence, which we employ in common life."[10] Usually, attention to the context will resolve these confusions by determining whether Hume is referring to Reason in sense I or to Reason in sense II. But sometimes (as in *Treatise,* p. 39) Hume seems to describe a matter of fact as if it were a necessity of Reason II; and often he treats of necessities of Reason II (analytic propositions, and tautologies that follow from definitions) as if experience were relevant to confirming or refuting them. Perhaps the most flagrant instance of the latter confusion is his search, which Hume himself calls vain, but which on his definition of necessity is strictly senseless, for cases of necessary connection between distinct matters of fact.[11]

The analysis of Reason I and Reason II, their comparison, and the discussion of their uses seems to be a third type of activity to which Hume gives the name reasoning, or reason, as on pages 89, 168, 199, 238, 300, 483 of the *Treatise.* Whether or not such philosophizing about logic, science, and the concepts they employ may itself be resolved into a combination of logical and scientific activities, that is, into Reason II and Reason I, is a leading issue in contemporary philosophy. But Hume does not explicitly so resolve it, and we cannot tell whether he would regard the resolution as practicable or not. We shall therefore label "Reason III" the reasoning that analyzes and distinguishes meanings, but that does not purport, *prima facie,* to establish facts or to make strict (i.e., analytic) logical deductions. It is Reason III, for example, that addresses

[6] Cf. *Treatise,* p. 31. [7] Cf. *ibid.,* pp. 92, 97, 157, 163, 172.
[8] Cf. *ibid.,* pp. 70, 84, 87, 124, 456–457. [9] *Ibid.,* p. 249. [10] *Ibid.,* p. 181.
[11] On Reason II cf. also *Treatise,* pp. 31–32, 69, 79, 157, 371, 463; and *Enquiry,* pp. 25, 27.

itself, not to the task of discovering what in fact causes the sun to rise, but to elucidating the meanings that are employed in discussions of power as enforcing and of causes as necessitating.

Hume also uses "reason," in a sense we may label IV, to mean the prudence and sagacity (*ibid.*, p. 610; cf. p. 583) of the man who resists "unruly passions," does not depart from "right reason" (p. 403; cf. also pp. 271, 276, 350, 437) or yield "to the solicitations of our passions, which always plead in favour of whatever is near and contiguous" (p. 535), forms his opinions "after a calm and profound reflection" (p. 214), and holds them with the degree of "doubt, and caution, and modesty, which, in all kinds of scrutiny and decision, ought forever to accompany a just reasoner," founds (as Hume alleges he himself has done) his system of morals upon "pure reason" (p. 546), respects (as Hume says he himself does) "the most rational philosophers" (p. 191), and supports the activities, and prizes the achievements, of reasoning in senses I, II, and III. But Hume characteristically describes this fourth as a figurative and improper sense of the word "reason"; since all preferences, even those whose objects are the activities of Reason I, II, and III, are as preferences really matters of feeling. That calm and deliberate choices which follow upon information and analysis are, with their consequences, more agreeable to many men than are violent passions and their usual effects, does not mean that the "reasonable" choices, preferences, or passions are in any sense certain or probable. Hence, if we mean by reasoning the processes (or the results) of science and logic, then Reason IV is not an instance of reasoning at all (pp. 416–417, 437, 457, 459, 463). The important question, however, is not whether Hume gave the name "reason" to the calm, deliberate, and informed judgment of moral acts, attitudes, rules, and institutions, of works of art, and even of the works of reason themselves—that is, of science, logic, and philosophy conceived as Reason in senses I, II, and III, and even in sense IV. Sometimes he did. Oftener he did not. The important points, commonly missed by Hume's interpreters, are (*a*) that Hume recognized and analyzed such deliberate and informed judgment; and (*b*) that he offered theories about the relations between knowledge and appreciation, facts and values—between Reason I, II, and III on the one hand, and Reason IV on the other—which are among

the most enlightening in philosophical literature. These theories have scarcely been touched by the muddy torrents of alleged refutation, whose main effect has been to spread misconceptions of Hume's position. Far from being negligent of Reason IV, Hume unquestionably overestimated its scope and influence in human life. And while he saw that no science, logic, or philosophy could prove the truth or probability of a value judgment, because such judgments are not susceptible of truth or probability in any strict sense, he was perfectly clear that information and insight do in fact causally alter our value judgments. His position is admirably summed up by Professor Sabine: "It is impossible by any logical operation to excogitate the truth of any allegation of fact, and neither logic nor fact implies a value." And it seems to me that Professor Sabine's own opinion bears extension beyond the limits of political theory, and applies quite generally to thought and practice, when he adds: "Consequently . . . *the attempt to fuse these three operations* [that is, logic, science, and evaluation—Reason I, II, and IV], whether in Hegelian idealism or in its Marxian variant, *merely perpetuated an intellectual confusion* inherent in the system of natural law."[12]

Hume also wrote of reasons in the sense of causes (*Treatise,* pp. 92, 482), of reasoning in the sense of loose general conjecture (a subform of Reason I; cf. *ibid.*, p. 387), of reason in the sense of final justification (*ibid.*, pp. 139, 179, 265), of reason in the sense of a faculty possessed by sane animals and men. And Hume wrote of reason in many other senses. But the four senses I have distinguished and numbered are, I think, the most important. Why? Because the clear discernment of these different senses may resolve the problems, and correct the pretensions, which nineteenth- and twentieth-century interpreters have found in (or read into) the writings of the classical rationalists. Because respect for Hume's distinctions might clear the confusions which have made the Appeal to Reason so ineffectual—and even disreputable—in contemporary political and moral discussion. And also because attention to the differences Hume discerned may remove the type of fallacy suspected by students of *Principia Mathematica,* and

[12] George H. Sabine, *A History of Political Theory* (New York, 1937), p. viii. The italics, and the bracketed phrases, are the present writer's.

the pedantry sniffed by "lovers of honest English," when they hear such questions as: "Is it reasonable to be reasonable?" "Is there any reason to believe that reasoning (and particularly reasoning about reasoning) makes men more—or less—reasonable?" So far as such questions are raised, in letter or in spirit, either by Hume or by those who (like the late F. P. Ramsey) are regarded as Hume's intellectual descendants, I believe that "reasoning" as logical function and "reasoning" as logical argument are generally the same *only* as shapes or sounds, and not as words (that is, not in their reference, which is what makes them words).

In order to test these claims of the importance of Hume's distinctions, let us consider what alternatives his great rationalist predecessors, and some of our contemporaries, offer to his position.

When we compare the writings of the seventeenth- and eighteenth-century materialists (such as Hobbes) and empiricists (such as Locke, Berkeley, and Hume) with those of the so-called "Continental Rationalists," one of the first things that strikes us is that the materialists and empiricists appealed to reason to establish basic principles, quite as explicitly, and at least as frequently, as did the rationalists. Hobbes, Locke, and Berkeley rely as confidently as did Descartes upon causation as a necessary connection certified by reason. Hume's fundamental difference from Hobbes and Locke on causation, and on all other alleged necessary connections, is expressed in his maxim that whatever is distinguishable is separable. However complex or simple it may be, in order to be at all, any object, quality, or action must be determinate—there must be some difference, however slight, between it and other entities. Where there is no difference, or where none is discerned, to assert necessary connection is only to assert the truism: A is A. But if there is a difference of any sort between entities, then the one way to determine how they are joined, interwoven, and related is by Reason I—that is, by exploring them. Hume believed that all distinguishable entities are in fact conjoined in various ways, and that no limit can be set to the extent, or the complexity, of the structures in which they may participate.[13] There is therefore only one sort of organicism or contextualism which Hume's logical atomism rules out—the sort which asserts that elements in organic wholes

[13] Cf. *Treatise*, p. 185, and the apparent confusion of the doctrine on p. 366.

are, in precisely the same respects, different-from-*and*-identical-with such wholes and therefore also different-from-*and*-identical-with all other elements in the wholes. I do not pretend to know whether any philosopher, ancient or modern, has actually intended organicism in this "sense." Organicists who have intended anything less can have no quarrel with Hume's principle of the separability of the distinguishable, although they may rightly feel that Hume knew vastly less about the relations of certain sorts of distinguishables than we now know.

Whatever the organic structures of acts, objects, and qualities may in fact be, we cannot, according to Hume (and here the classical rationalists have been supposed to differ with him), represent them as being established by Reason II, except in the entirely trivial sense that any change in the pattern or qualities of any structure is incompatible with the unaltered persistence of *that* structure. But Reason II does not, and cannot, make the slightest contribution towards establishing what entities, if any, must exist or do exist, and what their structures and relations are, or even towards indicating significant formal limits to, or formal traits of, any entities whatever.

It is on this last point that modern rationalists take issue with positions like Hume's, and aver that the great seventeenth- and eighteenth-century rationalists offered an alternative doctrine. This claim needs much more careful scrutiny than is usually given it. For Leibniz expounded even more rigorously than did Hume the principle that connections between *different* entities are contingent and not necessary, and that opinions about them can never be necessary truths of reason.[14] The different perceptions of any particular monad are, to be sure, necessitated by the monad's essence, but that essence is the career of the monad taken *in toto* and nothing over and above and distinct from (and yet necessitating) the perceptions that are the phases of the career. In understanding Leibniz, much depends upon how we interpret the Principle of Sufficient Reason, according to which there *must* be a Monad omniscient and perfectly active and benevolent who chooses to realize the best of all possibilities. Although Leibniz regards that Princi-

[14] Cf. Leibniz, *Discourse on Metaphysics*, Secs. XIII and XIV, also XXV; Letter to Arnauld of July 14, 1686; and Art. 46 of the "Monadology."

ple, and the consequent truth about God, as certain, he is careful—we must never forget this—not to call it *necessary,* which is his name for the truths (all of them, on his account analytic) that are certified by Reason II or logic, that is, are true *a priori.* We have from various commentators the interpretation of Leibniz's Principle of Sufficient Reason as a postulate of faith. It is hard to tell whether Leibniz would accept that interpretation; but it is much harder to understand how Leibniz (or anybody else) can offer an alternative interpretation, so long as "rationally necessary truth" is defined as Leibniz himself defined it, namely, as that the denial of which is strictly self-contradictory.

Descartes's writings are the happy hunting ground for all of us whenever, for one purpose or another, we want to consider statements of the view that deductive reasoning can establish facts, and indeed all the facts about all the thoughts and all the motions of all the substances in the universe, with no other premises than Descartes's rationally demonstrated metaphysics of God, finite spirits, and bodies, and what he regarded as the self-evident principles of a geometrical mechanics. Yet it was this same Descartes who, in his *Principles of Philosophy,* wrote that he could make no further advance until, and unless, he had the means of making more experiments. And it was this same Descartes who, in his *Regulae* (where he is most in earnest with the problem and formulates it most carefully), asserts that deductive reasoning is entirely infertile since its results, if true, are true not because they have been rationally demonstrated, but because they, standing as it were on their own feet, are themselves clear and distinct ideas evident to intuition, or by the natural light.[15]

But does Spinoza teach that Reason constructs or determines truth in a sense free of the restrictions of the first three—mainly the first two—of the four senses in which Hume recommended and practiced reasoning? The answer is, *prima facie,* Yes. And I have no doubt that Hume would have deprecated any suggestion of philosophical agreement between himself and the man he called the "universally infamous" author of "the hideous hypothesis."[16]

[15] Cf. Rule VII. Cf. also the admirable study of R. M. Blake, "The Rôle of Experience in Descartes's Theory of Method," *Philosophical Review,* Vol. XXXVIII.

[16] *Treatise,* pp. 240–241.

There is, however, no reason to believe that Hume had, in his early twenties, even a tolerable acquaintance with Spinoza's texts, or that he ever afterward studied them with care. Hence there is no reason to suppose that his comments on Spinoza reflect anything but his own ignorance and prejudice. The proposition that the "the order and connexion of ideas and the order and connexion of things is the same" suggests to most readers, influenced by nineteenth-century histories of philosophy, that Spinoza believed we could determine the laws of extended modifications by an activity called pure reasoning, approximately equivalent to Hume's Reason II. However, among the grounds upon which this proposition of Spinoza's depends are the definitions of Mode, of Attribute, and of Idea, according to which an idea is simply a mode which appears *identically* under the attribute of thought as well as under that of extension and all other attributes. Consequently although for Spinoza an idea that *is* an idea is necessarily true of its object, there is always the prior problem of determining whether what purports to be an idea is genuine or is confused (i.e., partly imagination or emotion). Spinoza proceeds in two ways to determine whether an idea of the relations of an extended mode is true. One way is to determine whether it accords with the relevant definitions and axioms. The other way is to determine whether it accords with the causal determination of the particular mode. This second way Spinoza follows, with an apparent exception which we shall soon consider, by the methods of observation and induction which Hume called Reason (in the sense we have numbered I). What Spinoza establishes in the first way, whether or not he adheres to his nominalistic teachings, would seem to be a series of distinctions with respect to what he will call motion, rest, and the like, rather than a series of determinations that any modes actually do move or are at rest, and, if they move, what the pattern of their motions is. Questions of the latter sort we can determine only by thinking, that is, intuiting, inspecting, the modes that precede, follow, and bound the modes whose motion we would determine. It is Spinoza's insight to this effect and procedure in this direction that justify—so far as anything justifies—Professor Wolfson's judgment that "he was, many views to the contrary notwithstanding, a hard-headed, clear-minded empiricist, like most of the mediaevals and

like Aristotle."[17] Spinoza's doctrine of cognitive intuition as more reliable than memory, hearsay, or inductive (or causal) inference throws important light on both of his ways of establishing the truth of ideas. Although Spinoza's intuition played upon different kinds of objects from those which Hume mainly considered, it is not clear that any difference of epistemic or ontic status has been specified, let alone established, between Spinozist intuitions, Humian perceptions, and medieval *apprehensiones simplices*—except, of course, where Hume goes wild, violates his basic principles, becomes a bad rationalist, and asserts such things as the *necessary* restriction of perceptions to minds, and to what *cannot* persist but *must* perish.[18]

There remains, of course, the historical distinction from the sensible of the rational—not as logic or mathematics *simpliciter,* but as *the orderly, the mathematically intelligible.* This distinction was prominent in Descartes, Spinoza, and Leibniz, and continued to some degree (in spite of their formal disclaimers of it) in Locke and even in Hume.[19] Leaving out of account Spinoza's classical criticism of the notion of order as used in such distinctions,[20] it is very difficult to make any sense of the assertion that the alleged want of order in sensible qualities is an intrinsic lack. It seems more appropriate to say that when we assert such a defect in sensible qualities we merely indicate thereby our own lack of attention and industry in distinguishing sensuous orders. And, what is more to the point, those (like Ostwald and Prall) who have discriminated sensuous orders have *not* thereby reduced (or elevated) sensible qualities to orders of positions or magnitudes, although they have made out, so far as they have gone, that sensuous qualities are no exception to the general principle that whatever stands in relations at all stands in relations which can be mathematically formulated.

We have turned, not to men who have been called empiricists

[17] H. A. Wolfson, *The Philosophy of Spinoza* (Harvard University Press, 1934), I:74.

[18] As in *Treatise,* p. 194.

[19] E.g., his description of merely experienced transitions and influences as "unintelligible" and "perfectly . . . incomprehensible."—*Treatise,* pp. 169, 172, and elsewhere.

[20] *Ethics,* Appendix to Pt. I.

and skeptics, but to the most celebrated historical rationalists, for light on the problem whether, and how, Reason II, or reasoning in any other sense than Reason I, determines the content or the structure of knowledge. We have found that, of these, Leibniz paid most attention to the problem and that his position was that all truths of reason are analytic—are species of tautology. They are principles that cannot be violated in thought or in any other form of being, but they are such because they exclude no thought or being, and also determine none. For reason, all things are equally possible, and therefore reason cannot enstate any fact as fact, or establish any synthetic statement as true. The Principle of Sufficient Reason, which grounds synthetic judgments, is not itself for Leibniz a truth of reason—is not, that is, a necessary truth, the denial of which would be self-contradictory.

Spinoza exhibited as rationally demonstrated certain great truisms—for example, that if we mean by Nature or Substance or God the *unconditioned,* which neither exists nor can be conceived in relation to anything else, then, if there is any existent at all (which, by the way, Spinoza did not prove), there must be one, and only one, Substance (or Nature or God), and in it all possibilities must be timelessly realized. But there is nothing in particular we could say of it, the great rationalist teaches, that even could be true of it. Any metaphysical characterization of all being, except the infinite versions of the truism that it is All in All, are ruled out as not only false but also blasphemous. But besides such resounding truisms about Substance (or Nature or God) Spinoza established a great many theorems that are formulated as if they were synthetic *a priori* truths—rationally necessary truths about relations between particular modifications of Substance. Among hundreds, the Corollary to Lemma III of Proposition XIII of the Second Part of the *Ethics* is typical: "Hence it follows that a body in motion will continue in motion until it be determined to a state of rest by another body, and that a body at rest will continue at rest until it be determined to a state of motion by another body. This indeed is self-evident." In what sense self-evident? One interpretation is: if each of the Attributes of Substance is infinite and there can be no unrealized possibilities (and there can be none if Substance is unconditioned or infinite), then under the attribute

of extension there can be no vacuum; therefore no motion, rest, or change of motion of any finite extended mode is possible except where all the bounding modes (which must be there if the original mode is finite and there is no vacuum) move or change, and move or change in ways that would produce a vacuum unless the mode first in question moves as it does, and as it therefore self-evidently must. In this sense the principle (expressed in Lemma III, to which the proposition whose evidence we have examined is the corollary) that every change in motion must have a cause, and a cause which necessitates it, is, when joined with the postulates and definitions which entail it, a complex analytic proposition. It is an instance of saying that *if* we accept certain propositions (i.e., axioms) and certain definitions, *then* we cannot in any respect deny the first or deviate from the second, since that would be not to accept them. However, although no other interpretation of the necessity asserted in such propositions may be free from contradiction, there is at least as much reason to doubt whether Spinoza meant the necessity in this sense, as there is evidence that he held that particular truths about modes had to be established, if established at all, by what we have called Reason I, that is, by reasoning in the sense of inspection (observation), to which Spinoza thought the various processes of comparison, induction, and experiment were all subsidiary.

It is not clear, then, that his rationalist predecessors and approximate contemporaries offered, with any consistency or thoroughness, a doctrine of Reason as differing in character and in functions from what Hume described and practiced as: I, empirical science; II, mathematics and logic; III, analysis, as against any sort of "establishment," of interpretive concepts; and IV, temperate, informed judgment on questions of value and of desirable conduct. Yet Hume often confessed a profound melancholy (as in the *Treatise,* p. 265) because he could find no reason which would compel him, or anybody else, to assent to his views. What, in such moments, Hume hankered after was probably what more recent rationalists offer us, and what men commonly appeal to reason to effect, namely: (*a*) some kind of validation, not of scientific results, but of the scientific procedures of experimental verification themselves; (*b*) principles of guidance and control in the in-

terpretive speculations which, in our science and philosophy, we build out far beyond established fact; and (*c*) some kind of validation of value judgments—if only of the superiority of value judgments associated with and conditioned by much information, over evaluations made, as we say, in ignorance.

What are the scientific methods which Hume, at times, wishes he could validate by a kind of reason freed from the disabilities of Reason I, II, and III? They are the procedures, familiar to all, under the names of experiment, observation, the formulation of hypotheses about the relations of events of certain classes, and their testing by further experiment and observation. To distinguish these factors in scientific procedure, let us understand once for all, does not (as logically it could not) imply that any of them ever occurs without the others, or that the order in which we list them and analyze them is either the temporal order of their occurrence in history or the order of their importance. Naturalists have been the first to insist that such processes as observation are known to occur, not in any "preanalytical" or "pretheoretical" innocence, or without an organic context, but only in the careers of elaborately endowed and elaborately conditioned animals in a complex environment—animals who have, and who try to maintain, habits, whether or not these, or their objects, have reached the stage of being formulated as hypotheses.

It is, however, the formulation of hypotheses which has commonly been regarded as the special work of reason. If we mean by this activity the determination of what further structures are entailed as necessary by observed structures of events, then the formulation of hypotheses is not the work of reason, but rather of superstition, for whatever may be its connections in fact, no structure strictly entails any of them. The formulation of hypotheses, while it cannot violate logic (Reason II), is not determined by logic, for reason as logical or mathematical procedure leaves *all* possibilities equally open. Also, the making of hypotheses, while it is causally influenced by experience of experiments, observations, and the testing of other hypotheses, is certainly not wholly produced by, nor in any way restricted to, what has been thus experienced. When we make hypotheses, we imagine, we expect, but without any rational necessity or guaranty for our imaginings and ex-

pectings that further stretches of nature will exhibit or, in certain respects, will deviate from, the patterns we have found in observed areas.

If we should therefore say that making a hypothesis is an act of reason in the sense of creative imagination, we should be naming the process (and perhaps in such a way as to indicate our ignorance of it) rather than explaining it. For what we know as creative imagination is not something that is distinct from structures of thought, of symbols, of images, of colors, sounds, shapes, and emotions, and plans for experimental procedure. It is simply such structures and plans and their factual production by animals more or less like ourselves. That such production is mysterious is suggested by the terms used in describing it: inspiration, flash of insight, and so on. The mystery consists in the fact that no set of conditions (internal or external to men) has been found to stand in regular correlation with the more fruitful and illuminating of such creative acts, and that we have had little success (for all our machinery of research foundations and the like) in inducing such creation or in controlling it. In a single field of study the same man may credit some of his hypotheses (which his colleagues call enlightening) to "acute and prolonged attention to the data in the confinement of the laboratory," others to "the complete relaxation of a walk in the country," others to "intense mental effort upon a problem in a wholly unrelated field."[21] However, the fact that we know little of the processes and the causes of the invention of original and enlightening (as against merely freakish) theories, as little justifies the assumption of a specific agency—creative reason or imagination—as our relative ignorance of biotic processes justifies the assumption of entelechies, vital forces, or controlling total forms, to explain what we do not understand in plant and animal life. What we know at present is that occasionally hypotheses of great generality and high explanatory power are made and consistently verified; that no other hypotheses logically entail them; and that their creators have often had no evidences on which to build which were not already familiar to hundreds of other men. It makes no theoretic difference whether we simply describe and

[21] A. C. Benjamin, "The Mystery of Scientific Discovery," *Philosophy of Science*, 1:224.

report these occurrences, or whether we call them acts of creative reason. For, what makes the most ingenious hypothesis in any degree valid is not the brilliance of imagination displayed in formulating it, nor the wealth of information or of erudition which may have prompted it, nor its intrinsic fascination or felt plausibility, but simply its *accord* with the stretches of qualitied and structured events it purports to be about. And what we *know* of its validity is just so much as we have discovered, by experiment and observation, of that specific accord.

Such is the familiar story. Is it reasonable? Suppose we challenge it, as it is widely challenged today. Let one of us say: "Not experiment and observed accord with fact, but rather the satisfaction of profound national, racial, or spiritual impulses, or aesthetic or economic needs, justifies a hypothesis. What is truth for me is determined by the kind of man I am. I am a Hottentot.[22] Therefore my hypothesis that non-Hottentots are physical and spiritual degenerates does not need the sort of confirmation recommended by myopic positivists, that is, confirmation (after a careful definition of 'degeneracy') by the measurement of sample Hottentots and non-Hottentots with respect to the degree in which they exhibit what I call degenerate traits. No. The hypothesis is 'intrinsically plausible,' or it is vouched for by my good Hottentot racial insight. Now a man who tells me he is rational comes along, appeals to Reason, and warns me that I am in danger of making errors about matters of fact. If (he tells me) I mean anything at all by the word 'degenerate,' and if I treat the next man I meet as trustworthy if he is a Hottentot, but as a degenerate liar if he is not a Hottentot, then I am very likely to be robbed by the first man and misled by refusing to believe the second man when he tells me, let us say, that the fungus I am about to eat is poisonous. But what is my reasonable critic doing? He is saying that, if I want to hold correct or probable opinions about matters of fact, I had better regard my hypotheses as verified by experiment and observation, and trust them no farther than such observations warrant. 'But,' I could answer, 'he is simply begging the question. He is telling me that it is

[22] The term "Hottentot" is employed here because it has, in one English usage, the sense of "wild man." In this essay the term is used to refer only to the person and attitude herein described, and not to the aborigines of South Africa, of whose reasonableness the writer is not qualified to judge.

reasonable to regard as true only such opinions as assert what is found by observation to be so. But that is because he, the barbarian, defines truth and probability and reasonableness, as I do not. I define truth as what my Hottentot blood tells me, and the probable as what I feel is intrinsically plausible—propositions that have a high "initial weight." It is most unreasonable of my critic to tell me that one definition is more reasonable than another. I will put him in a concentration camp, or I will send him to school to John Locke or Hume or Lord Russell or the logical positivists, and he will learn better manners. He will learn that it is merely question begging, or else the definition of a word, to say that reason, or anything else, requires us to make the public observation of facts the test of our dearest hypotheses, rather than hypotheses the test of facts.' "

The Hottentot seems to win the theoretical argument, for there is nothing self-contradictory (or in any other way *logically* fallacious) about a man's ignoring or abandoning what is familiarly called scientific method. Remembering and expecting, as well as the making of inductive hypotheses, are *good habits,* but the lack of them involves no contradiction. *Good* habits, did we say? Good for what purposes? If we tell our Hottentot that he is likely (we cannot, of course, say that he is certain, since his blood *might* prophesy more reliably than our inductions) to fall into mistakes about matters of fact, he can either agree, but tell us that such mistakes are unimportant compared with the artistic, or spiritual, or racial satisfactions to be got by deviation from what dull and unimaginative men call "facts."[23] Or else he can tell us that what any man admits as facts depends upon his metaphysical categories, and that (taught by his racial or national intuitions) he employs categories which give precedence to an order of facts not accessible to men of other races, whose metaphysical categories confine facts to the objects of possible observation. Since facts are determined by the categories and perspectives of interpreters, even starvation and death are facts only in certain perspectives or for certain inter-

[23] Cf. Benito Mussolini: "We have created our myth. The myth is a faith, it is passion. It is not necessary that it shall be a reality. It is a reality by the fact that it is a goad, a hope, a faith, that it is courage. Our myth is the nation, our myth is the greatness of the nation!"—From a speech made at Naples, 1922, quoted by Herman Finer in *Mussolini's Italy* (New York, 1935), p. 218.

pretive attitudes. If one does not enjoy seeing one's friends hungry or dead, the thing to do is to alter one's interpretive attitude—perhaps adopt the Hottentot perspective.

There was once a time when we could reassure ourselves in the presence of such Hottentots by the belief that *at least experimentally verified knowledge is power*. If Reason I, II, and III cannot refute those who flout experimental knowledge, at any rate "nature" will soon destroy them. But the time for such belief has passed. Consider two hypothetical groups of men. The members of each group know how to make and use cannon and bombing planes and mustard gas, and are able to produce sufficient food and military raw materials. Let one group hold what we should call scientifically confirmed and sensible opinions about its own needs and interests and those of its neighbor. Let the other group develop (by the subornation of science and by propaganda) hypotheses mistaken in fact about their own heroic virtues and their neighbor's murderous vices. Will knowledge here be power, and the greater knowledge be the greater power? Will those who have employed scientific method more faithfully and extensively be secure against destruction at the hands of those who have violated it in wide areas? Yes, if they can reëducate their neighbors before they are all destroyed themselves. Yes, again, if they wean themselves from peaceful pursuits and devote themselves to preparing for war more energetically as well as more skillfully than their neighbors. But it is precisely the group of men who love science that will find it hardest to divert their energies into anything so unlikely as war is to produce what they would regard as useful results. If, however, they do so redirect their energies, their love of science may easily die of starvation, and of the poisons of propaganda, and they may become as negligent as their neighbors of scientific method in fields outside the techniques of manufacture and war.

No, we cannot, by Reason in senses I, II, or III vindicate the methods of experimental science by showing that those who neglect them will hold mistaken opinions and will come to early deaths. For, in the first place, they may define "fact," "observation," and "truth" otherwise than do the defenders of scientific procedure, and even offer a metaphysic, or a series of metaphysics, in support of their "definitions." But even if they agreed (using

the same or different nomenclatures) in holding that observation determines the truth of beliefs about matters of fact—even then no logical inference would follow from this agreement to the effect that such truth ought either to be sought or to be acted upon. Nobody would recommend counting the grains of sand on the shores of San Francisco Bay, for all the truth of the result. It is not important enough for our purposes. And for those who take the dominance of a race or a class or an institution (economic, political, or religious) as the most important thing in the world, if scientific method stands in the way of a needed and effective propagandist myth, it will seem obviously reasonable that scientific method ought, so far, to be scrapped. This position is the abandonment of Reason I, but that abandonment cannot be ruled out as either a violation of logic or a confusion of meanings which would be contrary to Reason II or Reason III. And, in the second place, the repeated instances in history of the subjugation and partial destruction of what we call more civilized nations by nations less civilized and less respectful of the sciences and arts leaves us little grounds for believing that the more reasonable of two groups of men will survive in competition with the less reasonable, and thus at least secure their objectives in fact, whether or not they can justify them by Reason.

What we rely on, and appeal to, when we say that disregard of scientific method is unreasonable, would seem to be Hume's Reason IV, and that is a combination of a considerable variety of tastes and opinions, to which, as we have seen, Hume more often than not denied the name of reason. The combination includes: (1) a curiosity about the structure of nature and man and of man's institutions, irrespective of the uses (other than the satisfaction of curiosity) which knowledge of those structures may yield; (2) the opinion that knowledge, sought freely and scientifically, has served and will serve to increase human happiness in many ways, although no one can be perfectly certain that an apocalyptic vision which displaced science might not advance happiness the more, as no one can be certain that Henry Adams was wrong in predicting that reason and science would soon bring us to madness and death; and (3) a liking for the temper, tastes, and actions—the personalities—of men who (like Hume's "just reasoner") hold all their gen-

eral opinions as hypotheses subject to alteration as new evidence may warrant. If this is what we mean by reasonable, then we shall call men unreasonable who disagree with us. But in doing so we shall not be convicting them of violations of logic or of mistakes in theory, but only of holding hypotheses and preferences different from our own. And we cannot argue about such hypotheses and preferences with the man who flouts scientific method, because we share with him no meanings and no premises, and what would sound like an argument would therefore be only a beating of the air with our words. This would not need to worry us if we were sure that his folly, as we call it, would either discipline or destroy him. But if he flouts scientific method with enough luck and enough skill—deviates a great deal, perhaps, but not on all points,—there is altogether too great a probability that he will destroy us, or else (what may seem pretty much the same thing) so transform us or our children that we will take on his patterns of thought and conduct.

But suppose we grant to Hume that it is their loves and hates, rather than anything that could be distinguished from these as Reason I, II, or III, that persuade such men as do form opinions upon evidence and test hypotheses by experiment and observation, to proceed as they do. And suppose we address ourselves, not to those who flout the methods of science when its results offend them, but to those who approve (and even employ) those methods. Can we make out a function that we could distinguish from their observings and supposings and their verifications of their suppositions—a function that provides a critical control of hypotheses, a determination of what could be evidence, and also contributes positively to the architecture of hypotheses? The answer from scientists is usually, Yes; Reason, besides evidence, guides us in our work. But they seem to mean something pretty pragmatic by such assertions. Although they might not recognize the terms, they seem to be employing (as Hume did) what Immanuel Kant was to call the Regulative Ideal of Unity—employing it as an excellent guiding principle, well justified by the results of following it so far. But few of them seem to take anything like that principle as more than a practical guide—as anything like a logical presupposition guaranteed by Reason II. Professor Hogben speaks as a representative

of contemporary science when he condemns as a "retreat from reason" every pretense in the name of reason to direct the course of empirical investigation by logic or by any dialectic that is distinct from the construction and experimental testing of verifiable hypotheses.[24] The reasonableness, or "rationalism," which Professor Hogben defends is Hume's Reason I, which "has learned the hard lesson that logic which may be a good servant is always a bad master" (p. 6), and "repudiates any attempt to short-circuit the empirical method by verbal legerdemain" (p. 27), as he describes *a priori* logic and dialectic when they are treated as having any bearing on the truth or probability of synthetic judgments.

But when we turn to contemporary philosophy, we find fervid assertions that Reason, as distinct from scientific procedure and results, if it cannot establish that we should proceed scientifically, can at least determine for those who do wish to proceed scientifically, what will, and what will not, be allowable hypotheses. For all I know, many scientists may agree with this view, as Einstein seems to do in his Herbert Spencer Lecture "On the Method of Theoretical Physics."[25] But the important question for us is not, Who holds this position? but What is its meaning and its validity?

Professor Morris Cohen tells us[26] that Reason enjoins coherence and consistency and systematic completeness upon our explanatory constructions, not as virtues found to be desirable by scientific comparison and utilitarian appraisal, but as logically necessary conditions of there being any science at all. In a sense Professor Cohen is right about consistency, unexceptionably right. But what is that sense? Is it not the sense in which inconsistency or incoherence amounts to strict contradiction? *Provided* our purpose is to assert something, to suppose something, or to believe something, then we ought indeed to avoid mutually contradictory propositions. But is this because there is a function or canon called Reason that rules out such propositions? Or because, so far as contradictory (i.e., as unsaying precisely what they say), they state *nothing, a fortiori* could explain nothing, whereas it is in fact our purpose to assert, suppose, or believe *something?*

[24] L. T. Hogben, *Retreat from Reason* (Northampton, Mass., 1937), pp. 5–11, 22–27, 38.

[25] New York, Oxford University Press, 1933.

[26] *Reason and Nature* (New York, 1931), esp. pp. 106–114.

Reason as the canon of consistency does not, for example, rule out a physics which represents some matter as corpuscles or particles, other matter as vibrations or waves of force. It does not rule out a physics which represents every stretch of "matter" as having both phases—corpuscular and undulatory. It could be said to rule out a physics which "said" that one phase is the other, that is, that distinguished what is meant by "particle" from what is meant by "undulation" and yet "taught" that particles are identical with undulations. It could also be said to rule out a physics which "asserted" that all physical existents must *necessarily* be composed of particles, or that all must *necessarily* be composed of waves. But what are thus ruled out are not even doctrines at all, such that any of them could be either correct or incorrect.

However, the advice to seek consistency and coherence nearly always goes farther than to warn us against self-contradiction. It is frequently advice to construct hypotheses that represent the world as coherent in the sense that a relatively small number of qualities, of relations, or of patterns pervade (though in varying degree) all being. Sometimes it is the further advice that, in order to conceive the world coherently, we must suppose its every aspect, its every strand, as being related to, as responding to, and as affected by (and in these senses coherent with) every other, and as thus constituting "an intelligible system." This last piece of advice is empty unless it specifies what it means by "response" and "relation." *In general,* any strand of being would respond to all others *equally,* whether by refraining from or by performing any specified sort of response. And the same holds of the requirement that we must construct hypotheses which represent all the factors in the world as being coherent in the sense of each standing in relations to all others. The requirement adds nothing to the truism that, if we suppose anything whatever which is expressible by a synthetic (as against a strictly identical) judgment, it will be something which is relational in one way or another.

There is a more specific meaning in the rational canon of coherence when it is taken as the advice (or injunction, or guiding principle) to suppose that the variety of patterns and qualities in nature is not unlimited. What is the basis for this injunction or principle? If anybody ever experiences the repetition of a pattern

or quality in different instances (whether the repetition is successive or roughly simultaneous), then, quite apart from all questions of whether the repetition lies merely in the career of the percipient organism or also in processes external to that organism (since both are equally parts of the world), it follows that the variations of quality and pattern in nature are at least fewer by that much than the possible maximum. But, if thus established, the principle that the world is coherent in the sense of being limited in its variations is simply a finding of Reason I, and not at all a grounding of Reason I, or of its results, in some other and more authoritative kind of reasoning. For we thus assert that there is some degree of repetition in the world, not because a controlling Reason requires that there must be, but simply because we have found it. And we go further and make it a guiding principle to expect more widespread repetitions in natural and social history than we have found. It will be convenient in many ways for animals like ourselves (although in other ways inconvenient) if such expectations are progressively confirmed. But the desirability of such coherence in nature is no evidence for the fact of such coherence, and neither the desirability nor the fact implies, or depends upon, the rational necessity of such coherence.

It is often urged that there must be a considerable degree of coherence (in this last sense) in nature, since nature would otherwise be unintelligible. But is not any degree of variety whatever intelligible in the sense that it has the determinate configuration that it has, and also in the sense that a sufficiently comprehensive intelligence could conceive that configuration?

Consider three examples. Investigators of the rates of change in chemical reactions report that those rates vary "without rhyme or reason," that there is no general law which expresses the functional correlations of changes of rates with changes in other factors, even for many compounds of the same elements, let alone for all chemical substances. Similarly, students of the earth's rotation in relation to the moon's revolutions have found no regularity in its fluctuations. They can formulate the pattern of the fluctuations observed through any period, but so far no such pattern has been found to be repeated in the next following fluctuations. Again, students of number theory have proved that some sorts of regu-

larity are impossible in the series of prime cardinal numbers, and that the series of such primes is infinite, but they have neither found nor demonstrated any pattern of distribution of primes that has held through a stretch of the series that extends beyond whatever stretch that pattern was first found in. All these investigators are more or less disappointed. It would indeed be a great convenience if rates of chemical reaction, fluctuations in earth rotation or lunar revolution, and distribution of primes repeated regular patterns that could be formulated in general laws. But, so far as we yet know, they do not. Has any chemist, astronomer, or mathematician therefore thrown up his hands and said either, "These phenomena (or these mathematical structures) violate Reason: they cannot be understood!" or, "There *must* be an invariable general order in these phenomena (or these mathematical structures) which we have not yet discovered"? Not that I know of, and our university has included leading investigators of all three of these matters. They may have hoped for more regularity than they have found, but they have not claimed that Reason either demanded it or certified it. They have understood these matters *as varying* in patterns that are not repeated from one area to another, while they have understood quantum shifts and some motions of comets and the succession of odd numbers, *as relatively less varying,* or *as invariant,* in pattern. But so far as they have gone, they have understood both sorts of things equally.

Now, would there be anything unreasonable—anything that would violate Reason in senses I, II, III, or IV—in a world no phase of which contained any more repetition of quality or structure than men have found in the fluctuations of earth rotations or of the density of distribution of primes? If we mean by "the reasonable" what is comparatively easy for men like ourselves to understand and to adjust ourselves to, then such a world would be *very* unreasonable, although perhaps no more so than a world in which repetition should be carried to the last extreme of simplicity and invariance of pattern. But, if there were any animals in such a world, they would presumably function in it, and quite possibly (judged by success in survival or by any other norm) as well as, or even better than, we function in ours. If those animals philosophized, could they conceive variation, since they would never find a

repetition to contrast it with? Our own Bradleys have not hesitated to contrast with all that finite minds can experience, Absolutes which, they say, finite minds cannot experience. And who will deny that in a world without repetitions, a world which our Bergsons and Bosanquets tell us is either the Real World or at least much nearer to Reality than is anything scientifically observed—who will deny that in such a world some of the philosophers (who could never bore their hearers by monotony) might yet read papers to Union audiences about the possibility, and the horrors or the advantages, of a world marked by a feature none of them had ever encountered: the feature of repetition!

There is, then, and there could be, nothing incoherent (in the sense of self-contradictory or in the sense of intrinsically unintelligible) in any, even the maximum possible, degree of variation in the qualities and patterns of events. We know that variation in our world is limited, so far as we observe repetitions, and most (but not all) of us hope that further variations will have some similarity of pattern to variations already experienced. But unless we mean by "the rational" simply what has been empirically discovered, or what is convenient for (or is hoped by) animals like ourselves, Reason does not enjoin upon existence, or upon theories of existence, any degree of repetition, or of the lack of it.

Many would prefer to call the trait we have just discussed simplicity, rather than coherence, since the simplest and the most complex of worlds would be equally self-consistent. But of such simplicity we do well to take Whitehead's advice to seek it but distrust it. Certainly no degree of simplicity, or of its opposite, is intrinsically more or less intelligible than any other.

That reality, as reasonable men can conceive it, must be *continuous* is another maxim which has been interpreted in various senses and defended by contemporary rationalists. The crucial question would seem to be what is meant by continuity and discontinuity. If it is asserted that what reason requires is some sort of existential continuity of processes, whether or not there is also continuity in their patterns or qualities, the assertion is, in one sense, an indefeasible truism. For, if we conceive time as Aristotle did, and as most of our contemporaries do—not as flowing irrespective of events, but simply as the flow of events or some of their relations,—

then it would not make sense to speak of events as interrupted by a gap of empty time. If anything interrupts a course of events it is other intrusive events, and that means that the course of events goes on continuously, and not that it is discontinuous. But such a principle of continuity plainly could not rule out any jerk, shift, or deviation, however violent—except only the "jerk," "shift," or "deviation" *so* violent as to be no event at all, that is, like the Fichtean absolute deed-act, to be incapable of occurring.

Finally, some of our contemporaries represent it as a metaphysical principle, needed for science but established by Reason, that all events must be causally related. This principle I have examined at length elsewhere. It is hard to see that anyone has made out, let alone defended, an alternative to the Humian analysis of events and qualities as in fact linked as regularly as and as intimately as they may be, but as constrained by no rational (or any other) necessity to persist in such linkage, to avoid certain conjunctions, or even to occur at all. All of us expect, and most of us hope, that events will go on. But there is no principle, certifiable by Reason I, II, III, or IV, or by anything else, that requires any event to have a successor, let alone one related to it in a way that would justify our calling it, not just a successor, but an effect. If one means by "causal pattern" just any pattern of concomitance or succession whatever, then, if there are events, they must be causally related. If one means by "causal pattern" some one specific sort of pattern distinguishable by some trait or factor from other patterns, then neither Reason nor anything else requires events to happen in that specific sort of pattern. They may occur in any pattern. And what is more, all events may cease. But that is one eventuality none of us needs to worry about.

We have now discussed three questions. The first was, Can Reason II and III, or anything else distinct from Reason I and IV, justify men in developing their opinions by scientific method as against any of its alternatives? The justifications offered are two. First, it is reasonable to employ scientific method because thus we reduce the number of our mistaken opinions about matters of fact, and increase the number and scope of our probable opinions. But the fact of such reduction and increase can be established only by scientific investigation, that is, by Reason I. Moreover—and here is

the rub,—for those who accept scientific method such a justification is gratuitous; and for those who do not accept scientific method it is irrelevant. Second, it is said to be reasonable to employ scientific method in forming our opinions because we have thus improved, and may further improve, man's estate. Disputants who agree, however roughly, on what is meant by "human good" can proceed by scientific method, but hardly by reason in any other sense, to determine the probable effects of advances in science and in technics upon what they call human good.[27] But those who do not agree upon what is meant by "human good" would necessarily find all the results of Reason I, II, and III quite ambivalent and entirely indecisive for the justification of scientific procedures in terms of their effects on human good. Reason IV, that is, informed appreciation and evaluation, is thus the pivot upon which the justification of Reason I, II, and III, and their results, turns.

The second major question was, then, Can reasoning establish agreement upon what is good for man? Reason I, II, and III, that is, scientific investigation joined with logic, mathematics, and critical analysis, have sometimes *in fact* been accompanied and followed by increased agreement concerning what is good. But convergent social pressures, education, and propaganda have apparently had a much larger rôle in producing and increasing such agreement. Reasoning as logic, science, and philosophical analysis, while it may cause (i.e., be followed by) such increased agreement, cannot demonstrate the validity of a value judgment, cannot determine what we ought to agree in prizing as humanly good. For any "demonstration" that any sort of act or object is good has a single meaning and has validity only for people who use "good" in a somewhat similar sense, or whose purposes are fairly convergent. Thus, reasoning has to beg the fundamental question here, or frankly to assume it and not demonstrate it, in order to establish agreement on any opinion about the sorts of acts and objects that are better or worse than others.

The third question we have considered is, If reason cannot validate scientific procedure, does it positively or negatively determine

[27] An admirable example of such an investigation is offered by the report of the Subcommittee on Technology to the National Resources Committee, "Technological Trends and National Policy" (Washington, D.C., 1937).

the formal traits of hypotheses which may reasonably be made and tested? We have seen that reason has been said to rule out actually contradictory hypotheses, but only so far as actually contradictory hypotheses suppose nothing and explain nothing, however important they may be as symptoms, or influential as propaganda, or provocative as stimuli to thought, feeling, or imagination. But if Reason II and III rule out contradictions, they can give no indication whatever of which member of a contradictory function—or which of any other propositions—ought to be supposed or believed. Reason has been said to enjoin hypotheses which represent nature as coherent, continuous, and causally ordered. But if any specific degree or kind of relation or quality is intended by any of these terms, then neither reason nor anything else can establish that nature *must* exhibit it. Our knowledge, and our probability judgments, on the question whether or not specific coherences, continuities, or causal patterns do in fact prevail in nature, are all established by Reason I, and not by a reason distinguishable from Reason I but controlling, regulating, directing, or validating it.

These results largely determine what we can say of the Appeal to Reason when it is made in behalf of, or in attack upon, one moral or political program or another. It is probable that the factors relevant to such matters are always very much more numerous, more complicated, and more variously interactive than we know. Nevertheless, it is usual to find neglect of such relevant facts and probabilities as have been established by Reason I in the arguments by which men defend (or attack) moral rules, institutions, and practices. For example, most of us are now convinced that the whole treatment of women in medieval Europe (sanctioned as it was by the highest authorities in Christendom, and approved today in some increasingly influential quarters) was associated with opinions about the limits of women's tastes and capacities which were quite as mistaken as was the opinion that the velocities of falling bodies vary directly and proportionately with their densities. But whatever men may by Reason I discover to be the facts or the probabilities about the scope of women's abilities as compared with men's, Reason I, II, and III cannot determine on that basis whether men *ought* to give unusually generous privileges to women to compensate them for their great or little disabilities (or to compliment

them on their superiority), or impose such severe restrictions upon them as were recommended by the medieval theologians, by John Milton, by Spinoza, by Sir William Blackstone, by Immanuel Kant, Dr. Goebbels, and others.

Whether it is reasonable to be reasonable in sense IV—whether it is best for man to respect science, to develop his tastes in the light of information, to hold all his judgments on political institutions, as well as upon the subject-matter of the natural sciences, tentatively and subject to alteration, to sympathize and coöperate with his fellows in the advancement of such activities and the spread of such attitudes, to be kind and honest and "decent"—is a question to which Reason I, II, and III offer no answers. And those who do in fact prize and serve Reason IV do not thereby justify it. They simply are in fact reasonable in this sense, and to some extent their activities tend to spread such reasonableness among their fellows, although also, no doubt, to sharpen in some respects the opposition of those who hate Reason IV. They are confronted in our times, as they have been in most historical ages, by powerful zealots—now in the churches, again in civil government—who say that when racial or national destiny, or Allah or Jehovah, calls to great adventure, it is only the fool or the pedantic coward who remains reasonable in sense IV, who inquires what will be the consequences for life and health and the sciences and arts, or who judges the adventure by such consequences. It will do no good to tell such zealots that they are taking tremendous risks, that their enterprises may fail, or destroy their people or humanity. It is the very distinction of all so-called Absolute Goods, of all alleged Absolute Imperatives, that they must be served, they must be obeyed, even though the heavens fall, let alone the earth's inhabitants perish. For Absolute Goods and Duties are regarded as being their own standards, as justifying themselves and all else that can be justified. Failure and destruction in service of them is held to be a greater victory than any that could be won by neglecting them.

Hence, the predicament of the defenders of Reason IV resembles that of the zealots they oppose much more than they like to admit. For they cannot justify Reason IV by itself, nor yet by Reason I, II, and III. They can only point to the agreement, and try to increase the agreement, that prevails in fact among some men: the

agreement that life is better than death, provided we live lovingly and fairly and happily, provided some of us have the training and opportunity to explore space and time as scientists and historians, and to perceive and imagine (and express our visions) as artists, and provided all of us have the chance and the training to share not only in bread and work and play, but also in the information and insight and delight which the sciences and the arts afford. These are all *dreadfully* vague words, and the extent to which men agree in what they mean by them and in prizing what they mean by them is certainly variable, and probably never very great. But it is only to the extent that men do in fact thus agree that Reason IV exists at all, and that Reason I, II, and III have any relevance to the question, What ought we to do?

Neither as science, nor as logic, nor as philosophical analysis, can Reason demonstrate what men should agree in valuing, or even how much or how little agreement is desirable. Too little agreement may lead to the destruction of all men in the *bellum omnium* (a destruction which the Tolstoi of the *Kreutzer Sonata* would probably have called good, since he thought human life had become an incurable blemish upon Creation). Too much agreement may lead to a sterile (however classical) monotony. But there is no way by which Reason I, II, or III could determine the right mean, or even give meaning to "the right mean," between the too much and the too little.

Are we, then, in the predicament in which Hobbes and Spinoza and Hume thought they found us? Do passions and habits set our ends, and are social institutions (whose intricacies are little understood) a hundred times more influential than Reason (whether I, II, III, or IV) in determining the patterns of human feelings and habits? It was the great rationalist, Spinoza, who offered as a theorem of his *Ethics* (Pt. IV, Proposition VII) the principle that *only* a contrary and stronger emotion can alter or replace a troublesome emotion. To be sure, in the further development of his philosophy Spinoza describes Reason as able to dispel conflicts of passion, but only by eliminating passions altogether. But such elimination would eliminate all distinction between man and the world that he would (as rational) adequately know, that is, would eliminate man. For, "It is *impossible* that a man should not be a part of

nature, and that he should suffer no changes but those which can be understood through his own nature alone, and of which he is the adequate cause. Hence it follows that a man is *necessarily* always subject to passions" (*Ethics,* Pt. IV, Proposition IV and Corollary).

We do not know enough to begin to estimate the causal efficacy of Reason I, II, and III upon men's reasonableness in sense IV. All readers of Santayana will remember his cynical comments upon philosophical reasoning as much more likely to give a man skill in defending his prejudices than to develop in him a more humane judgment. All who remember the War of 1914–1918, and Santayana's own interpretation of it, will find it hard to discountenance his cynicism. The spectacle of the leading philosophers of Germany, England, France, and America—with a few never-to-be-forgotten exceptions—glorifying fighting (on their respective sides, of course) as the surest, and the rationally justified, way of defending the human spirit and its riches: scientific method and conscience, the fine arts, social justice, "the eternal values"—that spectacle, when all the results of historical and psychological science supported the probability that fighting, on any side, would mainly damage all these goods, must sober any defender of Reason I, II, and III who happens also to be a lover of Reason IV.

Did reason, did the science of the seventeenth and eighteenth centuries, and the criticisms of Voltaire and Hume, give us the milder reformers of the nineteenth century as against the savage zeal of the self-righteous Cromwells and the partisan leaders of the Thirty Years' War? Did the persecution of opinion and the torture of Quakers and witches flourish in New England a hundredfold beyond what it did in the Middle Colonies because there was less science, less reasoning, in New England, or because the closer balance of numbers and power of opposing sects and factions in the Middle Colonies made none of them so safe and inviting a target for the sadism and the persecuting zeal which are pretty easily developed in any men (particularly those frustrated by many restrictions)? Was it a lack of science, a lack of reasoning, or was it the violent shifting of economic and political pressures, that changed in half a generation one of the most science-loving and science-practicing of all modern nations into a nation whose

university rectors (as well as political leaders) publicly flout objective science and its methods, as well as plan their policies on the basis of ethnic theories which violate all scientific findings? Or is Reason, after all, as powerful as her confessed lover, M. André Tardieu, boasted, when time after time he rejoiced in Clemenceau's triumphs at Versailles over Lloyd-George and Wilson on questions of reducing penalties, by such sayings as "Reason has resumed her rights"?[28]

It cannot be much comfort, except to Aristotelian contemplatives and other tower dwellers, to realize that whatever (even the worst) we may come to know about the prosperity or the eclipse of reason, we shall still know by the scientific study of processes (i.e., by Reason I), aided by symbolic devices more or less clearly defined and convenient (thanks to the activities called Reason III and II).

But the examination of philosophical views about Reason, and about the need and the validity of Appeals to Reason, however indispensable, is fortunately preliminary. It is by the historical study and the philosophical interpretation of the concrete activities and achievements called science, morals, fine arts, and history that we may learn most about the functions and the promise of reasoning, whether in the senses considered in this essay, or in any others. And it is through such more interesting studies that subsequent lecturers in this series are to guide us.

[28] Quoted by G. P. Gooch in his *History of Modern Europe* (New York, 1923), p. 689.

ARTIFACTS OF REASON

BY

J. LOEWENBERG

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IT IS NOTORIOUSLY difficult to draw the line marking the fixed boundaries between nature and art, yet there is one distinction that applies to them which we are justified in making at the outset. The products of nature, we are persuaded, have a non-human origin and habitat; the products of art, on the contrary, are objects of human intent and contrivance. A sunset in the sky is one thing, a sunset painted on canvas is quite another. We do not hesitate to call one sunset natural and the other factitious, the terms "natural" and "factitious" denoting the difference between what is produced without human agency and what is produced by means of it. Whatever we think of as not made by man—mountains and seas, plants and animals—belongs to nature; the things created by man—his pictures and statues, his buildings and songs—pertain to art. It would be sheer perversity not to recognize as valid the common distinction between the facts of the world that do not owe their genesis to man and those which issue from his creative endeavors.

I

What does not owe its genesis to man may well be called a fact. A fact, if we take the word in its etymological sense, is something made or done. It is the result of some process. Whatever be the terms in which we express this process, we may speak of it as natural if we conceive of it as contingent and unintended. As ordinarily used, the word fact is elliptical: it is a name for something appearing in nature as a consequence of operations unlike those involved in the creation of a work of art. A fact is a fact, we say; it occurs or happens, not by design or purpose, but in accordance with such laws of motion and action as science may describe or explain. Hence the stubbornness of a fact: it is independent of human desire and volition. Now, a work of art is also a fact, in the general sense of something made or done, but the maker or doer is here a conscious artificer from whose intention or purpose the finished

product derives its individual form or design. The activity is that of a human agent. Nature, though it produces trees and birds and men, does not build cathedrals or compose symphonies. A work of art is a fact of a peculiar sort, and there is a suitable name for it. A work of art is an artifact. The word indicates that it *is* a fact, but a fact created by man and not by nature.

The expression artifact, being a compounded one, is singularly felicitous. Applied to any object belonging to any of the fine arts, it signifies a type of factuality at once natural and human. A marble statue, for example, has a double source. The origin of the marble is not the same as the genesis of the statue. Nature produces the marble, man creates the statue. Or, to put the same thing negatively, man cannot make the marble, and nature does not construct a statue. A marble statue exemplifies two incommensurable sorts of creativity: the marble involves a creative process radically different from the creative process represented by the statue. We may speak of the one as mechanical and of the other as purposive. Whatever form a piece of unhewn marble exhibits need not be ascribed to a creativity intentional in character. To do so would be sheer anthropomorphism. Science has taught us to banish final causes from nature. We must leave it to science to account for the process creative of the marble in such terms as its methods prescribe, and its methods definitely proscribe teleological categories. But the statue hewn from the marble, when the activity of hewing is not automatic or random, is the embodiment of a selective interest and a conscious aim. Unlike the marble out of which it is fashioned, the statue as statue requires for its description and interpretation reference to final causes. Not to invoke final causes here is to abandon the empirical distinction between a natural fact and a fact of human construction. If we designate the latter as an artifact, we do not remove it from nature; we install it there as a special kind of fact, not beginning to exist until a purposive activity has been consummated, and continuing to exist as the expression of that activity.

Artifacts, though made by human artificers, have a definite relation to the natural facts out of which they are formed. Facts of nature constitute their raw material. The raw material for any artifact, such as the statue's marble, loses in the artifact its raw-

ness but not its materiality. Marble, whether unhewn or hewn, has the same physical properties. And yet the identity of their physical properties does not lead us to identify an artifact with a natural fact. What belongs to the statue that does not belong to the marble? An artifact has an aspect which (for want of a better term) may be described as ideal. In the statue the marble undergoes transformation in shape and design in accordance with ideas and purposes of the artist. The shape or design exhibited by a statue is never found in the natural marble until a human sculptor has realized his intent. And of the same natural marble a variety of ideal objects may be constructed; they are ideal in the sense of assuming the impress of the minds of different artificers. All artifacts, whatsoever their raw material, are objects of this peculiar kind: they are natural facts expressive of the selective interests and conscious aims of individual minds. Artifacts, in short, are neither entirely physical nor entirely ideal. They are physico-ideal. What they are made *of* is derived from nature, what they are made *into* depends upon deliberate efforts of men.

The description of artifacts as physico-ideal enables me to discern two principles involved in their construction. I am in the habit of calling them the principles of *acquiescence* and of *transformation*. To acquiesce in the natural material chosen for transformation and to transform the natural material into something ideal are complementary acts of the artificer. He cannot transcend the materiality of his material, but he is free to alter its natural aspect or pattern. No musician can induce stones to sing, and by lifting his voice a sculptor is unable to add one cubit to his statue. Acquiescence in the materiality of his material remains for every artificer a principle he cannot violate. An artifact always retains the given material out of which it is formed. What the artificer does is not to create a new nature. He creates a new dimension of it, as it were, by forcing the facts of nature to echo or to image his interests and his meanings. Such creative transformation of natural material is the principle through which facts become artifacts. They become expressive of different ranges and depths of human experience and valuation. New objects—natural facts serving as vehicles of ideas and ideals—issue from this happy marriage of acquiescence and transformation.

We may speak of the union of acquiescence and transformation as the synthesis of limitation and freedom. The architect or musician, for example, is indeed constrained to work within a natural medium of definite scope, yet no boundaries can be set to his freedom to construct or compose his material in accordance with such design or form as his imagination is intent upon. Every artifact exemplifies natural limitation of material and human freedom of construction. A finished artifact, though embodying the intentions and interests of a creative mind, is in a literal sense an *embodiment* of them: it requires for its production a corporeal or physical medium which the artificer cannot transcend and in which he is compelled to acquiesce.

But there are degrees of acquiescence and transformation. Not all the arts contain them in the same proportion. The more limited the natural facts available, the greater the curb on the freedom to turn them into artifacts. In the increasing pliancy of their respective materials, the artifacts of architecture, sculpture, painting, music, and poetry constitute a definite order. The material in which the architect must acquiesce remains as material almost unchanged in the finished product, but the material with which the sculptor works undergoes, as such, alteration in appearance. The architect builds, the sculptor molds. And the transformations wrought by painter, musician, and poet gain proportionally in range and scope, each acquiescing less and less rigidly in the natural state of the material requisite for the creation of his artifact. Remoteness from the natural state of the material is characteristic of every artifact, but since the remoteness is a matter of degree, it may serve as a basis for ascribing to the different arts a plausible hierarchy.

Distance from the naturalness of the material has its degrees also within each of the arts. Between one school and another the difference frequently consists in the extent to which the principle of acquiescence is carried. Photographic artifacts, those that bear a close resemblance to the facts found in nature, typify the highest degree of acquiescence. The less representative or reproductive the artifact, the more pronounced the activity of transformation. And acquiescence may be so attenuated that the resulting artifacts manifest but formal or chaste abstractions. But between the extremes of acquiescence and transformation within each of the arts

lie all possible gradations, and artificers are free to decide which of the two principles merits their greater allegiance.

What I have said so far is neither new nor striking. Works of art are indisputably factitious, taking the word to signify that which is made by man, in distinction from what is produced by nature. A sonata or a sonnet, a cathedral or a picture, a rug or a statue—these are certainly artifacts. They belong to the world of nature if we denote merely the materials they are made of, but reference to creative minds is necessary if we consider what these materials are turned into. Artifacts manifestly enjoy a double status: they are physical, and they are ideal. Contrived of the stuff or substance provided by nature, their construction is under the control of ideas and purposes bred in the mind. Having their genesis at once in nature and in mind, works of art obviously owe their being to the acts of acquiescence and transformation. Artifacts, presupposing as they do raw material out of which they are fashioned, are subject to the natural limitation of their respective media: artificers are constrained to adapt themselves to the natural stuff or substance upon which they *impress* their creative forms and designs. But artifacts, being objects in which the material has undergone transformation, are embodiments of human interests and values: artificers are free to adapt the stuff or substance of nature to what they desire to make it *expressive* of. What will suffer to bear the impress of minds is prescribed by nature; what to express through the circumscribed media of nature is dictated by the genius of man. All artifacts exemplify the freedom of human agents to transform what they are under the necessity of acquiescing in. And although no artifact is possible which is not the result of acquiescence and transformation, artifacts differ in the degree in which either principle is made to predominate. All this can hardly be gainsaid when the discussion is confined to such objects as pertain to the domain of the "fine arts."

II

But human works, exemplifying in various degrees the acts of acquiescence and transformation, are not exclusively those which constitute the realm of the "fine arts." Science and metaphysics are precisely such human works. They are likewise factitious. They

are produced by men and not by nature. They, too, are artifacts. Reason is the artificer that transforms the crude data of experience into conceptual patterns or structures, proved to be true or valid descriptions or interpretations of them by such rules of evidence or such methods of demonstration as only reason can devise. The simplest logical pattern or structure, which no science or philosophy can do without, is a judgment, but a judgment is essentially something that only a mind can make. But if the mind is the maker of judgment,—be the judgment categorical or hypothetical, universal or particular, affirmative or negative, attributive or relational,—a judgment embodies no less the constitution of the mind making it than the facts or the data about which it is made. Even a single judgment is an artifact: it is a synthesis of acquiescence and transformation. It presupposes a content outside the judgment to which the maker of it must adapt himself, but the content is in turn adapted to the mind's formal mode of utterance. Content and utterance are inseparable but distinguishable elements in every judgment. There is no judgment until a mind makes it, but a judgment said to be true or false must be about something other than the terms of discourse of which the judgment is composed. Whatever be the standard to which one appeals for the determination of a judgment's truth or falsity, it is a standard formulated by the mind. Mind is thus not only the maker of judgment, but also the maker of the criterion to which the judgment is amenable. There must be canons of verification produced by reason before any utterance about any content may be accepted as true or rejected as false.

If this holds of any single judgment, it holds with still greater force of any series or system of judgments. No particular science or philosophy falls within the purview of a single utterance. A science or a philosophy is a "body" of concatenated judgments in which data are marshaled to support theory, and theory is propounded to interpret data. Such a "structure" of rational discourse about data agrees perfectly with my definition of an artifact: it is produced by man out of material to which he must conform. This can obviously not be denied when, instead of speaking of science and philosophy as such, we select particular instances of these disciplines, such as the works of Newton or Darwin, of Plato or Spinoza. They are works of individual men of genius, representing

the same synthesis of acquiescence and transformation as do the paintings by Botticelli or the symphonies by Mozart. Intellectual artifacts, the published works of scientists and philosophers, are "compositions" as much as are those of painters and musicians. That they are compositions in a different medium does not alter their status as artifacts. They, too, are fashioned of some pliant material, and they also express the ideas and persuasions of human artificers. And just as in works of art the raw material of which they are made loses its rawness but not its materiality, so in scientific or philosophic products the crude data upon which they depend forfeit their crudity but not their givenness.

Between the compositions of works of imagination and the compositions of works of reason there is no difference in principle. Aside from the fact that no indelible line can be drawn in the human mind to separate "imagination" and "reason," all artifacts being in some measure beholden to both, the possibility of tracing an analogy between the fine arts and science and philosophy rests upon the interplay of the acts of acquiescence and transformation to which as artifacts they owe their construction. If I speak of reason as the artificer of science and philosophy, it is because the structures proffered in their name are intended to be explicitly intelligible. They are composed of judgments, and judgments are discursive transformations of prediscursive data of acquiescence.

I have on several occasions made use of the distinction between "preanalytic" and "postanalytic" data, the former being given *for* analysis, the latter *through* analysis. The distinction is a relative one; the postanalytic data of one inquiry may become the preanalytic for another. But, though relative, the distinction is fundamental; it marks the difference between the *initial* content of a specific science or philosophy and the *terminal* reconstruction of it by means of hypothesis or theory. The distinction may, however, be criticized as misleading; it tends to lay undue emphasis on the process of analysis. Analysis of an initially given theme is indeed indispensable, but it is not the sole act of reason involved in the construction of a specific science or philosophy. Accordingly, though retaining the double sense of the term datum, specifying what is given initially and what is given terminally, I am now in the habit of distinguishing between data of acquiescence and data

of transformation. The former are what the mind conforms to, the latter are what the mind adapts to its own operations. This manner of stating the distinction has the advantage of indicating with some precision the analogous status of all human artifacts. Thus, the stones of a building or the pigments of a picture may be spoken of as data of acquiescence, the finished composition in any medium is a datum of transformation. Stones or pigments are given for construction, the building and the picture are given through construction. The artifacts of reason, represented by particular sciences and philosophies, exemplify the same duality of givenness. They are given through the agency of human artificers when appropriate data of acquiescence become transformed into concatenated judgments.

What are the data of acquiescence presupposed for the construction of science and philosophy? What is the raw material of which the artifacts of reason are the data of transformation? The answer is obvious, concerning the fine arts: their data of acquiescence are the familiar objects of common sense—stones and bricks, marble and bronze, pigments and sounds. Out of these initial data human individuals create new terminal data, the artifacts of architecture, sculpture, painting, music, and poetry. Now, the data of acquiescence requisite for the judgmental structures of science and philosophy are likewise the things we encounter at the level of ordinary experience. The word "nature" as employed by common sense is a summary name for the "stubborn facts" we habitually run up against and cannot run away from. Their stubbornness seems indefeasible so long as we are just aware of these facts without being aware of doing anything to them. But the stubborn facts of common sense are also plastic. They are experienced as plastic by creative minds; in noetic artifacts the facts of nature appear to adapt themselves to various hypotheses and theories. As transformed by science and philosophy, the word nature ceases to be a vague and compendious name for whatever happens; it represents a causal order or a stratified structure of things and events. The plasticity of facts, manifest in works of art, is no less evident in works of reason. A historical survey of science and philosophy shows that the same stubborn facts of common sense have served as initial data for the incommensurable hypotheses and theories

constructed by different intellectual artificers. Human reason, like human art, has found these facts pliant enough to be transformed into a variety of noetic structures. The possibility of human artifacts, whether aesthetic or noetic, embodying as they do the interplay of acquiescence and transformation, rests upon the two polar characters which the facts of common sense are experienced to possess, namely, stubbornness and plasticity.

The various degrees of acquiescence and transformation noted earlier in connection with the fine arts correspond to the various degrees of stubbornness and plasticity exemplified by the facts of common sense. The extent to which transformation may be carried in any of the arts depends upon the pliancy of the raw material. The arts may be ordered, as we have seen, in accordance with the relative stubbornness of their data of acquiescence. Thus architecture, sculpture, painting, music, and poetry may be said to form a definite hierarchy. And we have seen also that within each of the arts gradations are possible in the direction of greater or less acquiescence in the data available for transformation. May we not discern similarly varying degrees of stubbornness and plasticity in the data of acquiescence requisite for the artifacts of reason? Do the artifacts of reason represent an analogous order in the direction of minimal and maximal transformation of the objects of common sense that constitute their initial raw material?

It is tempting to apply to scientific and philosophic artifacts the same distinction germane to the various arts. In general, there is less remoteness from the "naturalness" of the material in scientific than in philosophic artifacts. Scientific constructions are closer to the objects of common sense than are philosophic. They are, as the saying goes, more "empirical." Their data of acquiescence are accordingly more stubborn. But their stubbornness is a relative matter since they possess, as they do, a plasticity enabling scientific artificers to adapt them to different hypotheses and theories. We must never forget that scientific hypotheses and theories are bred in the human mind. They must prove themselves fit and apposite in accordance with a standard that reason lays down as canonical. The standard which has acquired a canonical status in science is agreement with the observed and observable facts of nature. But the facts of nature about which hypotheses and theories are

"framed," and framed by "reasoning" minds, are initially nothing else than the pretransformed data of acquiescence found to be stubborn at the level of common sense. *Given* facts the stubbornness of which is attested by common sense, and *taken* as canonical a standard for testing the validity of hypotheses and theories regarding them, scientific artifacts in discursive form may be constructed in which the facts of nature are both empirical and rational. The empirical origin of the facts is retained, since they are given *for* construction, but they yield to what can only be given *through* man's constructive efforts, namely, patterns of discourse expressive of reasoned hypotheses and theories. However empirical a science is said to be, however faithful it remains to the data of acquiescence drawn from common sense, it is nevertheless an artifact of reason, something in which the facts of nature undergo transformation by taking the impress of man's refined concepts and categories; and no matter how far conceptual or categorial refinement is carried in any science, the refinement is always that of the crude data of acquiescence with which it must begin and which it cannot transcend. The union of stubbornness and plasticity which characterizes the material of any work of art is a characteristic also of the data involved in the artifacts of science. And so far as these artifacts have for their data the specific and denotable objects of common sense, they resemble those works of art in which freedom of construction is limited by the relatively low degree of plasticity of their material.

All scientific products, however, are artifacts constructed of materials possessing *some* degree of plasticity. The extant sciences, from astronomy to psychology, bear witness to the power of human reason to utilize facts for the construction of artifacts, the extent of the construction being determined by the plasticity of the data as well as by the genius of the individual artificer. But since any scientific artifact is a reasoned structure of which the given material is limited in range (being, if astronomy, systematic discourse about perceived stars and, if psychology, systematic discourse about observed behavior), its data of acquiescence always retain in it their specific nature. The very names of the particular sciences epitomize their adherence to the specific data they are constructions of; physics and chemistry, botany and zoölogy, and all the

other "natural" sciences, are special disciplines, and their votaries are called specialists, because special areas of experienced things and events furnish their raw material.

Metaphysical artifacts, unlike scientific artifacts, are, as the French say, *global*. Their data of acquiescence are less limited and of greater plasticity; consequently, the transformations to which they yield are more numerous and more varied. The facts used for metaphysical construction, though facts of common sense, are not drawn from any special field; and, without losing their initial factuality, they accommodate themselves to the different processes of refinement and synthesis applied to them by minds intent upon universality and wholeness. The data of acquiescence with which metaphysical hypotheses and theories begin undergo such consummate transformation that the continuity between the raw material and the finished product is not so definite or obvious as it is in scientific artifacts.

Shall I be deemed guilty of a frivolous *jeu d'esprit* if I venture to compare scientific artifacts with architecture and sculpture? As in these two arts the relation between the material given for construction and the artifacts given through construction is intimate and direct, the natural forms and structures of the former being to some degree conserved in the latter, so in the contexts of scientific artifacts the facts of common sense preserve to a certain degree their original integrity, since they are not only the occasions for reasoned hypotheses and theories but also the means of their verification. Metaphysical artifacts bear a closer resemblance to music and poetry. Compositions in the medium of sound and speech seldom incorporate in their finished patterns the original grossness of their materials. There is here no reduplication of the actual combinations and sequences of sounds and words. The artist does not deploy his sounds and words as they are heard in the course of ordinary experience. He deploys them in unfamiliar and unique formations, and he deploys them to convey interests and meanings essentially remote from those of common sense. In architecture and sculpture the transformed material retains its original rigidity; in music and poetry the material, being intrinsically more fluid, surrenders the stubbornness it manifests to common sense. In metaphysical artifacts we have analogously structures of

discourse involving data of acquiescence of maximal fluidity; consequently, metaphysical transformations, under the guidance of global hypotheses and theories, are at a greater distance from common sense than the transformations of science.

III

It is human reason as artificer which produces both the several sciences and the sundry types of metaphysics. But whereas in constructing the former it proceeds vertically, in creating the latter it moves horizontally. The basis of each of the sciences is a limited region of observable data, and the hypotheses or theories framed are framed solely with reference to that region. The different sciences represent, as it were, separate vertical bodies of knowledge the horizontal boundaries of which, though often shifting, are definitely marked. There is little confusion between their respective data and methods. Stars and organisms, for example, are separate phenomena; the specific procedures employed by astronomy are accordingly not pertinent to biology. But if each science operates with its selected data in a vertical direction, its aim being fastidious acquiescence in the material requisite for the construction of a special artifact, each type of metaphysics expresses the interest of reason in the horizontal order of things, in their spread and continuity. It is possible to take a wide sweep of things beyond the superficial boundaries drawn by the various sciences. A horizontal view, when sufficiently prolonged and intense, may discern in all specific things a homologous nature, and in all particular events a universal rhythm. Of things and events thus discerned the artifacts of metaphysics are the systematic interpretations. They have a cognitive value of their own, not competing with scientific artifacts, since they operate in a different dimension. There is rivalry, not between metaphysics and science, but rather between particular metaphysical artifacts, each claiming global validity for its horizontal conception of things.

There is thus difference but no antithesis in cognitive value between scientific and metaphysical artifacts. Vertical and horizontal interests are not antagonistic. A vertical body of knowledge is compatible with any horizontal survey of things, however great the incompatibility between one horizontal view and another. This

may be illustrated in various ways. The traditional metaphysical artifacts called materialism and mentalism represent not different, but antithetical global conceptions; each is an interpretation of the nature of things in their total horizontal extent. Matter and mind, taken as metaphysical categories, are *pervasive,* the resulting doctrine being either panphysicalism or panpsychism. Everything is corporeal as in Hobbes, or everything is immaterial as in Berkeley, so that the ordinary distinction between mind and matter becomes specious, since ultimately one is the other in disguise. Yet these mutually exclusive views, in which the horizontal boundaries of things are obliterated in favor of a radical monism, do not affect the vertical bodies of knowledge composed of the data of acquiescence drawn from common sense. Physics and psychology remain distinguishable sciences, distinguishable alike by their specific data and particular procedures, regardless of the ingenious reductions wrought by metaphysical monism. Physics need not alter the mode of treating the phenomena germane to it, even though they are conceived to be composed of the same stuff as mind; and whatever strict behaviorists may say (and as strict behaviorists they are metaphysicians who proceed as if mental phenomena were reducible to physical), the phenomena reduced by them do not cease to be conscious states and acts as experienced by everybody *in propria persona.* For nonbehaviorists, psychology is still what its name implies, a science of mind. A science, being a cognitive structure of special contents, does not forfeit its specific data when a metaphysical artificer shows them to be generically continuous with those of every other science. The interest in the generic is no substitute for the interest in the specific; one is complementary to the other. But different generic views are indeed irreconcilable. If the specific data of all the sciences are looked upon as belonging to the genus matter, they are obviously precluded from being regarded as pertaining to the genus mind.

The same is true of all other opposite genera which exemplify antitheses in horizontal conceptions. Mechanism and vitalism, atomism and organicism, evolutionism and eternalism, taken as global theories, are in perpetual conflict; each world hypothesis, however, concerned as it is with the generic identity of things, does not deny the specific differences with which the particular

sciences are preoccupied. The phenomena of biology, for example, are not those of chemistry; from the point of view of each science the distinction between living organisms and dead substances is indefeasible. The pronouncements of metaphysical mechanists or vitalists notwithstanding, the specific difference between an amoeba and a drop of water cannot be abolished. Yet the search for generic continuity between the animate and the inanimate is not meaningless. Each may be analyzed in the terms of the other, and each may serve as a principle of global unity. Whatever horizontal categories dominate the structure of metaphysical artifacts, they do not disturb those specific differences of things upon which the vertical artifacts of science are based. The production by human reason of vertical and horizontal artifacts simply shows that the data of acquiescence derived from common sense are plastic and suffer restricted as well as comprehensive transformations.

Metaphysical transformations, being comprehensive or global, have therefore a cognitive value of their own, not to be confused with that of the limited or special transformations of science. To judge the cognitive value of metaphysical artifacts by the canons of criticism relevant solely to scientific artifacts is as fatuous as to judge the aesthetic value of music and poetry in the terms of principles borrowed from architecture and sculpture. What art cannot achieve in one kind of medium, it may effect in another. Lessing in his *Laokoön* urged this point long ago. What he said regarding the need of separate principles of criticism in relation to the different genres of art has equal pertinency to the distinctive artifacts of science and metaphysics. In order to understand the distinction of their cognitive value, we must briefly allude to the two traditional views of truth that are often put forward as antithetical rather than complementary.

The two views are usually spoken of as "correspondence" and "coherence." It is a mistake to regard them as mutually exclusive. It seems clear to me that truth is a property of judgment, and that judgment is an utterance about some content. Content and utterance, though distinguishable, are inseparable aspects of judgment; to make good its claim to truth, not only must any judgment agree with the content of which it is the utterance, but also the utterance must at least be consistent with itself. And since knowledge,

in the pregnant sense, is never a matter of isolated utterances about atomic contents, the judgments that are its vehicles must exhibit internal consistency as well as agreement with a profusion of data. The knowledge embodied in a specific science or a particular philosophy is an assemblage of statements about a multiplicity of contents, and its truth lies neither in its logical integrity alone nor in its transcendent reference alone, but in both together. Of all judgments it can be said (adapting the words made familiar by Kant) that without coherence they are "blind" and without correspondence they are "empty."

Although the desiderata of coherence and correspondence are regulative for all judgments, be they scientific or metaphysical, it is possible to look upon one as more determinative than the other. In the vertical artifacts of science, correspondence is a more important desideratum. For the vertical structures of reason take their rise from common sense, they rest upon its objects, their aim being to transform through intensive refinement and extensive correlation the specific data provided for initial acquiescence. But the transformation, no matter how far it be carried, must carry with it precisely those data of acquiescence which define and limit the vertical structures, much as architecture and sculpture carry over their natural material into their respective constructions. Between the raw material and the coherent artifacts made of them there is a perceived congruity; the factitious forms imposed upon stone and marble, through the process of building and hewing, are not discontinuous with their natural forms. The finished products agree with that out of which they are produced. Correspondence here means strict conformity of artifact to fact. The correspondence between any science and its data must be understood in an analogous manner. No science transforms its data, however subtle the refinement or intricate the correlation, without ceasing to conform to their "empirical" status. Data do not lose their empirical significance, such as they have for common sense, when they are analyzed into their constituents or adapted to differential equations. Whatever is done with data, or done to them, their continuity with the scientific transformations effected must remain unbroken, the demand for such continuity being expressed by the word "correspondence."

In the horizontal structures of metaphysics correspondence becomes attenuated in favor of coherence. Metaphysics cannot, of course, neglect correspondence any more than science can disregard coherence. In metaphysics, however, correspondence is a notion of greater elasticity. It is a relation which is, so to speak, "saltatory" rather than "ambulatory"; the data selected for acquiescence serve as means for a conceptual leap to the global nature of things. But it is not a leap in the dark. In the metaphysical artifact of materialism, for example, the physical bodies of common sense and of science, which are its data of acquiescence, are so transformed that they come to represent the paradigm of all existence. That the homologous substance of all things is physical or material cannot be proved by the scientific method which exacts that reason in formulating a hypothesis ambulate from some specific data suggesting the hypothesis to other data said to verify it. The notion of a unitary substance is the result of a saltatory feat of reason; the term "matter," after a refinement of its ordinary denotation, is made to connote the reality behind the diverse appearances between which common sense and science erect horizontal boundaries. The cognitive value of metaphysical materialism depends upon the power of reason to skip these boundaries and to organize into a coherent body of judgments a view of the world dominated by a single conception. The same saltatory capacity of reason is exemplified by metaphysical artifacts governed by other universal ideas. Are all things intrinsically vital or mental or rational or purposive? These terms, initially borrowed from common sense, undergo a subtle refinement; and by means of them reason ultimately jumps across the boundary lines of appearances and exhibits in coherent structures the global unity of all existents.

In attenuating correspondence and in perfecting coherence, metaphysical artifacts resemble the compositions of music and poetry. The latter are not ruled by the same strict conformity to their materials as are compositions in stone or marble. Architecture and sculpture retain the rigidity of their pretransformed data of acquiescence. Music and poetry, however, impose upon their data, which are sounds and words, structures and forms remote from those which they manifest in their natural or precomposed state. The correspondence between a building or statue and

its material is so palpable that any person can immediately perceive it; the correspondence between a sonata or sonnet and its material is too distant for direct perception. The musician and poet may so transfigure given sounds and words that they acquire altogether new qualities or sequences. A leaping imagination ranges among their variety and heterogeneity, selecting those for combination into coherent structures that will adequately embody its creative intent. Continuity *with* the raw state of the material is here reduced to a minimum; what matters is the continuity *between* the sounds and words as segregated and organized, and in this continuity consists aesthetic coherence. What aesthetic coherence is to music and poetry, logical coherence is to metaphysics. The cognitive value of the latter, as the aesthetic value of the former, lies in the adequacy with which the data of acquiescence, essentially discontinuous in their actual state, are made to yield up their discreteness through mutual assimilation under the dominance of a central idea.

Correspondence, as pertinent to both aesthetic and noetic artifacts, thus signifies continuity *with* the actual state of the data of aquiescence chosen for transformation; coherence, on the other hand, means continuity *between* the transformed data *within* each constructed artifact. The relativity of this distinction is obvious, since every artifact, in being a structure, must satisfy the demand for coherence, and, in requiring material for construction, must fulfill the condition of correspondence. But, as we have seen, not all artifacts exhibit the same degrees of correspondence and coherence. Among the "fine arts," architecture and sculpture exemplify a greater degree of correspondence, and music and poetry a greater degree of coherence. And, in general, the vertical artifacts of science are more amenable to the standard of correspondence, while the artifacts of metaphysics are more subject to the standard of coherence.

But it is only "in general" that science and metaphysics may be thus distinguished. There are variations in science as well as in philosophy. The contrast discerned between one type of art and another applies also to the individual works within each type; analogously, the contrast between science and metaphysics extends likewise to the specific structures of either. There are sciences that

emulate philosophy in their speculative sweep, and there are philosophies that mimic science in their servility to the empirical method. All artifacts are the resultants of acquiescence and transformation, but the proportion of these two factors varies from artifact to artifact.

Consider the art of painting. How shall we classify it? Does the painter's art require an acquiescence in the material as exacting as that of the architect or sculptor, or does it permit transformations of material in the same free manner as practiced by musician and poet? Are painted artifacts more cognate with scientific or with metaphysical products? The art of painting shows in a striking way how variable are the degrees of acquiescence and transformation. For painted artifacts, though made of pigments, are not expressive of pigments. Acquiescence in the nature of pigments is, of course, a necessary condition of painting, but its artifacts derive their significance from the transformations to which given pigments lend themselves. And into what can they not be transformed? The configurations to which they supply the means may range from faithful representations to pure abstractions. Representative paintings conform to experienced facts and situations; abstract paintings bear no resemblance to objects or persons such as are commonly perceived. The former exhibit continuity *with* actual or specific subjects having the definite form and color found in nature; the latter, more or less remote from nature, show but continuity *within* their formal structures and designs. We judge one kind of painting by correspondence, another kind by coherence. Those artifacts which we value chiefly for their correspondence are rearrangements and refinements of what can be ordinarily cognized; those which we appreciate mainly for their coherence manifest greater detachment from common sense and greater freedom of conception. In other words, representative paintings are analogous to the operations of science, abstract paintings to the constructions of metaphysics.

Atlhough compositions in any medium may vary considerably from the "representative" to the "abstract," in painting the variations have more elastic limits. Moreover, the terms representation and abstraction, as applicable to painted artifacts, have a sense which is markedly close to the sense of the terms correspondence

and coherence by which we may distinguish scientific artifacts from metaphysical. For what are representative paintings representative of? Are they not representative because they correspond with the perceived or perceivable objects of common sense? The more representative a landscape or a portrait, the more "empirical" its subject-matter. And the more abstract the arrangement of pigments on canvas—that is, the less empirical the theme—the greater its distance from the perceived or perceivable objects of common sense, its "meaning" consisting not in verifiable correspondence with them, but rather in the internal coherence of its structure and design. The art of painting, so obviously capable of greater or lesser fidelity to the empirical method, shows how ludicrous is the demand for a uniform procedure for the creation of aesthetic values. The aesthetic values that accrue from the acts of representation and abstraction are admittedly different. Equally different are the cognitive values that result from faithful analysis and description of the facts of common sense and from the speculative transformation of them by means of global hypotheses. In general, as I have said, science and metaphysics aim at such different cognitive values. But just as within the art of painting all degrees of representation and abstraction are possible, so likewise within science and within metaphysics we may have varying degrees of adherence to the objects of common sense.

IV

The analogy between aesthetic and noetic artifacts, upon which I have dwelt at such length, is justified only if the data of aquiescence required for both are understood to coincide with the facts of common sense. All artifacts presuppose given facts of which they are transformations; the same perceived or perceivable stones, for example, may serve as data alike for architecture and geology. There is here identity or similarity in the empirical material used; the difference lies in the use made of it. We must not confuse objectives and objects. The objectives of architect and geologist are indeed dissimilar—one constructs buildings *with* stones, the other constructs theories *about* them. Yet the objects in which both must initially acquiesce are the familiar stones of our ordinary experience. These common stones constitute the bedrock, as it were, with

which or on which architecture and geology build their respective structures. And whatever the artifacts, the "facts" upon which they depend are those which we encounter as preconstructed at the level of common sense.

But are the facts of common sense truly preconstructed? To this fundamental question two answers are possible.

One answer is that the facts of common sense have an unalterable status independently of the specific objectives pursued by human art and human knowledge. Taken by themselves, apart from the artifacts to which they contribute the material, they are data of pure acquiescence. Prior to their transformation by human artificers, the facts of common sense possess their natural characters and relations, natural in the sense of being nonfactitious. Facts are facts; they owe nothing to hypotheses and theories bred in the mind. And although they serve as raw material for art and knowledge, their rawness must not be understood as synonymous with indeterminateness. Natural facts are indeed amenable to the refining processes of art and knowledge, but these refining processes do not create a determinateness not given antecedently. The meaning of aesthetic and noetic artifacts lies in their "material reference," that is, in their reference to the objects as given to perception and observation. In all art and knowledge, we can but *re*-construct what we find, and what we find we do not make. Without reference to experienced things and events, having the determinateness vouched for by common sense, artifacts are purely formal. Formal artifacts, such as abstract paintings or speculative discourse, are undeniably factitious, but they have no meaning, being nonrepresentative or tautologous, that is, lacking in positive content. Positive content is always empirical content, and empirical content is always what is given or what is found. We may thus distinguish between significant and nonsignificant artifacts; the former, whether aesthetic or noetic, are those which embody the denotable and determinate facts falling within the purview of an artless experience.

The other answer is that the facts of common sense have a determinateness to which constructive activities of the mind have added their increments. What we call common sense is not so artless as it appears. It grafts its persuasions upon all the objects it encounters. It injects its beliefs in all its perceptions. Its observa-

tions are commingled with its conjectures. For common sense is not a mere sensorium. The conception of a *tabula rasa* for pure facts to leave their impressions upon is a tortured inversion of actual experience. Experience from which the constructive work of the mind is absent, assuming its possibility in the infant or the imbecile, is not experience in the pregnant sense of the term. Experience at the level of common sense is just the reverse of this. At that level all perceptions are blended with judgments. What is common in common sense is a consensus of judgments regarding the nature of facts, judgments which practice and convention have made canonical, and which remain canonical until superseded by those of science and philosophy. The facts of common sense are thus not pure facts, but facts assimilated with the domesticated judgments taken on faith, that is, taken without awareness that they are questionable. It is the office of criticism to question them, and this criticism, undertaken by science and philosophy, leads to refinement or attenuation both of the facts which common sense acquiesces in and of the standards governing its acquiescence. The point is that common sense is not a mere patient in the presence of its objects, it is also an agent. It makes judgments concerning them, and these judgments, though inept or fallacious, are in their operations analogous to those to which the artifacts of science and metaphysics owe their construction. Common sense, therefore, is itself a kind of artifact; the same human reason which produces the artifacts of science and metaphysics is at work in the consensus of judgments called common sense. The recognition of common sense as an artifact is the recognition of its true continuity with science and metaphysics.

Of the two answers suggested, the second seems to me more adequate. To measure the cognitive value of science and metaphysics by standards borrowed from common sense—and this is to read continuity in the wrong direction—is to saddle empiricism with incorrigible paradoxes.

The acceptance of common sense as indefeasibly canonical involves the dogma that our ordinary perceptions are clairvoyant or that our stereotyped judgments are infallible. What a preposterous dogma! Yet what else than this dogma can justify the choice of a single criterion for the cognitive value of all scientific and philo-

sophic statements? The "empirical reference" of these statements, as the sole criterion of their "meaning" or "significance," is said to be reference to determinate "facts," found by an awareness which is not aware of doing anything to them. Clearly, such an empiricism, the source of all cognitive value, places the results of reason in a curious dilemma: if significant, they produce nothing; if creative, they mean nothing. Since the positive content of science and philosophy is the empirically given, the determinateness of which common sense finds but does not make, the function of reason is limited to the analysis or the clarification of it, but in no way can reason claim to be constitutive or determinative of the facts or objects amenable to its logic. Reason is positive as long as its concepts and propositions embody in symbolic form objects found or facts given; it ceases to be positive when it fails to reinstate or to rehabilitate the preanalytic data of common sense. If reason liberates itself from these data, constructing coherent systems of discourse in which their initial status undergoes radical transformation, and a transformation not subject to "empirical verification," then reason is indeed creative, but creative solely of a mere play of symbols or words. Such creative works of reason are then asserted to be tautologous or meaningless: they are but definitional or dialectical artifacts, affording perhaps emotional satisfaction to those who produce them, but having no cognitive value whatsoever. Primary cognitive value must thus be accorded to the statements of common sense because they alone are about experienced data. The cognitive value of scientific statements is derivative, depending initially as well as ultimately upon the statements of common sense—initially, because scientific statements are mere refinements or extensions of those of common sense, and ultimately, because nothing but empirical data, which are data of common sense, can give them a verified status. It follows with relentless logic that no cognitive value can be ascribed to metaphysical statements if they transcend those of common sense. The statements of common sense, being always canonical, must never be subverted or replaced. If we subvert or replace them, we sacrifice the only sure basis of cognition, namely, the factual data which these "empirical" statements are assumed to report.

In the light of this apotheosis of common sense, which usurps the

name of empiricism or positivism, the part that reason must play in human cognition is ineluctably prescribed. In an *a priori* manner (though the term has a strange sound in connection with this theory) empiricism or positivism lays down the law for the permissive and the prohibitive uses of reason. With the aid of a universal principle—*the principle that the data of common sense must remain inviolate*—this theory draws in advance the boundaries between science and metaphysics. Science, however abstract in procedure or refined in technique, consists of material propositions, and these are statements about denotable "matters of fact" or "states of affairs"; and these reiterated words, if an ostensive definition of them is demanded, can signify nothing else than the objects of common sense. Reason as exemplified in science has accordingly no other function than to explore the determinate matters of fact or states of affairs that are given to observation and analysis. And what of metaphysics? *A priori,* there is no justification for such a discipline. If its propositions are about matters of fact or states of affairs, metaphysics can add nothing to science. It is a sort of supererogatory duplication of science, generalizing on insufficient evidence, and transcending the limits set by the inductive method. But if metaphysics lays claim to a cognitive value of its own, professing to give an insight into the nature of things not amenable to "empirical verification," the propositions in which such insight is couched are unmeaning, since the only propositions that are *a priori* declared to have meaning are those which contain as their objects of reference or of application the data of common sense. Metaphysics thus becomes by definition poor science or pure verbiage, to be eschewed by those who, weary of the futility of dialectic, take refuge in palpable facts. Are those who engage in metaphysics, and who claim nonempirical validity for their propositions, incorrigibly deluded or perverse? It would seem so. By a strange irony, sanity is to be sought in *ontophobia,* in fear of metaphysics, and salvation in *methodolatry,* in worship of the empirical method.

The ontophobia of positivism, which is a consequence of its methodolatry, shows what happens when the function of reason is limited *a priori* to an exploration of the data of common sense, as if these data had a determinate nature altogether free from ra-

tional ingredients. If we are to avoid the paradoxes of positivism we must entertain a different view of the continuity between common sense and the artifacts of science and metaphysics. The continuity, if I may say so, is not factual, but artifactual. Science and metaphysics are continuous with common sense because common sense also represents, though in rudimentary form, a synthesis of acquiescence and transformation: its data are not pure data, but data saturated with judgment and theory. Common sense differs from science and metaphysics not in kind but in degree: it is crude science and roughhewn metaphysics. The same human reason that produces our explicit noetic artifacts is operative in the consensus of implicit judgments called common sense. The description of common sense as an artifact is designed to repudiate the view that there is a level of human cognition completely passive and artless. The *intellectus ipse* (to use a Leibnizian expression) which builds the vertical structures of science and the horizontal systems of metaphysics is the source of the consensus of judgments antecedent to them and requisite for them.

But if common sense is an artifact, differing only in degree from the artifacts of science and metaphysics, what is the raw material out of which it is fashioned? The raw material of science and metaphysics, we have maintained, consists of the objects of common sense, and these are not pure data but data assimilated with a consensus of judgments. What are the data for such a consensus of judgments? Here we come face to face with a prevalent ambiguity, that between preanalytic and postanalytic data. Properly speaking, data in the preanalytic sense are the *objects* of common sense, since the *explicit* or *overt* activity of reflection, in science and metaphysics, starts with them and starts from them. Initially data of acquiescence, they become transformed through the labor of reason. And this constructive labor of reason is simply a conscious prolongation of what takes place at the level of common sense. At that level, objects already represent a fusion of data and judgments; but these data are not preanalytic, but postanalytic. These data are not given for analysis, but through analysis. The analysis of any denotable object of common sense, such as a chair or a table, enables us to distinguish between a sensory content and a judgmental act. Here we must recognize as valid the principle that to

distinguish is not to separate. Both the sensory content and the judgmental act are given together; only criticism can discern them, and theory may allocate each to a different source.

This conception of common sense requires the revival of the ancient distinction between the sensible and the intelligible. The sensible and the intelligible aspects of knowledge, both postanalytic, are inseparably commingled in all the objects of common sense. The very term "common sense" felicitously expresses the union of the sensible and the intelligible. Common sense involves both a "sensorium" and a "consensus": its data are common, not because they are equally "sensed," but because they are similarly "judged," and similarly judged by a common reason operative in all recipients of sensory stimuli. The cognitive mind, never reducible to a mere sensorium, is patient as well as agent; what it is constrained to acquiesce in becomes transformed in accordance with its own rational nature. Without this interplay of acquiescence and transformation there can be neither science nor philosophy, for these are essentially artifacts. And it is my contention that, if common sense is more than a mysterious sensorium for the passive reception of indubitable facts, then common sense is likewise an artifact, an extant fusion of data and judgments, impressions and interpretations, sensible contents and intelligible forms.

If common sense is an artifact, it is an artifact of spontaneous rather than deliberate reason, and hence the illusion that reason is not creative in its construction. The distinctions which common sense discerns between its objects—between their qualities and relations, similarities and differences, specific natures and uniform sequences—are thus alleged to be passively observed, distinctions found but not made. I am at a loss to understand such an allegation. All distinctions, I submit, are distinctions of reason. This is obviously true when the distinctions are scientific or philosophic. Only reason can establish the distinction between veridical and nonveridical observations, between valid and invalid inferences, between adequate and inadequate hypotheses, between true and false theories. Without such distinctions, *made by reason,* in accordance with which the objects of common sense are interpreted, all science and philosophy would go by the board. The elaborate artifact called positivism, for example, would be meaningless with-

out the *a priori* distinctions in terms of which it is constructed—distinctions between facts and words, propositions and definitions, experience and logic. Whatever distinctions are made by common sense are likewise produced by a common reason. Some of them are retained in the artifacts of science and philosophy because they are intrinsically rational; and if others are rejected, they are rejected only because they are unable to withstand the assault of criticism.

Since common sense is an extant artifact of spontaneous reason, it is the inevitable starting point for the more explicit artifacts of science and philosophy. From common sense we may depart in two directions. One direction is forward and the other is backward. In the vertical structures of science and in the horizontal systems of metaphysics, we have a progressive extension or prolongation, a radical refinement or transformation, of that consensus of judgments about the world which reason in common sense is spontaneously building. We are able to pass forward beyond common sense without breach of continuity with it because common sense is an adumbration, as it it were, of the rational work of science and metaphysics. But when we raise the question of the nature and constitution of common sense we must go behind it. The distinction between its sensible and its rational components is the work of logical analysis; and to account for the relation between these components, and for the conditions of their interaction, requires special theories. In the artifacts of epistemology, those depending for their data of acquiescence upon the artifactual results of biology, psychology, and anthropology, we have reasoned attempts to trace the genesis of common sense. Viewed in reverse, common sense is indeed amenable to different hypotheses regarding its structure and evolution, but these hypotheses must start from the same consensus of judgments about the world presupposed for the construction of any and every noetic artifact, be such an artifact a special science, a definite metaphysics, a particular epistemology.

V

I rest my case ultimately on an "empirical" consideration. No one can dispute the "fact" that there are numerous aesthetic and noetic works produced by human artificers. A science or a philosophy is

as much a human creation as is a painting or a symphony. Because aesthetic and noetic works are constructed by human artificers, we are justified in describing them as artifacts. But all artifacts, whether aesthetic or noetic, presuppose some raw material out of which they are fashioned. According to my view, the raw material for both types of artifact consists of the objects of common sense. These are the initial data of "acquiescence"; the finished works represent "transformations" of these data. All artifacts thus exemplify a synthesis of something "given" and something "made" of it.

We may speak of noetic constructions as artifacts of reason, distinguishing them from the artifacts of imagination, because they involve the explicit exercise of judgment, and the explicit exercise of judgment is for me essentially an exercise of reason. But the distinction and relation between imagination and reason constitute a special problem. Committed as I am to the view that the human mind is continuous in all its functions, I should reject a "compartmental" theory that would draw too sharp a line between reason and imagination. Whatever their line of demarcation, all artifacts are to some extent embodiments of both. But this is not my chief point.

The analogy between aesthetic and noetic artifacts rests on the interplay of acquiescence and transformation to which both types owe their origin and significance. The analogy is undeniable if the data of acquiescence requisite for any artifact are equated with the objects of common sense. But what are objects of common sense?

The burden of my thesis is the view that the objects of common sense are themselves "artifactual," that they owe their status to a spontaneous fusion of acquiescence and transformation. What is common in common sense is a common reason exercising identical judgments upon diverse impressions that continually invade our private sensoria. Such a common reason or a consensus of judgments is a necessary presupposition of all articulate and communicable experience. If we conceive our common judgmental acts suspended or eliminated, objects of experience cease to be objects and become instead discrete and ineffable impressions of a supposititious patient for whose pathological state the correct name is "solipsism." Solipsism is a good illustration of a hypothesis con-

trary to fact; it describes the plight from which each of us would suffer in the absence of a common reason operative in all cognitive minds. The common reason which is implicit in common sense is the explicit agent of all the artifacts of science and philosophy. Hence the continuity between common sense and the more overt artifacts of reason. The continuity is in the direction of greater intelligibility. We may think of this continuity in either of two ways. We may think of common sense as containing science and philosophy in embryo, or we may think of science and philosophy as being ripened versions or deepened persuasions of common sense. In either case, what is continuous is human reason as artificer, the maker and builder of noetic structures.

If our noetic structures are artifacts, what, it will be asked, are we to understand by the nature of existence or reality apart from its transformations by human reason? What are the intrinsic attributes of being? The ontological problem is indeed fundamental: it is immanent and imminent in all cognitive endeavors. Knowledge is nothing if not ontological. Its reference to the real is twofold: the real is its prior object, and the real is its ultimate objective. But the status of the real, whether as prior object or as ultimate objective, is a question with which reason alone can grapple. Many noetic artifacts have been constructed in which the status of the real has received different interpretations. The conception of the real *minus* these human interpretations is a legitimate one, but it is a conception of reason, arrived at by a process of difficult abstraction. The preinterpreted real is the independently real, conceivable as substance, as that which exists in itself. I have defended on other occasions the legitimacy of such a conception. If a self-existent substance is the preinterpreted real, the assumption that its nature is identical with the nature of reason might well be regarded as a fallacy which perhaps no other could equal in pathos. Yet the judgments we make about it, if intended to have cognitive value, are judgments of reason. For better or for worse, reason remains our court of appeal even against reason's extravagances. We cannot go behind or beyond reason without reducing cognition to sentience. And sentience, whether stupid or ecstatic, is indeed acquiescence, acquiescence pure and absolute and silent. All noetic artifacts, however, bear witness to the indefatigable labor of reason.

That there are differences between them, radical and irreconcilable, does not mean that the labor is vain. These differences but prove reason's fertility. They show that the quest for intelligibility is an irrepressible ideal of the human mind, and that this ideal admits of various kinds and degrees of approximation.

REASON IN SCIENCE

BY

V. F. LENZEN

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IN THE HISTORY of thought reason has generally been viewed as the supreme activity of mind. Through rational processes the raw material of experience is molded into knowledge. The function of reason in knowing is analysis and synthesis; the ideals of reason are most adequately realized in a science founded upon principles.

Professor Loewenberg has characterized science as an artifact of reason. The present essay attempts a demonstration of that thesis by an analysis of the methods and structure of exact science. Exact science is exemplified by mathematics, which in its several fields has achieved the form of a deductive system based upon postulates. Theoretical physics, in that it is expressed in the language of mathematics, has also achieved this deductive form for large realms of natural phenomena. Physics as a doctrine about nature is founded on experience. An adequate study of rational activity in the development of science must therefore reveal the relation of reason to experience. The word experience is ambiguous: in its narrow sense, experience is awareness of the bare data of perception; in its broad sense, it includes constructive interpretation in addition to awareness of the given. If experience is understood in the broad sense, one may declare that rational factors occur in all common and scientific experience. In this essay I shall exhibit the interdependence of reason and experience in science. We shall see that, while reason constructs science, experience controls the origin of rational principles. The central problem may be formulated in the question, How is mathematical knowledge of nature possible?

A preliminary statement of this problem may be given in terms of accounts of two classical solutions, those of Plato and Kant. Plato rejected the possibility of a rational science of the world given in experience. The objects of science must have precise and fixed properties, but the physical things experienced in perception are in a state of flux. The object of science consists of the universal

forms, or ideas; mathematics notably is a doctrine of knowledge of ideal forms. The forms, which are known by reason, are assigned to a supersensuous realm of conceptual objects. Science is made possible by endowing its objects with a transcendent status; the changeable perceptible things of common experience derive their nature from participation in the eternal forms. Since particular things only approximately exemplify the forms, the mathematical representation of natural phenomena is impossible. Thus, the traditional Platonic doctrine explains the possibility of exact science by limiting it to conceptual objects. Kant, on the contrary, offers a positive doctrine which acknowledges the constructive function of reason. Reason constructs the objects of mathematics in the pure intuitions of space and time, and it constructs the objects of natural science by applying the pure forms of the understanding to the manifold of presentations in space and time. Pure natural science is possible because nature is constructed by the application of *a priori* forms of reason in the synthesis of the manifold given in experience.

As I have already stated, it is the purpose of this essay to study the activity of reason in the development of empirical science. Of especial value for the study of rational factors in scientific method are the periods in which fundamental scientific concepts have been fashioned or transformed. Such a formative period was that of ancient Greece in which science and philosophy were founded. In the seventeenth century the mathematical representation of macrophysical phenomena was placed on a firm basis, and in the present era the extension of this method to microphysical phenomena is being worked out. We shall obtain insight into rational activity by an analysis of these transitional periods.

I

It has been traditional to declare that the ancient Greeks initiated rational inquiry in the Western world. Hence an examination of this creation of science, of the problems raised and of the solutions proposed, should reveal the activity of reason. Let us therefore study the transition from primitive thought to science and philosophy which was accomplished in the creative period of Greece.

Science did not originate in Greece out of nothing; the rational

activities of these ancient thinkers emerged out of a matrix of common sense and primitive religion. Primitive man acknowledges the existence of things which are experienced in perception. The predecessors of the early scientists described common things—witness the descriptions in the *Odyssey*—and knew how to measure distance, time, and weight. Primitive man also uses a crude principle of causality as an instrument of explanation. Animism and the elaborate system of mythology, which may be said to have endured up to this skeptical era, gave an anthropomorphic explanation of natural phenomena. In these processes of perception, description, measurement, and explanation there occurs, implicitly or explicitly, an element of reason. The character of reason, however, is especially exhibited in the creation of science. In founding science and philosophy in Europe the Greeks introduced systematization into the cognitions and procedures of daily life. For example, out of crude observations of the perceptible properties of things they created theories concerning the nature of things. The fundamental assumption of such theories is that the essence of things may be embodied in diverse modes. The Milesians assumed that there is one primary stuff out of which things are made, that a unitary nature constitutes the essence of all things. Thales, for example, taught that the primary stuff is water; this means that what we ordinarily call water exhibits most directly the essence of primary matter. Solids and gases are different states of aggregation of water, arising from the normal state of water by transformations, such as condensation and evaporation, which affect only the outward characteristics. Thus there is one substance which exists in many forms.

The theories of Thales and his immediate successors are not sufficiently detailed. Ice and steam may be interpreted as arising from water by freezing and evaporation, respectively, but we cannot explain other things as arising from water by the same processes. From the school of Thales the development of the theory of matter proceeds in two directions. One direction is toward greater analysis. Thus, Empedocles taught that there are four elements, earth, air, fire, and water, of which things are composed. Aristotle's analysis yielded the four qualities, the hot and the cold, the dry and the moist. The ultimate limit of analysis is expressed in the

qualitative atomism of Anaxagoras, the doctrine that there are as many different elements as there are kinds of thing. The other direction of the development in the theory of matter may be derived from the Milesian conception that different things result from different states of aggregation of one primary stuff. This suggests the hypothesis that the perceptible qualities of things are explainable in terms of the spatial arrangement of primary matter. The Pythagoreans correlated the pitch of a musical tone emitted by a vibrating string with the length of the string. Democritus explained sensory qualities as the effects of spatial arrangement and motions of the atoms in the void. In modern terms, secondary qualities are thereby reduced to primary qualities. Plato characterized the various elements in terms of different geometrical figures. Such reduction of qualities to certain primary ones was subordinated in the ancient world to qualitative analysis. But the method of reduction was revived in the modern era and was interpreted in terms of a mechanical conception of nature.

The Greeks founded European science by their theories concerning the nature of things. They also invented the form in which a science is ideally expressed, namely, the deductive system. A deductive system is based upon principles and definitions from which the propositions of the science can be derived. The process of deduction is a typical example of rational activity. In the passage from hypotheses to conclusions, from postulates to theorems, from general principles to particular propositions, we may study reason at work. The Pythagoreans appear to have created mathematics as a deductive science in applying the method of deduction to geometry. The Egyptians had known isolated propositions, but it was these early Greek philosophers who first investigated the rational connection of geometrical propositions. The classic example of a deductive system has been Euclid's geometry. The value of this creation is demonstrated by the significance of Archimedes' Statics, Newton's *Principia,* Classical Thermodynamics, Electrodynamics, and so forth. In these theories reason has condensed a science into the principles of a deductive system.

But it is not my purpose to discuss the theory of deductive systems. Deduction merely reveals what is implicitly contained in the hypotheses. Through the transformations, combinations, and sub-

stitutions which characterize deduction the content of the hypotheses is exhibited in the conclusions. In a sense, deduction does not present us anything new. In this essay I am primarily interested in the process of discovery of new principles which are applicable to experience. I am interested in the logic of discovery rather than the logic of deductive systems. My problem is reason and its function in constituting scientific principles.

II

From a study of the Greek physicists we observe that science is characterized by the analysis of things and the explanation of their properties. Science is based on analysis and synthesis. The first process expresses the abstractive function of reason, the second its constructive function. The function of reason is also expressed in the form of science created by the Greeks, namely, the deductive system based upon principles. Of especial significance for our study are the processes whereby the principles of a deductive system are determined. I shall particularly consider principles which represent the results of experimental science in mathematical form. What is the genesis and nature of the principles of a science which applies to nature?

How can experience give birth to rational principles? As we shall see, the significant step in the development of principles is the transformation of generalizations from experience into postulates. These postulates may be interpreted as the definitions of characters of perceptible things, or as principles of construction of the concepts of objects which are assumed in order to explain experience. Either way, postulates become principles of interpretation of new experiences.

There are thus two phases in the genesis of principles, abstractive and constructive. The abstractive phase is exemplified by the creation of the theories of classical physics. In this field I have called the transformation of generalizations into definitions the method of successive definition. This process is best exemplified by the creation of Newtonian mechanics in the seventeenth century, and by the subsequent developments of theories of heat and electricity. But the process may also be illustrated by statics and geometry, which were created by the Greeks. Since I wish to stress the sig-

nificance of the Greek contribution to science I shall begin with the two latter examples.

The possibility of interpreting the principles of a physical theory as definitions may be exemplified by statics. Archimedes created statics as a deductive system, adopting as a fundamental assumption the restricted principle of the lever. This principle states that if equal weights are attached to the respective ends of a lever with equal arms, the lever will be in equilibrium. From this and other assumptions Archimedes derived a principle of the lever for unequal arms. What is the epistemological status of Archimedes' fundamental principle? He assumed that the principle is self-evident; but Mach contends that it is a generalization from experience. In order to test whether the principle is an experimental result, let us examine how one could verify it. For this discussion I shall assume that we know how to measure length. In order to construct a lever one would choose a straight rigid rod of uniform cross section and place it on a fulcrum so that both lever arms are equal in length. One would then hang equal weights from the respective ends of the arms and observe that the lever remained horizontal, thereby verifying the restricted principle of the lever experimentally. But now I should like to ask the experimenter how he knows that the two bodies attached to the respective ends of the lever are equal in weight. He could reply that the two bodies were both stamped with the same number, for example, 100, indicating the mass in grams. Since weight is proportional to mass, the two bodies are equal in weight. But how does the experimenter know that the weights have been accurately calibrated? He may reply, "They were obtained from a reliable instrument maker." Granted that the maker was honest and accurate, how does he know that he should stamp the same number on both bodies? I think that if one observed the maker in his workshop one would discover that he employed a beam balance in order to test the equality of the weights of two bodies. In other words, the instrument maker employed the restricted principle of the lever as a definition of equality of weight, which is embodied in the balance. If he now declares that the two bodies are equal in mass, he employs as his definition of mass its proportionality to weight. Archimedes, however, operated with the concept of weight, so that his principle is a definition

of equality of weight. Of course, one could use another definition of equality of weight, and then the principle of the lever would be an experimental law. But the alternative definition would presuppose the employment of some other principle of mechanics as a definition. Our discussion must now be completed by describing the empirical basis of the principle of the lever. Since the principle has been inherited from antiquity, it requires careful analysis to discover the basic generalization from experience. The empirical law is that if two bodies maintain one lever in equilibrium, they will maintain all others in equilibrium, regardless of position, length, material, color, and so forth. Archimedes recognized that this empirical law had been transformed into a postulate which defines equality of weight in statics. The self-evidence which Archimedes attributed to his principle is a consequence of its status as a definition in the statics which he constructed. In general, the quality of self-evidence is likely to indicate a definition.

In the preceding example the purpose was to emphasize the status of principles as definitions. In the succeeding discussion I wish to explain the development from empirical generalization to definition. Our first illustration will be the concept of rigid body as it occurs in metrical geometry. We initially assume as given the concept of practically rigid body. Such bodies are exemplified by the sticks, stones, and other solids of common experience. In anticipation of geometrical analysis we assume that it is possible to distinguish points on a solid body. Now, two points on different bodies may be brought into coincidence. I must initially assume that the concept of coincidence is understood. We may then discover empirical laws for coincidence, such as the law that coincidence is a transitive relation. If A is coincident with B, and B is coincident with C, then A is coincident with C. This law may be confirmed only approximately, but we transform the laws for coincidence into postulates which define the precise coincidence of ideal points. This is our first level of abstraction.

Two points on a solid determine an interval. The end points of an interval on one body may be brought into coincidence with the end points of an interval on an adjacent body. If the two bodies are displaced together, the coincidence of points is preserved. If one interval is displaced and then returned, the coincidence may be

restored. In view of these empirical results we declare that the two intervals are congruent, that the distance between their end points is the same. The concept of distance between two points is thus introduced as an expression of these empirical laws of coincidence of end points of intervals. This is our second level of abstraction.

We must extend the application of this concept by the assumption that two separated intervals are congruent if their end points may be brought into coincidence. Hence, separated distances may be judged to be equal.

One may next define a straight line and then construct geometrical figures such as triangles and parallelograms. But it is beyond the scope of this analysis to describe the many geometrical structures. It is sufficient for our purpose to note that the propositions of Euclidean geometry approximately describe the spatial properties of the rigid structures of common experience. The propositions have been condensed into a set of postulates. Our third level of abstraction is attained when we transform these postulates, which were initially a generalization from experience, into an implicit definition of the properties of an ideally rigid body.

The implicit definition of rigid body by Euclidean geometry is clearly expressed in the postulates of Pieri, in which the notion of rigid displacement is assumed as a primitive idea. The term rigid displacement means that an interval undergoes the same kind of displacement as a rigid body. The concept of distance is introduced by the definition: Two intervals are congruent if there exists a rigid displacement which transforms one into the other. The postulates, which are expressed in terms of the concept of displacement, thus constitute an implicit definition of rigid body. Metric geometry may also be characterized by a group of transformations. The propositions of metric geometry state the properties of figures that are invariant under any rigid displacement. The rigid body of Euclidean metric geometry is then defined by the statement that its properties remain invariant under translation, rotation, reflection, and the similarity transformation.

The creation of geometry and statics by the Greeks refutes the charge, which is frequently made, that their physics was purely speculative. It appears to me that the lack of appreciation of Greek physics arises from the failure to recognize that metric geometry

was originally a generalization expressing the spatial properties of solid bodies of common experience; it is a branch of physics which had been so completely verified in ancient times that there remained only the problem of molding it into a deductive system. In this form geometry appeared to have no dependence upon experience. The modern interpretation of the self-evident character of geometry is that its postulates define the fundamental concepts involved.

The Greek sciences of geometry and statics were restricted to fixed structures. It was not until the modern era that mechanics was properly generalized so as to describe motion. An adequate mechanics was first expressed by Newton's laws of motion. I propose to exhibit these laws as generalizations from experience which have been transformed into postulates defining the fundamental ideas of mechanics. A knowledge of geometry and the measurement of time are presupposed in the following. One may proceed in various ways, but I shall assume that we have given, as an example of force, the force exerted by a stretched spring, the magnitude of which is proportional to the stretch. One may apply this force to a solid body, and since the knowledge of geometry and time enables one to define and measure acceleration, one is able to discover that the body is accelerated. For the small speeds considered in classical mechanics the force is directly proportional to the acceleration; the factor of proportionality depends upon the particular body accelerated. This empirical law may now be transformed into a definition of an intrinsic property of a body, its mass. In this way we obtain the equation that force is equal to the product of mass and acceleration. Therefore Newton's equation of motion may be interpreted as a definition of mass based upon a particular kind of force. Having assigned a characteristic mass to every body, and assuming that the mass of a body is constant in different physical contexts, one may then vary the type of force and determine its magnitude from the equation of motion. The equation is thereby employed as a definition of force; force is an influence that accelerates masses.

The empirical basis for this new employment of the equation of motion is the fact that under constant physical conditions the same measure of force is defined regardless of the mass of the body em-

ployed. As the mass varies the acceleration also varies so that the same force is determined. Thus for a constant extension of the spring the force as calculated from the equation of motion is independent of the mass of the body accelerated. We have employed the equation of motion in one context as a definition of mass and in another context as a definition of force. The conclusion is that Newton's laws of motion may be interpreted as an implicit definition of force and mass in classical mechanics.

Our final illustration is the definition of the concept of temperature which expresses the degree of hotness of a body. Initially, the concept of temperature is based upon sensations of hotness and coldness; we may touch a body and declare it to be hot, warm, cool, cold, and so forth. But temperature as determined by direct sensory experience depends on the condition of the organism. Observation shows, however, that as the hotness or coldness of a body varies, some precisely measurable property, such as volume, changes. This empirical functional relation may be transformed into a definition of temperature. For example, one may define a scale of temperature in terms of the variation in volume of some substance such as mercury in glass. Using a thermometer which embodies this definition, one may discover the law expressing the dependence upon temperature of the pressure of hydrogen gas at constant volume. This law may now be transformed into a definition of temperature; indeed, the latter definition was embodied in the international standard thermometer. The law for the variation of volume of mercury in glass with temperature was then transformed from a definition into an approximate experimental law.

In the course of investigations into heat phenomena there has been accepted as an experimental generalization the second law of thermodynamics. A classical statement of this law is that heat does not flow spontaneously from a colder to a hotter body. From the foregoing statement one can derive Carnot's theorem, which states that all reversible engines working between the same temperatures have the same efficiency. Carnot's theorem furnishes the basis of the absolute thermodynamic scale of temperature, and consequently the second law of thermodynamics may be interpreted as a definition of temperature. Temperature is a variable that determines the direction of flow of heat. The thermodynamic definition

is preferable to those in terms of mercury or hydrogen, because it is independent of the nature of the working substance. The thermodynamic definition is founded upon a macrophysical law which, if we ignore fluctuations arising from its statistical basis, is universally valid. It is an experimental result that ordinary thermometers indicate approximately correct temperatures.

III

In the preceding discussion I described the abstractive activity of reason. The procedure was summarized by Newton in his statement that the properties of bodies should be derived from experiments. The results of experiments are expressed by generalizations which are transformed into definitions of the properties manifested in the phenomena. Initially assumed crude concepts are thereby replaced by more precisely defined concepts. But reason is not satisfied with abstraction; it also adopts constructive hypotheses. In the *Principia* Newton declared that he did not make hypotheses. Nevertheless, he did speculate in other contexts. I now propose to study the explicitly constructive activity of reason; we shall discover that reason employs principles to form the concepts of new objects. This constructive function is especially exemplified in the contemporary development of microphysics. In order to explain phenomena, principles obtained by abstraction are applied so as to yield new objects. In general, the acknowledgment of the existence of a thing presupposes the application of principles of interpretation to new data.

My first example is a problem in which the decision for construction has not yet been made; one may thereby clearly observe the constructive function of reason. Among physical phenomena is the emission of beta rays from a radioactive nucleus. Every source of beta rays has a well-defined rate of decay, but for each source the energy of the emitted beta particle varies continuously within wide limits. As Bohr has emphasized, this contrast of properties creates a problem. If energy were conserved in these processes, it would imply that the individual atoms of a given radioactive material were essentially different, and it would then be difficult to understand their common rate of decay. If, on the contrary, there is no energy balance, it is possible to explain the law of decay by assum-

ing that all nuclei of the same material are essentially identical. Bohr therefore has suggested that it may be desirable to give up the application of the principle of conservation of energy to nuclear disintegrations. But an alternative solution has been advanced through the hypothesis of the existence of a light neutral entity, the neutrino. A neutrino is assumed to participate in the emission of a beta particle so that there is conservation of momentum and energy. The new entity is required in order to preserve the universality of the principles of conservation. At the present time, while the issue remains undecided, we may clearly observe the function of reason in determining the constitution of the physical world. One is confronted by the theoretical choice of the acknowledgment of the existence of the neutrino or the abandonment of the application of principles of conservation to nuclear disintegrations. The process of deciding between these two solutions is a rational one, if there be reason at all. The decision cannot be made on the basis of the given data; there is a choice of interpretations in the light of ideals of reason.

In the hypothesis of the neutrino we may observe reason explicitly at work. I shall now discuss a series of examples in which the rational element becomes less and less evident.

One of the achievements of recent physics has been the construction of a theory of the atom. According to this theory the atom consists of a nucleus about which electrons are distributed in concentric shells. If we adopt provisionally the model of the atom in which electrons revolve around the nucleus under the action of an attractive force, we provide an image for the conception of the atom as possessing definable states of energy that are restricted by a quantum condition. As an electron makes a transition from one orbit to another, there is an absorption or emission of radiation the frequency of which is determined by the energies of the atom in initial and final states. The radiation emitted produces spectral lines upon some photographic plate, and from the serial order of the spectral lines it is possible to determine the energy levels of the atom.

The set of energy levels in the atom is an object of rational construction. These levels, or quantum states, were initially the object of a constructive hypothesis which served to correlate and predict

spectral data, but the hypothesis has been so often confirmed that an observation of spectral lines now seems practically a direct observation of the energy levels of the atom. Nevertheless, they were the objects of theoretical construction only a short while ago. One who has lived through the development of physical theory during the last two decades can realize that there has been a development from the active rational construction of atomic theory to the unreflective acknowledgment of these structures as real. What was initially indirect observation, consisting of measurements on spectral lines plus the theory from which they can be calculated, is now almost considered to be direct observation.

The observation of energy levels presupposes that we can observe spectral lines and may interpret them as the effects of radiation which travels from the atom to the plate. The principle required in this inference is less evident than the principles applied in observing the energy levels. To the spectroscopist, who reads the position of the cross hair of his instrument which coincides with, or covers, a spectral line, the observation is practically a direct observation of wave length. But he is applying without question the wave theory of light. The light which is interpreted to be the cause of the line on the plate is assumed in accordance with the maxim that one should interpret physical phenomena in terms of a principle of contiguous causality. Radiation may be introduced as that which produces lines on a photographic plate. We conclude from something visible, the line, to something invisible, the light. The light is not the object seen, but the cause of its existence. The rational factor is so definitely imbedded in a measurement on spectral lines that it is almost unnoticed. Yet at one time in the history of physics the employment of the hypothesis of light was a conscious rational process.

Let us now reconsider the hypothesis of the neutrino in the light of these other examples. It is frequently remarked by physicists that we have found no means of observing the neutrino directly. If the neutrino produced a scintillation on striking a screen it would be considered to be directly observable. But an observation using scintillations requires a principle of interpretation. If one should definitely accept the neutrino, one could view the observation of beta-ray emission as an observation of the neutrino through

application of the principles of conservation. If one used the concept of neutrino sufficiently, its indirect observation would finally acquire the status of a relatively direct observation like that from scintillations. Whether an observation is direct or indirect is a relative matter.

In the preceding account I have set forth the constructive function of principles in acknowledgment of the existence of the neutrino, of atomic-energy states, and of radiation. With each step the rational factor became less evident. But even less evident is the rational element which is presupposed in the perception of photographic plates and other apparatus. Thus far I have taken the process of perception for granted; we must now determine if there are principles of interpretation implied in the perceptual observation of common things. This is a primary level of knowledge; the acknowledgment of the existence of ordinary things is the first step in the development of science. I propose to show that perception, which is the fundamental kind of observation, involves a rational element that is almost hidden in perceptions of the familiar things of our environment.

The basis of the acknowledgment of the existence of things is perception. Perception gives a content, which I call an aspect in order to abstract from the circumstance of its being given. In addition to the given aspects of a thing we need to consider the aspects which are merely possibilities of experience. Through immediate experience, memory, and reason we discover that there are functional relations between aspects. An individual thing is a center of reference for a correlated set of aspects which characterize it and which may be given in perception. To give an example: the perception of a table may be analyzed into the immediate experience of an aspect of the table and the interpretation of that aspect as characterizing the table. In ordinary perception the process of interpretation occurs without reflection and may pass directly into action. But every perception involves a hypothesis that the given is significant of a thing of which most of the aspects are merely possible. The process by which perception refers beyond the given, even though it occurs without reflection, I shall view as a rational element.

The principle employed in determining the physical properties

of a thing is that the structure of things is manifested in the structure of aspects. This rule is made definite in metrical physics by the statement that the experience of contact of aspects signifies the perception of contact of the things which the aspects respectively characterize. In order to illustrate the employment of the latter rule, let us suppose that we are to determine the position of a particle at a given time. I shall assume that the particle moves along a scale which defines the frame of reference and that appropriately synchronized clocks are placed at points on the scale. The observation is as follows: One experiences the aspect of the particle coincident with the aspect of a mark on the scale at the moment that the aspect of the hand of the clock at the mark coincides with the aspect of a mark on the face of the clock. All observers will experience one coincidence as simultaneous with the other coincidence. Thus the position of the particle at a point on the scale is determined at a time indicated by a clock at that point. The perception of coincident events in space-time is thus based upon experiences of coincidences of aspects. Obviously, the exact application of the principle of determination of physical events requires idealization of particles, scales, and clocks.

To summarize: There are three factors in the perception of a thing—first, an immediate experience in which an aspect is given; second, the hypothesis that the given aspect is functionally related to possible aspects (e.g., on seeing a visual content I make the hypothesis that a correlated tactual aspect may be given); third, the acknowledgment of a thing to which the aspects are referred. The second and third factors are rational processes. Thus the perception of a thing involves abstraction and construction. The empirical basis of perception is the functional relation between given and possible aspects. This functional relation is transformed into a definition of the perceptual essence of the thing. But the aspects must also be referred to some center which thus constitutes the thing. The relation involved may be explained by an analogy. I shall assume that we have given a set of masses for which we know the functional relation between their positions, for example, three masses may be at the vertices of an equilateral triangle. The introduction of the center of mass is a new constructive act. From the definition of the center of mass its position can be determined from

the relation between the positions of the masses, but the point constituting the center of mass is to be distinguished from the relation. Similarly, a thing may be defined as the center of reference of correlated aspects, and may be determined from the relation between the aspects, but is not reducible to it. In the cognition of an object of perception abstractive and constructive functions of reason are united.

We have seen that the perception of things requires the application of constructive principles. There remains the problem of determining the epistemological status of these principles; especially, the principle that a thing is the center of reference for experiences. The problem may be explained by considering two typical solutions. According to dualism a thing is absolutely independent of experience. Independently real influences from the thing act on the organism, and the end product is a perception. The thing is the object of a constructive hypothesis. The principle that the structure of things is manifested by the structure of aspects follows from the hypothesis that the structure of the effect corresponds to that of the cause. I do not think that dualism requires that one interpret causality as efficient production.

The second view is that the object is merely a conceptual parameter which is an instrument of correlation and prediction of perceptions. The principle that the thing is a center of reference for correlated aspects is a definition; the thing is the object of a constructive definition. The principle that the structure of aspects exhibits that of the thing is a rule in accordance with which one constructs the thing. The second view may be interpreted by different metaphysical theories. In direct realism, aspects exist independently of experience; in absolute idealism, aspects are always given to an absolute mind; in phenomenalism, aspects exist only during experience.

It is not my purpose to sponsor a particular metaphysical theory of things. For philosophy of science it is sufficient to restrict oneself to the general principles which are employed in acknowledging a thing on the basis of correlated perceptions. But I do wish to stress the fact that the existence of a thing cannot be verified by a single immediate experience. Perception, like other kinds of observation, requires the employment of some principle of interpreta-

tion. Contrary to the view of some philosophers, dualism is thus seen to be a meaningful hypothesis. We can employ immediate experience to know things beyond it if we assume a hypothesis connecting the two realms.

IV

As a concluding topic I shall consider the relation of the present interpretation of principles to the Platonic and Kantian conceptions of science. The principles that express the properties of the conceptual objects of mathematics and exact natural science are definitions. In view of their status as definitions the problem of providing for their truth vanishes. Definitions lack the absoluteness which supports the subsistent realism of traditional Platonism. Since the defining principles are postulated by human reason they are subject to modification, and hence there is no reason to interpret them as expressing the properties of eternal objects in a supersensuous realm.

Let us next consider the relation between our view of principles and the Kantian theory of the *a priori*. The starting point of Kant's theory is the problem, How are pure mathematics and pure natural science possible? In agreement with Plato he contends that a science cannot be founded upon principles which depend upon experience for their verification. But whereas Plato taught that one may attain only probable opinion of nature, Kant asserted the possibility of a pure natural science which is founded on universal *a priori* principles. According to Kant the *a priori* element in knowledge consists of the forms of intuition, space and time, and the categories of the understanding, such as the concepts of substance and causality, which are applied to the given in order to construct a world of objects in which events are connected by laws. The categories are the basis of *a priori* principles which constitute the foundation of pure natural science. In order to know a natural thing *a priori* it is necessary that the *a priori* intuition corresponding to the conception of the thing be given. Now the objects of mathematics are constructed in pure intuition. Hence the doctrine of nature can contain only as much of science as there is in it of applied mathematics. From the construction of motion in intuition it is possible for reason to obtain the *a priori* principles of pure natural science as a doctrine of the motions of bodies. Because he held

that the objects of mathematics are constructed in intuition, Kant asserted, in contrast to the theory of Plato, the possibility of a pure natural science.

One may criticize the Kantian doctrine from a number of points of view. At the present time most philosophers of mathematics would reject the view that the objects of mathematics are constructed in intuition; Plato's doctrine of conceptual objects is more in accord with the dominant theories of this era. Thus Kant's *a priori* deduction of the principles of mechanics falls. There is, however, an element of value in the Kantian attempt to construct the object of natural science in intuition. All physical measurements are ultimately reducible to the observation of coincidences in space-time. The contemporary attempt to reduce physics to geometry is in accord with Kant's idea that pure natural science is reducible to mathematics which constructs its objects in space and time.

We must recognize as unsound his attempt to deduce *a priori* the principles of mechanics. In this aim he was unduly influenced by the achievement of classical mechanics, which was the only branch of mathematical physics in his time. A mathematical theory of electrodynamics had not been begun, the laws of thermodynamics had not even been adumbrated. The sole existence of classical mechanics made it appear that it was the only kind of mathematical physics possible. But new phenomena have given birth to new theories and new forms of thought. The mechanical conception of nature has been rivaled by electrodynamical and geometrical conceptions of nature. In addition to Kant's conception of causality as the connection of phenomena in accordance with an invariable rule, quantum theory has furnished the basis for a statistical causality. The Kantian *a priori* has been replaced by new forms which are required for the interpretation of new experiences.

In this discussion of Kant I am interested primarily in giving a new interpretation to his principles of natural science. Kant overestimated the extent of *a priori* knowledge in his sense; principles which he deduced *a priori* are derivable only from experience. His statement, "No law of attraction could be conceived as suitable for a world system, other than that of the inverse square of the distance," is definitely to be rejected. Therefore, Kant's distinction between rational and empirical propositions is unsatisfactory. The

present theory of principles breaks down the distinction so that we obtain a new concept of the *a priori*.

I have exhibited the genesis of fundamental principles of natural science. Starting with crude concepts, we discover laws which in the ideal case are organized into a deductive system based on postulates. The postulates then define a set of concepts which are instruments of interpretation of the data of observation. Thus the *a priori* consists of definitions, but as arising from experience it is subject to modification under the pressure of new experience. The *a priori* has a variability which is lacking in Kant. Our *a priori* consists of the conceptual schema which is defined by the principles of a science. In place of the categories we have a hypothetico-deductive system which implicitly defines the characteristic concepts of science. A science is a rational construction which is adapted to the raw material of experience which it serves to interpret. Kant did not have the contemporary logical doctrine that a set of postulates constitutes an implicit definition of fundamental concepts. Since all generalizations from experience may be transformed into postulates which define concepts, our *a priori* is more plebeian in origin but richer in content than that of Kant.

Kant explained his concept of the *a priori* with a famous analogy: "Reason, holding in one hand its principles, according to which concordant phenomena alone can be admitted as laws of nature, and in the other hand the experiment, which it has devised according to those principles, must approach nature, in order to be taught by it; but not in the character of a pupil, who agrees to everything the master likes, but as an appointed judge, who compels the witnesses to answer the questions which he himself proposes." I should change the analogy to the following: Reason, which approaches phenomena equipped with a theory, is the attorney who questions the witnesses in accordance with a definite plan in order to present to the court the evidence for his case. If the witness gives unexpected answers, the skill of the attorney is subject to doubt, and if he loses a case he may be replaced by one with a better theory.

Now for a concluding remark. In this essay on reason in science I have sketched the character of the hypothetico-deductive systems which serve as instruments of interpretation of the data of obser-

vation. But I have not answered the question, How is this procedure possible? There are two aspects to this question. First, how is it possible to apply mathematical concepts to objects of perception? In Plato's theory perceptible things participate in the conceptual objects of mathematics. But the changeable things of experience realize the eternal forms only approximately. Kant's solution is that the objects of pure natural science are constructed in the pure intuitions of space and time which are conditions of the possibility of experience. But empirical intuition lacks the definiteness of pure intuition and so again a mathematical representation of nature holds only approximately. Our solution is that the postulates which define the concepts are based upon generalizations from experience. But the conditions of a definition can be realized only approximately.

The approximate application of mathematical physics is not, however, the crucial question in the possibility of natural science. The important question is, How is it possible that a mathematical representation, which has been obtained from past experience, will hold to the same degree of approximation in the future? How do we know that a thing will continue to participate in the same forms, that events will be related by the same rules, that our definitions will apply in the future? The possibility of applying metric geometry depends on the existence of approximately rigid bodies. If all the matter in the universe should be vaporized, the macrophysical, rigid body would disappear and the concepts of metric geometry could not be applied. But our science is subject to the more fundamental limitation that the order of phenomena may change. In the last analysis, the only certain knowledge concerning the applicability of rational schemas in the constitution of science is presented in the skeptical doctrine of Hume.

DEFINITION

BY

STEPHEN C. PEPPER

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THE CONNECTION between reason and definition is obvious in the philosophical maxim: To avoid confusion, first define your terms. The application of this maxim to the present subject, however, has a peculiar difficulty. We wish to know about definition. But how can we know about it without first defining it? And how can we define it if we do not first know it?

It might be held that definition (or perhaps, at least, the definition of definitions) was indefinable, and known only by an act of immediacy. Those who believe in the reality of essences and in the possibility of an immediate intuition of these, hold such a view. I do not, however, wish to approach the subject in this easy way. I am very doubtful about indubitables, and believe that in the past an appeal to immediacy or intuition has uniformly hidden a *petitio principii*. Not that the felt certainty of immediate data is not as good evidence as we find anywhere, but that the appearance of purity in these data is never reliable. When we have reached what we believe to be an ultimate datum of immediacy, we have found something cognitively very important. But the philosophical experience of the past, as well as competing theories and their evidence in the present, should teach us that a claim of ultimate immediacy must itself be supported outside that mere claim. To the reply, But where shall we rest if every datum is suspected of containing interpretation in terms of another datum, which is suspected of interpretation, and so on *ad infinitum?*—I answer, How can we honestly rest simply by smothering our doubts? And I answer further that this linear dissolution of concrete evidence into abstract infinity is itself a *petitio principii*. There are many other alternatives within reasonable doubt besides the infinite regression.

These remarks clearly apply to the matter in hand. The nature of definition is not something to be settled by an act of immediacy any more than the nature of anything else is. It so happens that a theory of definition very prevalent today amounts to an appeal to

immediacy. This is the theory advanced by the logical positivists to the effect that definitions are arbitrary injunctions concerning the use of symbols. These are, accordingly, neither true nor false; and consequently indubitable. In the positivists' terminology it is "meaningless" to say that a definition is doubtful. For only propositions may be false, and only what may be false can be doubted. Accordingly, since a definition is not a proposition, it cannot be doubted. It is, therefore, indubitable. It is indubitable, however, the positivists will aver, not in the sense that it is certainly true, but only in the sense that it is "meaningless" to doubt it.

Do not these two senses of "indubitable," it will be asked, clear up the question? In the first sense, indubitable means cognitive certainty and its opposite, dubitable, cognitive uncertainty. In the second sense, indubitable means cognitively irrelevant, and its opposite, dubitable, means cognitively relevant. Suppose we coin the word "undubitable" for the second sense, then there will be no ambiguity. The positivists, it is suggested, do not assert that definitions are indubitable, but only that they are undubitable.

But do they? And, since definitions are not in fact cognitively irrelevant, can they? Let us admit that expressions of the will are cognitively irrelevant, and undubitable. When an angry man pushes another man off the sidewalk, or a baby howls for its bottle, we have expressions of will which may well be considered cognitively irrelevant and totally undubitable. But are definitions acts like these? Is it not precisely the cognitive relevance of definitions that distinguishes them from acts like these, and is it not precisely the cognitive side of definitions and not the voluntary side that interests logicians, scientists, and philosophers? How can the positivist assert that definitions are undubitable previous to a cognitive examination of the field of subject-matter under discussion? In their own terminology the statement that definitions are undubitable is either a proposition or a definition. If it is a proposition, it may be true or false, and is not itself undubitable. In other words, it remains to be seen whether or not definitions are undubitable. They may, upon investigation, or some of them may, contain propositional constituents and be genuinely dubitable. The question cannot be settled beforehand without begging the question. On the other hand, if the statement that definitions are

undubitable is offered as a definition, then the question is begged at once.

It would seem, therefore, that the positivistic theory of definition as an undubitable act is self-contradictory. For it seems to entail the recognition of at least one definition that is not an undubitable act, namely, the definition of definition itself. If this definition is not true, then it is not true that a definition is an undubitable act; and if this definition is true, it is not true that this is a definition.

The foregoing, however, is not a conclusive argument; it is merely an exhibition of the symptom of a disease. The crucial point is that the position of the logical positivists regarding the nature of definition is as arbitrary and unjustifiable as that of the intuitionists who appeal to immediacy and indubitability. The appeal to indubitability and that to undubitability amount to the same thing in the end, namely, the evasion of responsibility for producing evidence. The theory that a definition is an arbitrary act, as well as the theory that a definition is an expression of the real esssence of a thing, as well as any other plausible theory, we should be glad to consider in the light of available evidence. But we are skeptical of any suggestion that appears to dispense with the need for evidence. If positivists and realists now protest that they have never suggested such a thing, then there is no issue among us, and we can proceed in peace upon an empirical search for the nature of definition.

So now we are back where we were at the beginning. What we have gained by the intervening discussion is a reassurance that the subject of definition is one to be investigated like any other empirical subject—by gathering together the facts and describing their nature and relationships. As with all such subjects, we find ourselves embarrassed at the outset to determine just what are the facts. Supposedly, the facts are actual definitions. But how are we to know what are or are not definitions unless we already have a definition of definitions? And how can we obtain such a definition and still be empirical? A *final* definition or description of this or any subject, we cannot have at the start. But may we not have a *tentative* definition, or description, or hypothesis of the field? It would be ridiculous for us even now at the beginning of our dis-

cussion to act as if we did not know anything about definitions. We obviously know a lot about them. We should not have started with such deliberation and clearing away of expected obstacles unless we had known a lot. The pretense of total ignorance of a subject on the part of some philosophers as they stand on the threshold of an inquiry is an inheritance from the Cartesian method of absolute doubt in the pursuit of absolute certainty. Since we shall make no pretense of absolute certainty, why should we now make a pretense of absolute ignorance? Why should we pretend at all? Let us observe squarely that we do find ourselves now in the midst of a great many things commonly called definitions and even of a great many descriptions and theories of definitions. Definitions are quite as common as robins, and it would be foolish to deny it. To admit that I recognize robins when I see them does not mean that I know robins as an ornithologist should, nor that I may not be calling many birds robins which more careful study may convince me are not. But I am quite sure I never mistake a rabbit or a trout for a robin. So with definitions. I do not at present precisely know what a definition is. But I am quite sure I should never mistake a toothache or a sneeze for one.

So, admitting that we do know a good deal about definitions, let us give a tentative description or perhaps definition of the field and then see what happens in the further application of that description. From the results of the experiment, we can then try framing a better description or, perhaps, definition. And, incidentally, those results may show whether what we first framed was only a description or perhaps also a definition.

Following this plan, I am going to suggest that a definition is *a rule for determining the meaning of symbols.*

The crucial term in this description is "rule." Obviously we cannot be too precise and restrictive in determining the meaning of this term without undermining our intention of treating the subject empirically. A rigorous definition of "rule" at this moment supported by the dogmatism of either self-evidence or tautology would amount to the same thing as a definition of definition similarly supported. So, we do not know just what "rule" means any more than we know just what "definition" means, though we do know at least as much. The advantage of shifting the attention

from "definition" to "rule" is that the latter term is nearer common sense and less loaded with theory.

Now, "rule" is generally contrasted with "natural law" and the two together with "datum" or "an observation." Neither a rule nor a natural law could exhibit itself in one instance without any other cognitive assistance. A single observation of something-or-other could exhibit a color, or a shape or a sound—in short, perceptive content,—but never a rule or a natural law. If you had been told that a content under observation contained a rule or law, you would assume that the form or structure to be found in the material observed was an instance of the application of the rule or law, but without such prior knowledge you could never become aware of rule or law in the perception of one instance only. If you do not know a rule or a law beforehand, your only means of discovering either of them through observation is by means of induction, which invariably requires a reference in some way or other to more than one instance. Rule and law, therefore, are alike in that neither can ever be wholly identified with an observation or with the content of an observation. On the contrary, they *govern,* as we say, observations or contents of observations.

This term "governing" is worth examining. When we say that a rule or a law "governs" content, we mean that in some sense it is separable from the content and in some sense is closely connected with it. The separation is apparent in part from our reflections of the previous paragraph. When rules and laws are found applying to content, they apply indifferently to many different individual contents. Since the identical rules and laws apply to different individual contents, there is at least that degree of separation which is called identity of form in multiplicity of content. But separation may go further, even to the conception of rules or laws having a status independent of their applications. With respect to natural laws, opinions differ concerning whether these can ever be regarded as having such a status. But with respect to rules, opinions, so far as I know, all agree that such a status is normal if not necessary. Laws and rules, therefore, are at least distinguishable from any individual content and may be (rules, probably, must be) clearly separable from any individual content to which they apply.

As to their connection with the content, both, when they do

apply, that is to say, so far as they "govern" content, do "govern" it by determining its structure to their nature, so that the structure of the content is the law or the rule present or working in that content.

At this point, it may be wise to have in mind an example of a natural law and of a rule, especially as we must now attempt to distinguish between them. As an example of a natural law, let us take the law of the falling body,

$$v = v_0 + gt,$$

where v is velocity, t time, and g the constant of gravitation. As an example of a rule, let us take the rule in checkers that all moves of uncovered men have to be made forward from their starting point and on the black checks only.

Now, such a natural law and such a rule "govern" any falling body in the first case, and any game of checkers in the second. Both are thus, as we saw, distinguishable, and at least one is separable, from their instances. We have therefore got at least this far: that a law or rule is not identifiable with an individual datum or observation or fact. The next step we wish to make is that of finding the difference, if any, between a natural law and a rule.

In the preceding examples, the difference seems obvious enough. Unfortunately, the more we examine the matter the less obvious it becomes. But while the difference seems obvious, let us see if we can catch the motive of it before we are submerged among details. The motive for making the difference seems to be that of emphasizing the predominance of human acquiescence where laws are concerned, in contrast to human volition where rules are concerned. The form of a natural law is supposed to be determined by nature so that man discovers it or uncovers it, whereas the form of a rule is supposed to be determined by man, and man makes it and can unmake it. What blurs this contrast almost as soon as it is made are the facts that, first, natural laws as well as rules are, so far as known, to an unknown degree human constructions, and, second, rules as well as natural laws "govern" the materials to which they apply. Ideally, a natural law should never have any exceptions, nor ever be subject to error, and ideally a rule should always be humanly revocable, and capable of exceptions at will. Actually,

neither the one nor the other seems ever to be found except in trivial and artificial circumstances.

Is there any way of making this contrast hold as more than a contrast of interest? Theoretically, at least, natural law can be cleared of arbitrariness by denoting it as a structure of nature independent of human observation. Can a rule be similarly cleared of nature, even theoretically? Can we denote anything purely arbitrary? Perhaps the nearest we can come to it will be a game the materials of which would offer the least possible physical resistance. A game like tennis is so far from arbitrary that all the laws of mechanics apply to it. Checkers or chess is more arbitrary, but these are subject to the geometrical pattern of the board. The most nearly arbitrary game I know is a game of marks or symbols where symbols are given the strange meaning of meaning nothing but what they mean among themselves. I refer to mathematics and symbolic logic when interpreted as purely abstract or as independent of all possible applications. Here we seem to be as far from natural law as we can get and as near pure rules as we can go.

How pure these rules are is again a matter of theory—that is, a controversial matter. Historically, as Lenzen has already shown, they are not pure at all, for their origin is in the physical and perceptual field of tallying, surveying, measuring, and noting of similarities. How far have they divested themselves of these physical and perceptual origins? To what extent are they still "governed" even in their extremest abstractions by the natural structures of their origins? One cannot safely say. But this we can say: that they are as nearly arbitrary as anything we know.

Between these theoretically pure rules at one extreme and the theoretically pure laws at the other, goes on our whole intellectual life. This life is apparently for the most part very impure. The extremes exist rather as norms or as goals of approximation or as extremes of extrapolations than as actual attainments. Unless I am much mistaken, an empirical study of definition, as a study of a certain kind of rule, will have to be content with materials as evidence which are not ideally pure.

A definition, we tentatively suggested, is a rule for determining the meaning of symbols. It begins to appear that our study will be essentially that of the factor of arbitrariness or human volition

in cognitive materials. By good luck we discover that the most nearly arbitrary, or volitional, or rule-determined objects in human experience are within the cognitive field. We shall, therefore, be able to study this factor of arbitrariness all the way from its extreme form in symbolic logic to forms more and more adulterated as they approach the ideal of natural law.

I am suggesting that we have, through our reflections up to this point, discovered the general field of our inquiry. It is the field of the arbitrary in cognition. We may expect to find this field capable of many subdivisions, and we may ultimately find it advisable to restrict the term "definition" to one or to a group of these subdivisions rather than permit it to apply to the whole field. But in such an empirical study as this it would not at this stage of the inquiry be legitimate to give the term a narrower reference.

I propose to study this field by a method of sampling, proceeding from the most arbitrary cognitive materials toward the least arbitrary. Our first sample will obviously be an example of symbolic logic, abstractly treated. For this purpose I open Lewis and Langford's *Symbolic Logic* and settle upon Lewis's summary of the Boole-Schröder Algebra in Chapter II. It is true that Lewis gives this algebra here an interpretation for the convenience of the ordinary reader and for the argument of the book, but he explicitly states later that this has no effect upon the form of the system as given. "In Chapter II," he writes, "we developed the Boole-Schröder Algebra with examples and readings of theorems which took it as a logic of terms in extension, a logic of classes. But if one notes the form of our symbolic postulates and the character of proofs, it will be observed that nothing in the mathematical development is allowed to depend on this interpretation: so far as the assumptions and deductions of them are concerned, the system may be regarded as an abstract mathematical system, independent of any particular interpretation. The method of demonstration is no different from that by which a mathematician would deduce the laws of complex algebra or of geometry from a set of definitions and postulates" (pp. 114–115).

In other words, the Boole-Schröder algebra *may* be taken as independent of all interpretations, as a pure game carried on with symbols according to certain rules.

In developing his own logistic calculus in Chapter VI, Lewis states even more emphatically: "It is to be observed that the performance of these simple operations is independent of their logical significance. They could be carried out 'mechanically,' according to the rules, by one who has no interest in the interpretation of the symbolism.... The whole system is rendered abstract in the sense that we may say, 'Regardless of any interpretation which may be assigned, the initial expressions, manipulated according to certain rules of operation, give certain other expressions in result'" (p. 126).

Some logicians put great emphasis on this extreme of abstraction in symbolic logic, as if to indicate that this is logic *par excellence*. Here we find, if anywhere, the maximum of arbitrariness in the use of symbols and the minimum of perceptual or physical or metaphysical restraint. In such an abstract system of symbols, there is, or there is supposed to be, no reference by the symbols to any entities external to the system. If there were, the system would not be abstract in the manner explicated. Now let us turn to Chapter II and see what we find. We find first a set of five primitive marks or "ideas," namely, (1) ordinary terms, a, b, c, etc., (2) a unique term, 0, (3), a sign, $-$, which when interpreted is called negation, (4) another sign, $\times$, which when interpreted is called "and," and (5) another sign, $=$, which when interpreted is called "identity."

We find, second, a set of three "definitions," so called; namely, (1) $1 = -0$, (2) $a + b = -(-a \times -b)$, (3) $a \subset b$ is equivalent to $a \times b = a$.

We find, third, a set of six postulates, namely, (1) $a \times a = a$, (2) $a \times b = b \times a$. (3) $a \times (b \times c) = (a \times b) \times c$, (4) $a \times 0 = 0$, (5) if $a \times -b = 0$, then $a \subset b$, (6) if $a \subset b$ and $a \subset -b$, then $a = 0$.

We find, fourth, a set of theorems indefinite in number, of which about ninety are stated in Chapter II.

Now, our concern with these four sets is the question: What is their relation to the subect of our inquiry as we tentatively laid it out? What is their relation to definitions regarded as rules determining the meaning of symbols?

Our first question must be, Are these sets concerned with symbols? They are called symbols. But when symbols are treated ab-

stractly, in the manner recently described, are they symbols? The answer seems to be, Yes. Symbols treated "abstractly" are to be stripped of external interpretations, but not of internal interpretations. The abstract logistician who manipulates his symbols mechanically is supposed not to have a weather eye out to geometrical spaces or perceptual classes. His symbols must not be moved about in conformity with, or under the restraint of, these external references or interpretations. But clearly, if his symbols did not have some references, there would be no restraint upon their movements, and a monkey in a box of logomachy letters would be as good a logistician as Bertrand Russell. The symbols of symbolic logic, then, are not mere marks, nor are their manipulations literally mechanical, as would be the case if a monkey shook a box of logomachy letters. They really are symbols, and they differ from more familiar symbols merely in that their references or meanings are strictly confined to references among themselves. They are inbred. And when the manipulation of these symbols is said to be mechanical, what is apparently meant is that if the internal references of these symbols to one another has been thoroughly learned (i.e., if the rules of the game are acquired as a skill), then the working out of theorems and proofs is a mere matter of habit. So we say that typewriting becomes purely mechanical. But in typewriting there is always something external that is being typed. The point about the abstractness of logic is that nothing external is being proved or manipulated. The symbols themselves are simply following out their own references. That is what makes abstract logic a pure game and not an applied skill. The mechanicalness of the process, therefore, is not strictly pertinent, but the internality of the symbolic references is.

The symbols of abstract logic, then, are symbols and have determinable meanings. They do apparently fall within our tentatively marked-out field of study, and they would consequently be said to be somehow defined. How are they defined? How are their meanings determined?

If we return to the four sets of symbolic marks which make up the structure of the Boole-Schröder logic, we find that the second set is explicitly called "definitions," and the first set is ordinarily called "undefined." According to our preceding reflections, this

opposition must be illegitimate, if by "undefined" is meant meaningless. The "primitive ideas" are, of course, promptly defined, that is, given their meanings in the postulates which are the third set of symbolic marks.

The situation amounts to this: In logical exposition, it is convenient first to give a list of all (or many of) the marks that are to be used, and then to give their meanings. As logical entities, however, as literal symbols, these marks are not instated till they get their meanings in the postulates. The postulates, in other words, constitute the basic definitions of logic.

Instead of saying of the four sets in order, "undefined ideas," "definitions," "postulates," "theorems," it would seem to be closer to logical practice to say "primitive marks," "abbreviations," "definitions," "theorems." And "abbreviations" would be understood to mean a secondary kind of definition. For an abbreviation does fall within the field of our subject-matter. It is a determination of the meaning of a symbol in accordance with a rule. But its characteristic is that it is not indispensable for adequate comprehension of the system. Abstract logic could, so to speak, logically get on without abbreviations, but it would become unwieldy, and psychologically some proofs might be too complex for apprehension without them. A logic without a set of "definitions," in the technical logical sense, is therefore conceivable, and can, in fact, easily be made by simply substituting the expanded forms for the abbreviations wherever the latter occur in postulates and theorems. But a logic without meaning, as we have seen, is letters blown in the wind.

So it appears that in abstract logic there are several kinds of definition, according to our tentative demarcation of the field. First, there is definition of a primitive mark by its relation to other primitive marks in the postulates. Second, there is abbreviation or the definition of a simple mark in terms of a combination of marks. Third, there is apparently in some sense a definition of the meaning of a set of postulates in terms of the set of theorems deducible from them. And, fourth, it may be that in "abstract" logic the meaning of a proved theorem should be regarded as somewhat like that of a postulate, since it functions in the proof of subsequent theorems just as any postulate does.

It must not be forgotten that we are taking "abstract" logic

literally, taking it as *totally* uninterpreted, as a pure manipulatory game carried on with the least resistant of all materials, namely, marks.

Now, let us examine for comparative purposes the four kinds of definition we seem to have found in such a logic and consider them in respect to the following three points: (*a*) What is it that is the meaning of what? (*b*) What is the rule that determines the meaning? (*c*) What is the degree of arbitrariness of the definition?

(1) *Abbreviation.* Since abbreviation is what is customarily called definition in logic, let us begin with that. For illustration, take the abbreviation $1 = -0$.

(*a*) The symbol on the left means the symbol group on the right.

(*b*) The rule is that wherever the symbol group on the right occurs, the symbol on the left may be substituted, and vice versa.

(*c*) This definition is arbitrary on the following scores: First, any man is free to make or not to make an abbreviation without its having any effect external to the abstract logic (as is evidently what we already understand by "abstract"). Second, any man is free to make or not to make an abbreviation without its having any structural effect internal to an abstract logic (i.e., without its affecting the theorems deducible from the postulates). Third, a man may theoretically take any group of primitive marks and make an abbreviation out of them, though practically he would be restrained by considerations of manipulatory convenience. Fourth, a man may theoretically take any mark he likes as a sign for an abbreviation, though practically again he would be restrained by considerations of convenience.

(2) *Primitive marks.*

(*a*) A primitive mark means, or is defined by, its relation to other primitive marks as exhibited in the postulates.

(*b*) The rule is that a primitive mark shall refer to other primitive marks only in accordance with the relations stated in the postulates.

(*c*) A primitive mark is arbitrary on the following scores: First, it may be entertained or not without effects external to the logical system. Second, it may theoretically be of any shape, though practically this is restricted by considerations of manipulatory convenience. That there must be some such mark, however, is essential

to the structure of the system, as also that such a mark shall have the relations to other marks determined by the postulates.

(3) *Postulates.*

(*a*) A postulate by itself (unless there is only one postulate in the system) has no meaning, for the rules determining the meaning of any postulate apply only to that postulate as one of the complete set. A set of postulates, however, is a symbol set and means the theorems that can be deduced from it.

(*b*) The rules determining the meaning are the rules for the manipulation of the symbols: according to Lewis, the operational principles of substitution, adjunction, and inference.

(*c*) The arbitrariness of postulates with respect to theorems in a purely abstract manipulatory logic seems to be as follows: First, deductive manipulations of symbols may or may not be made without any effects external to the logical system. Secondly, a man may entertain a set of postulates together with the rules of operation, without actually making the manipulations (or even following them along the lines which somebody else signifies that he has made), and this abstention has no effect upon his making the manipulation at some other time. In other words, if a man stops manipulating symbols at any stage of the game, he has not got to start the game all over again the next time he comes back to it. He is free to take his time in playing the game. Thirdly, there are often alternative lines of proof for given theorems or sequences of theorems. And, as a special extreme instance of this sort of freedom, we may perhaps place here the possibility of selecting alternative sets of postulates for the same logical system.

On the other hand, the theorems that can be deduced from a set of postulates are restricted by the postulates and the rules of operation. This is the so-called abstract logical necessity, which seems to amount to this—that if a man plays the abstract logical game, he can derive only certain combinations of symbols as theorems, and not others.

It may be noticed that the definition of postulates in abstract logic is different from that of primitive marks and abbreviations in that it is normally never completed. A set of postulates is in its definitional aspect like a set of directions for counting, which is itself a peculiar instance of an operational definition like a cooking

recipe or a knitting formula. This consequence, of course, follows from taking the abstract logician literally when he says that abstract logic is a "mechanical manipulation of symbols according to rules." And it may be added that this is the only view of logic which successfully avoids an interpretive reference. That logic *can* be considered in this light is, it would seem, obvious.

(4) *Theorems.* Theorems are definitional only so far as they are proved, in which case they take their place with the postulates and function with the principles of operation as conditions for the proof of new theorems. They would, accordingly, be just like postulates in their definitional aspect, differing only in a restriction postulates do not have, namely, that a theorem cannot have meaning until it is proved, whereas a postulate does not need to be proved.

This also follows from taking logic as literally free from interpretation, as a pure game in the manipulation of marks.

Logic so viewed, as a pure manipulatory game with symbols, is, of course, like any other game, a temporal procedure. This, I believe, is the view of a logical system which makes it most arbitrary and free from interpretation. But logic so viewed is not, strictly speaking, "formal." It is operational in the most abstract sense of "operational," namely, as being entirely abstracted from, or free from, any purpose or application to which the operations could be put. It is operation for operation's sake. In this particular game there is not even present the purpose that most games have—of winning. From this view of logic (which is clearly a possible view, whether some logicians adopt it or not) we have found four interesting sorts of definition.

But those logicians who think of abstract logic as "formal," and as in some sense timeless, or as analytic or perhaps tautological, evidently have some other view of a logical system in mind. In the preceding account a theorem in its relation to a set of postulates seems to give something more than is given in the postulates (or in the postulates plus the principles of operation). It gives a *new* arrangement of symbols. To be sure, this new arrangement is deducible from the postulates by way of the principles of operation, but the deduction must be made in order that the theorem with its particular arrangement of symbols should be given. A possible

manipulation of symbols is not the actual manipulation, any more than a possible move in chess is the actual move.

There is sense, however, in viewing a logical system as "formal" in some manner. *But,* in order so to view it, it must be interpreted and is no longer abstract in the sense of being free from interpretation. One such interpretation is to consider a set of symbols spatially spread out on paper and temporally deduced like those in Chapter II of *Symbolic Logic* as a symbol set referring to an essence, to an "abstract" form or structure where "abstract" now means potentially free from specific existential reference. This, however, is interpretation with a vengeance. It is a metaphysical interpretation in terms of the form and matter categories of Plato and Aristotle and those whom we may call "formists" generally. Such an interpretation, however, yields us an interesting new sort of definition, as follows: (*a*) The spatiotemporal symbol set as a whole (e.g., Chapter II, *Symbolic Logic*) now becomes a symbol set which means the eternal essence or form which the system itself reveals to thought. (*b*) The rule determining this meaning is that principle (to be metaphysically determined) by which a symbol refers to "abstract" meanings rather than to existential particulars. (*c*) This definition is arbitrary on the following scores: First, it is free from all spatiotemporal-causal existential restrictions on the essence side. That is, whether the form intended is exemplified in existence or not makes no difference. Second, the choice of symbols, their number, arrangement, and the like on paper, are free and have the sole proviso that they exhibit in a convenient manner the structure of the essence to which they refer. But the form itself, the structure of the essence, is fixed. Third, the symbolic system, as a whole, may or may not be given this metaphysical interpretation. The essence (if it has ontological being) is unaffected by any man's giving or not giving the symbolic set a reference to it. And that symbolic set continues to have the same rules and arrangements of symbols whether or not any man interpret it as referring to essence. It is true that we should probably never know the essence with any precision unless we gave the symbols their reference to the essence. But a man is under no more compulsion to know essence with a symbol system than a card player is under compulsion to gamble when he plays cards. One can man-

ipulate symbols without assigning them to essence, just as one can play bridge without assigning tricks to dollars.

We have, however, discovered a new possible kind of definition by considering the interpretation of a system in terms of essence. Let us now see what we may find if we seek to interpret a system in terms of empirical existents.

The Boole-Schröder algebra has several interpretations, we are told, and one of these is to classes taken in extension. Now, a class is a more or less empirical object. One does not ever exactly observe a class, but one observes objects such as cows or bugs or beetles, and one notices that one naturally gives identical names to these objects because, as we say, they look alike. Without pursuing our observations farther along these lines, but just considering how we use the names "cows," "bugs," and "beetles" in reference to the objects to which these names are given, we find that no members of the class of cows are members of the class of bugs, but that all members of the class of beetles are members of the class of bugs; that if cows are a class, then not-cows are also a class; that some not-cows are beetles; and so on. Now, these are the relationships which are referred to by the Boole-Schröder algebra when this algebra is given the interpretation of classes taken in extension.

And now we note that an extraordinary metamorphosis takes place in the meaning of every symbol in the system. The symbols *a, b, c,* etc., now mean cows, bugs, beetles, etc. The symbol $\times$ means the members *common* to two classes. The symbol $-a$, applied to any class, means the class of all objects that are not members of the class *a*. The symbol 0 means the class of no members. And so on. But note especially that the set of definitions which as marks were mere abbreviations suddenly take on a descriptive value. The equivalence $1 = -0$ now means that the class of all things has the same membership as the class that is the negation of the class that has no members. And $a \subset b$ now means "*a* is contained in *b*," which comes to us as a distinct observation not identical with the observation that, for instance, the members of the class of beetles-and-bugs are equal in number to the number of members of the class of beetles alone. We note, however, that these two observations are, in fact, equivalent so far as class membership goes.

In a word, the primitive marks now become literally ideas. They

become symbols of empirical observations. And the definitions (so called), the postulates, and the theorems all become descriptions of relations holding among the observations. The significance of the system as a whole now is that the rather complex relations referred to are organized and presented in such a way that the human understanding can grasp their interconnections, be freed from confusions of thought, or even of perception, and possibly make difficult predictions which can be verified.

Employing our previous three features of comparison, what do we find to be the nature of this definition? (*a*) Roughly, the system as a whole is a symbol set which means the set of empirical facts recently referred to. More particularly, specific symbols in the system mean discriminated features in the observational field, and arrangements and rearrangements of the symbols deduced in the system mean configurations of discriminated features in the observational field. (*b*) The rule is that symbols in the system shall refer to discriminated features of observation and, throughout symbolic interpretation, shall continuously refer to the same features. (*c*) This definition is arbitrary on the following scores: First, the shapes, and so forth, of the symbols of the system may be changed so long as the structure of the system is not affected. Second, a man may make such an application or interpretation, or abstain from making it. These are the limits of arbitrariness for this sort of definition. For the symbolic system is to be regarded as fixed, and the field of facts is supposedly fixed. It follows that if, on closer observation of the facts, it is discovered that the symbolic system does not conform, there is no alternative but to withdraw the application and leave the symbolic system abstract—at least so far as that interpretation goes.

But there is another way of considering the relationship between a symbolic set and a field of observation, which yields yet another sort of definition. In the preceding situation concerning the application of a symbolic system to a field of observation, the attitude was that of a definer who has a complete abstract system and is looking about from the point of view of his system for a possible observational application of it. Let us now imagine a definer who has in mind an observational field and is looking from the point of view of this field for a possible symbolic system to describe it. Noth-

ing is changed in the situation except the attitude. But it is clear that the shift of attitude makes a difference in the distribution of factors of arbitrariness. It is now the observational field that is taken as a settled point of departure and it is a symbolic system that is being sought to comply therewith.

Our first thought is that an observational definer is habitually more persistent than a logical definer in seeking for connections between a symbolic system and a set of observations. If a logician or mathematician has a consistent abstract system, he is apt to be content in its possession and to regard an application as a curious and amusing addition. He may, on occasion, take especial pride in a system which he believes has not and cannot have an observational application. But an empirical observer such as a scientist is not happy unless he has some symbolic system, however rudimentary, which interprets his observations. A logician does not demand an application for his system as a scientist demands a description for his observations.

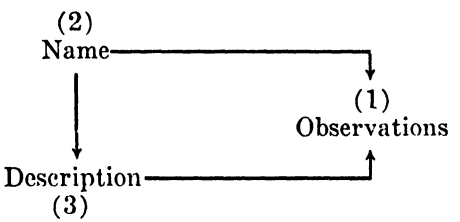
But on second thought we realize that the scientist's demand for a description is as arbitrary as a logician's demand for an application, and that a pure observer is as little interested in descriptions as a pure logician is in applications. For the pure observer is, of course, the aesthetic observer, too little noticed in cognitive discussions. It is not the observer as observer, but only the observer as scientist, who demands a description of his field. A scientist is, in fact, an observer who makes that demand. But the demand is quite arbitrary. An observer is at liberty to be either an appreciator or a scientist, but theoretically a scientist who does not discover a symbolic system ready at hand satisfactorily describing his observations may with as much ease as a logician assume the comfortable attitude of an appreciator.

Actually, scientists do not easily become appreciators. Once on the quest of a good symbolic description for a set of observations, a scientist does not stop till he finds one,—and then a better one. The scientific observer's drive to find or make a symbolic description and to make it better and better, is a new factor in the definitional situation not typical of the abstract mathematician or logician. The persistence of that drive is itself symbolized in a new and more complex definitional structure.

The way of it is this: An observer gets interested in a field of observation and wants it described. In order not to lose track of his field, he denotes it with a sign, just as a man in the woods blazes a tree where he has left a *cache*. Incidentally, this act itself is a kind of definition, sometimes called ostensive definition. It is most clearly and simply exhibited in the application of a proper name. An ostensive definition consists of a mark referred to a field of observation, and its rule of reference is a gesture in the nature of pointing with the understanding that observations "continuous with" these or "like" these will be given the mark.

It is the most fundamental type of definition in the one sense that without it no symbolic references could begin to be established. But sometimes it functions for an empirical observer much as an abbreviation does for a logician: it could be theoretically dispensed with, but this would be inconvenient to do.

Suppose the field of observation to comprise such matters as the relation we referred to earlier among cows, bugs, and beetles. The observer ostensively defines this field as "logical class." "Logical class" thus becomes a symbol referring to a field of observation, and what the empirical observer customarily says is that he wants to "define 'logical class.'" The statement is, of course, ambiguous and has led to many misunderstandings. In an ultimate sense "logical class" is, as we have seen, already defined by the rule of ostensive reference which gives the symbol a determinate meaning. What the empirical observer usually intends to say is that he wants a description in addition to the ostensive definition. And I suggest that the usual structure of an empirical definition is the following:



The observations are taken as given and stubborn and not subject to change. A name is applied to them by ostensive definition, and then a description is found for them, whence it follows that the

name, as well as the observations, is defined by the description. But it should be noted that it is only because the description defines the observations that the name is defined by the description. Whence it happens that if the description is found false or even simply refined and improved upon, the *definition* is said to have been corrected or improved.

This manner of speaking about definitions reflects the empirical observer's persistence in finding a symbolic system to fit his field of observations. Element (2), the name, is the essential symbol of that persistence. Theoretically, it could be dispensed with. The binary (3)-to-(1) structure is theoretically sufficient. Actually, the absence of (2) would be very inconvenient; for it would require the acknowledgment that every alteration for improvement in the description, however slight, constituted a new definition of the field.

Strangely enough, the binary reduction of the ternary structure generally suggested for the empirical definition is the (2)-to-(3) relationship in which the description is said to be the definition of the name. This would, of course, simply convert the empirical definition into an instance of abbreviation. The name (2) would be a short symbol for the complex symbol (3). That the binary (2)-to-(3) reference in the ternary structure (1) (2) (3) has something of the character of an abbreviation is not to be denied, but as part of the ternary structure, in which the observational field is pivotal, the reference (2)-to-(3) cannot be legitimately separated from the reference (2)-to-(1) or (3)-to-(1). Nor is it to be denied that a name *may* be used as an abbreviation of a symbolic set which *in fact* happens to be a description; but if a name functions merely as an abbreviation, the description becomes merely "abstract" and not a description at all, and ceases to be an instance of the sort of thing we are examining. Finally, this suggestion for the binary structure of an empirical definition has the same inconvenience as the former one, namely, that every alteration in the description (in the way of empirical improvement) would constitute a new definition, with the added objection in this case that out of consistency the *name* defined ought also to be changed with every change in the description. This suggestion, evidently, has very little to recommend it, and its prevalence, I believe, is due simply to a failure among writers on the subject to

consider definitions as facts like any other fact to be observed and described.

So, regarding the class relations between cows, bugs, beetles, and the like as the observations (1), and "logical class" as the ostensive name (2), and the Boole-Schröder logic as a description (3) of these observations, what do we discover about: (*a*) what means what, (*b*) the rule determining the meaning, and (*c*) the degree of arbitrariness involved?

As to (*a*), we have already described the ternary structure of the empirical definition.

As to (*b*), the rules: The rule for the ostensive (2)-to-(1) reference we have already given. The rule for the (2)-to-(3) reference is that for any abbreviation. The rule for the (3)-to-(1) reference is that for the application or interpretation of any set of symbols in terms of observed facts. These three rules are furthermore held together as a set by a fourth rule to the effect that the description (3) is modifiable in accordance with the criteria of truth and cognitive refinement as these criteria come to apply to the material in hand. This fourth rule is a genuine rule of definition because it gives a special persistence of signification to the name (2). This rule for persistence of signification in a name is, as we have seen, the reflection in definition of the scientist's persistence of will in finding a true description for his field of observations. The typical ternary descriptive definition used in science and philosophy is, therefore, structurally distinguishable from the typical binary interpretative definition applied by mathematics and logic—even though the *descriptive* symbols in the two kinds of definition be identical. The structure of the definition reflects the aim of the definer.

(*c*) The degree of arbitrariness involved in the ternary definition requires careful consideration. The observations (1) are here regarded as not arbitrary at all, but as "stubborn facts." This attitude toward observed facts is not wholly justifiable, but we shall not question it here. As for the name (2), that is completely arbitrary so far as the selection of the symbol is concerned, except for questions of convenience. Questions of usage are likely to enter in, but these questions with their peculiar problems of definition we are not considering here, and here they are indeed essentially

irrelevant. As for the description (3), this is sometimes treated as if it were not arbitrary at all, but, so to speak, a sort of reflection in a mirror and just as physically necessary as the incidence of light rays on a polished surface. A naïve treatment of the descriptive theory of science comes to about this conclusion. On this theory, a true description would not be definitional or arbitrary at all. There is a certain parallelism between this treatment of descriptions as a necessary conformity of a set of chosen symbols to a set of observations, and the treatment of theorems in logic as necessary explicit expansions of the implicit meanings of postulates. Both conceptions seem to be somewhat naïve in somewhat the same way. A description appears to have several ranges of arbitrariness. There is an arbitrariness in the selection of the physical symbols. Theoretically this choice is quite arbitrary; actually it is fairly closely controlled by usage. There is an arbitrariness in the degree of precision of application of symbols; a rough description is true as well as a precise one. There is an arbitrariness in the choice of units of measurement. There is an arbitrariness in the choice of frames of reference for measurement. There is often an arbitrariness in the choice of controlling hypotheses which reaches a certain culmination in the choice of metaphysical categories. Each one of these ranges of arbitrariness establishes the definitional character of description. And I offer this as evidence that all empirical descriptions are definitions in their symbolic aspect. When a distinction is made in a scientific book between a definition and a description, the ground for it is mainly one of degree since some descriptions have clearly a greater factor of arbitrariness in them than others, or sometimes simply one of convenience in exposition since some descriptions are more pivotal in a subject than others. In general, we call an empirical expression a description if at the moment we are more concerned with its truth or verifiable reference to fact; we call it a definition if at the moment we are more concerned with the elements of arbitrariness it contains. This explains why an identical set of symbols such as "Man is a rational animal" may be taken either as a definition or a description according as the writer or reader takes this or that attitude. So, too, with the Boole-Schröder algebra of classes. Take it as definition or description, as you will. It is both, for it is both arbitrary and true.

There are, of course, other kinds of definitions, notably those having to do with verbal usage, but we have sampled a sufficient number of kinds to be able to draw some tentative conclusions. We have examined (1) abbreviation, (2) definition of marks through postulates, (3) definition of postulates through the theorems deducible from them, (4) definition of proved theorems and postulates by further theorems deducible from them, (5) a definition of an essence (if metaphysically justifiable) by a logical system which symbolically exhibits it, (6) definition of a field of observation as an application or interpretation of a logical system, (7) ostensive definition, and (8) definition of a field of observation as a description of that field in accordance with criteria of truth and cognitive refinement.

When we look back over these samples of a field of subject-matter, the attitude of those writers who lightly say that definition is this or definition is that, and heavily deny that it is anything else, appears slightly ridiculous. I doubt whether even now, with these eight diverse samples before us, we would wish to say definitively what definition is or what it must be (or how, accordingly, reason must inevitably run therefrom).

We do see, however, that we must revise the tentative definition with which we began, in order to make it a closer approximation to the facts we have observed. That original definition, we now see, was of the descriptive ternary type. We tentatively asserted that a definition is a rule determining the meaning of symbols. If we look back over our examples, we shall see that what is normally denoted as a definition is not a rule but a system of symbols, and that the rule involved lies outside the symbols and may be identical for different sets of symbols. The rule is generally not stated but understood. This fact is particularly evident in abbreviations and ostensive definitions. In abbreviations, the equality mark or the symbol "is" has to be interpreted externally. It means, "Substitute the symbols on the left for the symbols on the right"; and this is the *rule*. The symbols on the right merely exemplify the conditions under which the symbols on the left are to be used according to the rule. Similarly with ostensive definition. The rule is, "Use the symbol you now hear for any observations resembling or continuous with those observations at which I am pointing." But the expressed

definition is simply, for instance, the sound "apple" and a gesture to a closely delimited field of observation. Or, more complexly, the expressed definition may be a picture of an apple with the letters written beneath it, "APPLE." The rule is not expressed; only an illustration of the conditions for its application is expressed. The rule is understood.

I conclude, then, with the following improved but still tentative definition of definition: *A definition is an expression illustrating the conditions for the application of a rule in accordance with which the meanings of certain symbols expressed are determined.* If the rule happens to be one involving the cognitive criteria of truth to observed fact, the definition resulting is automatically true, partly true, or false. This conclusion does not mean that the distinction between the arbitrary and the veridical in knowledge is unimportant, but, on the contrary, that it is so important that it ought to be carefully studied in all its appearances, discriminated in all its variety, and described with great care and precision. It cannot be settled by injunction.

REASON IN HISTORY

BY

EDWARD W. STRONG

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I

THE ARGUMENT

REASON is not an endower, but an endowment realized through an individual's social participation and communication. The life of reason, both in genesis and vocation, is an embodied progress.

The theory of an original faculty of reason inverts the realization of reason into its own cause. This theory is rejected, since eventual rationality is not its own prior producer. The difference between physical movements and rational activities, historically viewed, is a resultant difference. Faculty psychology, to the contrary, supposes an independent actor for each kind of performance.

Retention makes representation possible, thus enabling an individual to review and to choose his opinions and actions. In representation, the past is remembered and reconstructed in the present, and plays into the selection and rejection of rôles. The historical comprehension of individuals is a function of their cultural endowment. Their review and choice is thus conditioned by a world view. The judgment and perspective of each historically conscious and purposive individual is time-dependent and culturally determinate.

Historical comprehension is itself a historical event. Reflection by an individual upon his own plans and aims discloses no ground beyond histories for the interpretation of human thought and action. The life of reason is naturalistic in its derivations, but is moral and purposive in the interests, engagements, and enterprises of human culture and social action. The foregoing judgment expresses a contemporary world view, the modern historical outlook, which postulates a pervasive temporalism or historicism for both thought and action. The problem engendered by such a world view is one of the bounds of skepticism. The relativity and plurality of histories—a relativity and plurality inextricably tied up with the social determinations and temporal perspectives of persons and groups—casts doubt on the possibilities of rational intercourse between historians of diverse beliefs, and between parties of conflicting purposes. To examine the grounds and to suggest the bounds for skepticism of reason in history are the tasks undertaken in Parts II–IV of this essay.

THE LIFE OF REASON is a function of embodied progress. A man who approves of himself as a rational being has come by such approval through a learning process. What the living body has undergone in past action and sufferance is figured in speech. The body which stands under remembrance becomes understood by images and signs. In the conversion of the body's aptitude to the mind's con-

versation, reason inhabits premises necessary to human gestures, but not the meaning of them. For man is a communicant in cultural history. His vocation is shaped through his social participation, and he reflects and passes judgment upon it. Such reflection and judgment illustrate historical understanding and are possible because retention and cumulation of experiences have taken place. In this embodied progress, the individual is not only the bearer, but is also the witness of his actions. His statement that man is rational is self-testimony. His rationality, genetically considered, is eventual and domestic.

The career of reason in an individual may be traced in a variety of ways. In none of them will we find an original and originating mover, spirit, or faculty of reason. Only by inverting the realization into its own cause can it be said that man is rational through the efficacy of Reason operative as a transcendental tenant in the body's house. If the process of knowing makes man a knower, it is erroneous to take the consequence as its own producer. Activities of reflection and judgment are characteristic of an embodied progress rather than a testimonial to origins. Although the difference between rational activities and physical motions is indefeasible, to believe that this difference is to be explained by hidden, productive agencies is historically indefensible.

The dramatization of the deed into a doer is the familiar story of faculty psychology. We then have a Reason that reasons, a Will that wills, and a Memory that remembers. The complex body is taken to be a vessel with a crew of powers to direct its course. The vessel carries, from the beginning, a full complement of captain, mate, and common sailors. Reason, according to Plato, should be the captain commanding the mate of Will in the rule of the able-bodied senses. Augustine, on the contrary, would elevate Will, which prompts us to love and faith, to the rôle of chief navigator, and assign Reason to do the mate's work. The launching of the vessel on its voyage through the world's flux provides the occasion and content for the performance of officers and crew. Without vessel and voyage, the crew would have no employment, the mate would have no orders, and the captain would have no course to steer. The living body is thus treated as merely a necessary condition for the offices of volitional and cognitive acts. The mental proc-

esses, morally graded in their order of excellence, are esteemed to be not only superior to the body, but also underivable from its constitution and social career.

This dramatic psychology installs an independent actor for each kind of acting. The separateness and superiority of reason is honored by a mythological generation from mysterious forebears. Thus, we are told the myth of the preincarnate tour of the soul in the region of pure forms, the myth of the active intellect entering the body from without and remaining to act as a mover, and the myth of the soul's special creation as a spiritual agent destined for immortality. Supernatural genealogies are today generally suspect; but to be concerned only with the denial of miracles is to miss one instructive moral of the mythology. Was it not the worth of reason which prompted the Greek philosophers to assume divine parentage? Reason was the hero in the quest for the good life; and, as of Heracles, the prodigy of labors performed seemed to call for more than mortal parents on at least one side of the family. A denial of divine birth does not rob the hero of his history. A rational life, if worthy, remains worth while though it be an offspring of retention and communication and not of God. This modesty in respect to antecedents also requires reservations in respect to destinations. The heroic reason of Plato in its Christian conversion to the service of love was in that service assured an everlasting felicity. Although the vessel would eventually founder in the sea of time, the captain did not go down with the ship. The miraculous incursion of the soul into the body was the premise for its equally miraculous excursion to a home provided when the foundations of heaven and earth were laid. But reason generated in the confluence of bodily aptitude and social communication has no immortality save that of perpetuation in cultural history.

The occurrence of reflection depends, as Santayana tells us, on representation which raises "bodily change to the dignity of action." The earlier in life is not only that out of which the later comes, but is the past remembered or reconstructed in the present. With the advent of historical comprehension, a man enters upon his distinctive vocation. He begins to cast himself in rôles suggested by the performance of others. The onset of dramatic casting in the life of an individual transcends physical adjustment and routine

accommodation. Instinct, habit, and custom are necessary properties of the historical stage, but they do not constitute the moral rehearsals where possible rôles are reviewed and selections are made for actual performance. Only some of the rôles rehearsed can be performed, since time, capacity, and compatibility are limited. Representation of the careers of other men enables us to consider consequences to be expected from rôles we might decide to try.

The selection and rejection of rôles, furthermore, takes place within the confines of a theater. There are no *plein air* rehearsals bare of theory. All representation is a function of embodied progress—the endowment funded in the present by the contributions of our predecessors. The theater is a metaphysical construction assumed consciously or unconsciously by the actor as his world view. When the world view is assumed without question as the normal, inclusive, and permanent abode of all choices, the theater is taken as nonoptional. This is the dogmatism of the theater exhibited in the Christian philosophers of the thirteenth century. The dogmatism is innocent with these men, for they lacked historical consciousness of other world views. Their theater seemed absolute because they believed it to be the sole, inclusive Truth, and all events in time a continual illustration of this Truth. Within this innocent dogmatism, the temporal drama has a timeless plot. The actor's problem lies in the choice of rôles in which to cast his life under a proscenium arch identified with the eternal vault of heaven. The modern philosopher initiated in history is aware of a multiplicity of constructions. Cognizant of theaters other than his own, his purview of their relativity provides no exemption for his own metaphysics. He thus suspects that a modern dogmatism, if not historically naïve, is guilty of Jesuitical provisos. For skepticism in its modern form is not doubt of rôles alone, but doubt of all world views claiming finality. If there is no alternative of divine or of natural law standing outside constructed theory to save us, the limits to skepticism must be assigned within our historical purview. Man, as a historically conscious and purposive being, is constrained because he is what he is to distinguish the sane from the insane, the rational from the irrational, the known from the mythological, through reflection upon and utilization of his embodied progress. The portent of this issue in which each man becomes his own his-

torian has been expressed in Woodbridge's oracle: "For him the study of his own history is his congenial task to which all his knowledge of other histories is contributory; and for him the conscious, reflective, and intelligent living of his own history is his congenial purpose."

If the beginning of historical comprehension were also the discovery of some prime mover, the life of reason would have a prior rationalization. Dialectically, at least, one could ask what such a faculty required of a man by way of his preferences and acts. The way of reason, for Plato and Aristotle, is at once the efficacy of logically ordered inquiry and the value of its pursuit. The way is not produced by the power of the faculty. Rather, it is defined in the discovery and attachment of the soul to its appropriate objects. The appropriate objects are first principles or eternal reasons. The career of thought is simply the temporal process of disclosure and participation. With the increase of the sun's light, sensible objects are revealed to the vision of the physical eye. Analogously, with the increase of intellectual light, the soul is roused from its natal slumbers and perceives the rational forms which it is by its nature able to comprehend. Learning takes time, but the cognitive faculty and its rational essences are nonhistorical. One conclusion from this metaphor of light is found in Plato's *Republic* in the deduction of temporal order from the harmony of Reason and eternal objects. Reason, Plato assumes, is one and the same in all men as a pure knower, and is a single wisdom for all men in the theoretical vision of the Essential Form of Good. The rule of Reason in the person of the philosopher-king subsumes the temporal under the eternal and imparts to the former the stability and harmony which pertain to the latter so far as this is possible in a world of variety and change.

The attempts to ground the life of reason beyond history are themselves constituents of the history of ideas. They afford instruction to the historian concerned with his own judgments and purposes. It would be ingratitude to depreciate them, even though they are mistaken in psychological fact and assume rather than demonstrate an eternal logos. The study of nature has discredited the theory of faculties, and the study of history discredits the doctrine of an infallible vision of eternal reasons from which social guidance can be deduced. Our sciences and histories provide no footing for

an extreme rationalism. Histories constrain us to see the life of reason as a human persuasion, naturalistic in its derivations, and relativistic in the theoretical options and practicable rôles brought before us in moral rehearsals. The naturalistic history is genetic and anthropological. Its theme could be expanded at length, but I will henceforth be concerned with a second theme, that of the historical as man's "congenial purpose." This moral history is dramatic and vocational. Santayana's exposition of the moral drama in the five volumes of *The Life of Reason* prompted the title of this essay. Common Sense, Society, Religion, Art, and Science, the five phases of human progress, themselves comprise a sum of interests and enterprises making up our activities. The factoring of this sum throughout the five volumes suggests a sixth volume, a work in which the profession of the historian displayed in the other five would be examined. The examination of history as progress embodied in men and as profession engaged in by historians has led me to conclusions about history other than those expressed by Santayana, especially in his later philosophical writings. There the historical, rejected from the heaven of aesthetic and logical essences, dwindles in the limbo of Democritean skepticism.

II

The Argument

The divorce of science and history, of natural events and human events, lies at the root of Santayana's skeptical conclusions about historical opinion and historical action. Santayana maintains that the historian's predilections furnish the "vital nucleus" of his interpretation, and therefore that written history expresses an inescapable falsification. The historian's reconstruction of the past is a work of art fabricated from more or less authenticated data.

If the historian's interpretation falsifies, what is historical truth? Either it is truth established outside the conditions of historical representation and comprehension, and is thereby a truth independent of embodied progress; or it is truth established within the relativistic and pluralistic province of historical judgment. The first possibility is the denial of historical naturalism. For historical naturalism, the limits of skepticism have to be found within the historical domain. An examination of historical representation develops the following argument:

The past is reconstructed from evidence existent in the present. The events so reconstructed are "historical events" as distinguished from "actual events" or past actions which have ceased to exist. No correspondence or comparison is possible between the reconstructed historical event and its referent, the

once actual but not-now-existent happening. Evidence is itself a present actuality but is circumstantial in reference to the past. The conditions and processes of past history, as well as the events, have to be reconstructed. In addition to conserved evidence, the study of present relationships provides hypotheses for the interpretation of antecedent changes. By historical truth is meant the likelihood of interpretation. The test of likelihood is twofold: (1) conformity of an interpretation to the facts established by critical scholarship, and (2) conformity of an interpretation to contemporary scientific knowledge.

The foregoing argument, if sound, enables us to reject interpretations which deliberately cultivate and inculcate historical myths. First, such interpretations contain an internal contradiction in claiming to promote social welfare while subverting science. Secondly, they are false by the test of conformity to demonstrable propositions in science.

The deliberate rejection of knowledge for mythology is irrational practice. The rational is here defined as action in conformity with that which can be shown and demonstrated. The possibility of rational intercourse and judicial argument requires a field of evidence recognized in common by opponents, and a willingness to conform to that which is proven. Rejection of these conditions by either party to a dispute abrogates methods of reason for those of physical force.

The judgment of what is rational is itself historically implemented and conditioned. Its soundness stands on the relative grounds of present, embodied progress. Santayana's skepticism of these grounds makes an illegitimate appeal to "ideal finality" based on a conception of a direct omniscience of historical totality. The rôle of history, as defined by Santayana, not only expresses his own skepticism, but also provides no safeguards against a "vital nucleus" of dogmatic mythology. Neither extreme would follow in historical theory if knowledge in the sciences had not first been divorced from the work of historical representation. Granting that history is an imperfect field of reason, are its conceptions arbitrary?

An omen of this later skepticism appears in *Reason in Science*, Chapter II, entitled "History." History, as Santayana defines it, "is nothing but assisted and recorded memory." The veracity of memory is subject to test in assertions referring to natural events. This corroboration of representation by direct observation is part of natural science. But to speak of memory when we come to the reconstruction of human happenings in an age long past is clearly metaphorical, and corroboration by material events impossible. The reconstruction of the past which lies beyond any quickening personal recollection has its materials in the archives, records, and artifacts available to the historian. Although history proper is thus distinguished from the recollections of memory, Santayana mini-

mizes the difference. "The principle that elicits histories out of records is the same that breeds legends out of remembered events. In both cases the facts are automatically foreshortened and made to cluster, as it were providentially, about a chosen interest. The historian's politics, philosophy, or romantic imagination furnishes a vital nucleus for reflection." Santayana goes so far as to say, in this vein, that "history is always written wrong," and that "such falsification is inevitable."

These judgments, if taken literally, would postulate a condition endemical to the history of ideas portrayed in *The Life of Reason.* It is written wrong, and inevitably so. But if one knows that his history is written wrong and by an inevitable falsification, he must also know, if his terms are to have meaning within the province of historical reconstruction, what historical truth would be. Is truth in history established within or without the province of historical comprehension? To grasp the significance of this question and of Santayana's skeptical answer to it, we shall need to consider the nature of historical reconstruction.

The actual happenings of the past are gone, never to be seen again. Things conserved from the past—the document and the artifact of tool, structure, garment, utensil, coin, and other made things—can be pointed to because they exist in the present. But the facts to be gleaned from the document, or established by study of the remains, are the work of criticism. Accuracy and thoroughness in this work with source materials yields the historian's evidence about past happenings. From this evidence the events of the past are reconstructed; but these historical events can never be compared with what actually happened. The evidence by which the historian reconstructs the deed is circumstantial. He produces conviction by the likelihood of his case on the basis of the facts established by critical scholarship. To his task of reconstructing the past he may bring also knowledge provided by the physical, social, and life sciences. This knowledge will not provide him with the events of human history derived from the literary and artifactual tokens. Yet, since the earlier conditions and processes of change have to be reconstructed no less than the events of the past, hypotheses for this part of his work have their sources in what is known to the living historian. He will reject the testimony of

documents which contain eyewitness reports of the Devil on grounds more certain than his own lack of such experience. He has in the researches of modern psychology an explanation of hallucinations, and in the physical and life sciences a knowledge of man and nature which casts out a demon hypothesis. Furthermore, relationships between economic, social, and political conditions and correlated modes of behavior, when shown to hold in contemporary practice, may also hold in the reconstruction of historical events and provide an interpretation of changes. The historian's truth is one of likelihood of interpretation. Likelihood is subject to a test of conformity to the facts established by critical scholarship, and of conformity to contemporary scientific knowledge. Such knowledge is not final, nor is it free from its own conflicts of interpretation; but theory has no better alternative if our aim is to understand how men have acted and how changes have taken place.

When an interpretation of the past is deliberately undertaken as a mythology of race and blood, the test of conformity to the consensus of expert scientific opinion is rejected. Such an interpretation carried into the making of further history contains a contradiction, however, if it claims to promote the welfare of the society in which it is inculcated. For human welfare depends upon knowledge of the material conditions by which our lives are sustained. If our most reliable knowledge is derived from science, to reject or to corrupt the evidence of scientific work for political or any other kind of gain is disastrous in the end. Sciences are human pursuits and do not remain unaffected by political compulsions and social changes. The goods made possible by science through the knowledge and mastery of the material conditions of our existence are subverted with the subversion of science. The dark age of European history was a period in which men were reduced in civilization by the loss of Greek and Roman sciences and techniques. The antiscientific counsel of the Church Fathers and the theological rationalization of human history supplied by Augustine were directed to ideal gains to the despite of scientific knowledge. The disabilities and sufferings of men so wed to an ideal doctrine are perhaps consoled by that doctrine; but the doctrine does not promote human welfare if it is also responsible for loss of the spirit, method, and results of science.

The sciences, like any other human enterprise, are an embodied progress in the form of activities carried on by men now living. What is conserved from the past in museums and archives is potentially material for artist, poet, novelist, historian, and archaeologist; but it has no efficacy until taken up by some interested individual. What is continuant from the past, however, in the form of laws, institutions, modes of production, customs, groups, techniques, and ideologies, is not potential, but actual. Our culture or civilization is what it is through the continuance of relations and activities not initiated by us, but shaped by the work of many men through many centuries. The further continuance of any institution or practice is wholly within the province of living men in whom this past progress is embodied. There is no action from the past. Galileo, Newton, and Darwin can lift no protesting hand to defend the tradition in which they are honored and from which we have benefited. Those who believe that any tradition continuant from past to present will, because it has so far persisted, therefore go on necessarily in the future, are confusing the reconstruction of the past with the performances of the present. The worship of Zeus once instituted could never cease, if this view were correct. There is no embodied progress that cannot be lost in time because not practiced, or because supplanted by other practices antithetical to its continuance. No political or religious edict can controvert a scientist's demonstration of a conditioned reflex; but the edict can coerce the scientist and purge the universities.

There is no appeal to reason in history except that which speaks in the language of man's embodied progress interpreting its derivation from the past, its present conditions, and its direction to the future. An interpretation propounding a mythology in the interest of national aggrandizement is not, because it is historical and political, walled off from the test of conformity to scientific knowledge. If such a test is rejected when applicable, there is but one judgment to be made if we prize the continuance of the scientific phase of our activities. The interpretation is irrational. The criterion for this judgment is provided by the activities in which men engage, and their consequences. A consequence of the pursuit of science is knowledge; and to act in conformity with what we know is to be rational. However limited the range and however relative

the grounds of the knowledge upon which we act, within that range we can present evidence for our hypotheses, and upon those grounds we are freed from the tyranny of superstition. Exhortation and theatrics have power to sway men willing to believe, but not to persuade the nonbeliever. A field of evidence recognized by both plaintiff and defendant is requisite for the possibility of judicial argument. In the absence of some common store, meanings are esoteric and each debater talks past the other to confirm his own opinion. It is futile to try rational persuasion with men whose preconceptions are insulated against all evidence to the contrary. If our path is uncrossed by the zealot, we may profitably ignore him; but when he threatens the existence of pursuits that we prize (and which we have reason to prize in terms of knowledge and control), we are forced to meet him on the level of force. No one can like this less than the man who knows the waste and folly of war when compared with other more intelligent ways of settling disputes. When the preferred ways are closed, however, the alternatives to avoidance and isolation are those of armed truce and open fight.

Grant, with Santayana, that "the historian's politics, philosophy, or romantic imagination furnishes a vital nucleus for reflection." No cell will lack its membrane to defend and justify its own metabolism. The membrane will be impervious if historical reflection provides only a rationalization of appetite. I have argued that the vital nucleus for reflection upon human history lies within a surrounding body of knowledge to which interpretation must conform in order to be accepted as reasonable and likely. The likelihood of the argument I employ stands, itself, on the relative grounds of present, embodied progress. I cannot, therefore, follow Santayana when he remarks that the historian "would wish, as he loves the truth, to see and render it entire." This is to indulge in the scholastic device of calibrating truth with that which is. The truth of history, by this principle, is everything that happened just as it happened. Such truth, if it could be contemplated, would be "direct omniscience." A direct omniscience of all reality is not only an ideal impossible to attain, as Santayana observes; it is not even an ideal, for to care equally for everything is to care especially for nothing. The indifference of God, if He has direct omniscience, is the antithesis of the ideal which is always selective.

By laying down a criterion of ideal finality, Santayana finds that the three parts of history—investigation, theory, and story-telling—are all pursuits to be transcended. Historical investigation, by this criterion, is, in "its aim to fix the order and character of events throughout past times in all places," convicted of the futile ideal of trying to survey all the facts. Historical theory is said to be not only arbitrary but also a falsification of causes, "since no causes are other than mechanical." "Thus history," Santayana concludes, "proves to be an imperfect field for the exercise of reason; it is a provisional discipline; its values, with the mind's progress, would empty into higher activities. The function of history is to lend materials to politics and to poetry. . . . A good book of history is one that helps the statesman to formulate and to carry out his plans, or that helps the tragic poet to conceive what is most glorious in human destiny."

Houston Stewart Chamberlain's *The Foundations of the Nineteenth Century* fulfills both requirements of a good book of history by the foregoing definition. Chamberlain provides the doctrines of race, blood, soul, soil, and nation incorporated in Hitler's statecraft, and helps the tragic poet to conceive the glorious destiny of mankind under the leadership of the Teutonic hero. Santayana's divorce of our knowledge in the sciences from the task of historical representation needlessly exposes historical theory to this kind of dogmatic exploitation, on the one hand, and to his own skeptical depredations, on the other. Grant that human history is inescapably a realm of opinion in the actions of men, and in their accounts of past happenings and present meanings. Grant, also, that we are wont to cherish the interpretations which lend significance to our efforts, and that our will to understand and to make history is probated in a secular court where we both try our case and act as judges. Must we, then, conclude, not that history is an imperfect field of reason, which I would admit, but that its conceptions are "fragmentary, arbitrary, and insecure?" And if we so conclude, can history in the sense of human events escape a similar characterization? What is the necessity of skepticism in history, and what apology can be made for it?

III

THE ARGUMENT

With Santayana, a necessity for skepticism is admitted. Santayana's apology, however, with its attendant escape in the contemplation of essence and its renunciation in charity, is declined in favor of judicious action. The alternative to contemplation and charity is the recasting of practice through utilization of science in our understanding and making of history.

A consideration of the consequences of opinions and actions is relevant to our own attempts to live intelligently. What is valued in present possession and performance constitutes embodied progress. The value judgment alters nothing in the endowment, but is central to our interpretation and further effort. The reference of judgment, both retrospective and prospective, is necessarily selective. So far as men believe in a time-transcending alternative, the relativity of historical knowledge can be consigned to appearance and given over to skepticism. This transcendental skepticism is not Santayana's skepticism with its necessity of, and apology for, illusion. In criticism of the latter, it is argued that the natural sanity of substance is no alternative to man's conventional sanity. The timeless essences of the spirit's contemplation afford a negative freedom; but positive freedom, harmony in performance, is social-historical.

Rational or judicious interpretation of natural events is affirmed by Santayana, but is withheld from history when human events are treated as opinions and actions rationalized in an arbitrary way around the "vital nucleus." Opinions and actions, like the Spinozistic passions, are necessary in their genetic derivation, material determination, and cultural conditions. But philosophers, as well as historians, are subject to this necessity. Their conceptions have no superhistorical guarantees, but are only refined opinions. The treatment of the temporal as an illustration of a master principle (whether transcendent or immanent) is a metaphysical rationalization. The historical study of such rationalizations confirms rather than allays the skepticism based on the plurality and relativity of histories.

It is concluded that the problem of positive freedom (Santayana's "productive spirituality") must be taken up within the historical domain. Conventional sanity is an affair of historical purposes.

The historian records and relates human affairs, and his activity of investigation and writing is itself an instance of what men do. If action in conformity with knowledge is rational practice, the historian has a criterion of reason by which to distinguish folly and superstition from wisdom and control. The criterion imports no more rationality into the record than the evidence of human performance and production justifies. It does not require the historian to write apologetics and gives him no Hegelian master key of

objective Mind. The historian as one man writing about what other men have done has an endowment to draw upon, the endowment which Santayana calls "embodied progress." This phrase intends no theory of universal development in a desirable direction. Rather it expresses a condition characteristic of science, art, and every other human enterprise now had and engaged in. Our having and engagement depend on no genealogical piety honoring our predecessors. Their actions are completed, and if their names were effaced from buildings, documents, inventions, discoveries, instruments, and ideas, the endowment would still belong to us, even though it came anonymously. We do not have to know who Boyle was, in order to make use of the law of gases that bears his name. It is enough for the scientist to know the formula for temperature, volume, and pressure.

Yet to have and to engage in contemporary civilization occasions thought of what has been and what may be. Change was not invented by historians and tragic poets, but the themes of progress and mutability spring from their vocations. The retrospective reference brings to reflection the differences of having and not having the sciences, the arts, the religions, the governments, and the economic and social relations with which our lives are engaged. What we prize in present possession as contrasted with that which is either lacking or different in some earlier time is progress for us. Nothing in the endowment as it comes to us is altered physically by this judgment. Our inheritance is time-dependent in respect to its production and perpetuation. What is altered is our estimation and interpretation. Historical study, which is one among others of our occupations, affords the commentary by which we cast and recast our own lives. This is not done for the sake of dead men in the eventful past, except so far as piety to our predecessors is one of the present attachments we esteem. The purpose is congenial or embodied. Our estimation and interpretation represents the past as now understood, and construes what is to be done and what is worth doing from now on. "Great interests are a gift which history makes to the heart," writes Santayana. "A barbarian is no less subject to the past than is the civic man who knows what his past is and means to be loyal to it; but the barbarian, for want of a trans-personal memory, crawls among superstitions which he can-

not understand or revoke, and among persons whom he may hate or love, but whom he can never think of raising to a higher place, to the level of a purer happiness. The whole dignity of human endeavour is thus bound up with historic issues; . . ."

Both in retrospective and prospective reference, our judgment is selective. One need only read what earlier historians have written, in order to note how each bears testimony to interests and purposes indigenous to his time and place. Although imagination may chart regions remote from the familiar, its cartography is always a derived delineation. We recognize this when we say that no Beatrice is for us what Beatrice was for Dante, but that in Dante's age we would have shared his belief in her transfiguration. Dante was not more free from domestication in his embodied progress than we are in our own. His faith in a time-transcending kingdom and his lack of a critical and extensive knowledge of the past rather wed him more closely and unconsciously to his own age, than the contrary. The doctrine of a supernatural alternative to time's gain and loss of store promises deliverance from the burden of the historical. Skepticism may then be invited to do its worst with secular affairs in portraying the misery and uncertainty of a human life wasting away in time, since there is an eternal best, lying beyond life, to sustain with present consolation and to save by an ultimate redemption. Yet the poetic or speculative delineation of eternity takes no substance from its symbol or definition. For those who believe in no saving alternative as an alternative standing in its own being, the challenge of skepticism has to be met on the relative grounds from which it springs. No human beliefs are then exempt, no doctrines immune from the criticism that notes their derivation and history. The criticism itself vouchsafes a human contemplation of the historical spectacle, a contemplation that misapprehends its vocation if it identifies its refinement of meanings with the gospel of some eternal Referee.

Since contemplation is theoretical detachment, it is possible for the philosopher to turn his dialectic upon the content of his own opinions. Herein lies a contrast between the Democritean skepticism of Santayana and the angelic skepticism of Thomas à Kempis. For the latter, the fullness of God's Truth and Being descends to the contempt of human supposition and temporal circumstance.

For the former, the innocence of matter untroubled by doubt and care evokes laughter among us when we see the grim jokes we play upon ourselves in the name of a name. Convictions are metamorphosed into dramatic illusions when viewed from the pit of atoms, and the man professing them seems the victim of his own madness. Illusion and madness are, indeed, unusual names for our normal opining. Lacking complementary categories of reality and sanity, the play with words is a verbal trick to be enjoyed but not taken seriously. Opinion or action kept within bounds by punishment and agreement is, in Santayana's own phrase, "conventional sanity." We play with paradox in calling it "normal madness." For if it is madness, is there a metaphysic for it which is not itself a symptom of our malady? Can homeopathic remedies cure us of our own morbidity?

If Democritus, in the dialogue entitled *Normal Madness,* speaks for Santayana, the questions are answered by a question: "Has not my whole discourse been an apology for illusion and a proof of its necessity?" The question, however, is preceded by the Democritean aphorism that atoms in the void are eminently sane. No fret of ambition, no itch for goodness, truth, and beauty, disturbs matter uninfected with the disease of consciousness. We would be guilty of exceptional folly, however, if we sought to return to the atoms in order to heal ourselves; for there is nothing of self in this nonhuman world of indiscriminate elements. To call it sane is to pay it a compliment for that which it does not enjoy. The moral of the contrast between the spokesman for matter and the matter of which he speaks is appreciated only by those who can weep or laugh in the knowledge that the beautiful is the unsubstantial. There is no cure for our historically conditioned lives in either the contemplation of atoms or the return to them. Contemplation delivers itself of a discourse on illusory opinions as a manifest of its skeptical wisdom; and death is a limit and not a remedy of activity. The natural sanity of atoms, therefore, is no legitimate alternative to the conventional sanity of opinions and actions.

In *Platonism and the Spiritual Life,* we meet with a second gambit by which time-dependent man puts off the burden of historical illusions. The spiritual life, Santayana writes, "is distinguished from worldly morality and intelligence not so much by knowledge

as by disillusion; . . ." Its saving essence consists neither in eternal forms nor in changeless love as structure or act of ultimate substance. Such infinite survey is an angelic hope rather than a human possibility. But if we cannot transcend time with the angels, we can rescind it by contracting experience to immediacy of feeling. Here we have purity of essence through renunciation of all reference and meaning. The moment signifies nothing to one who dwells wholly within it, taking no thought for yesterday or tomorrow. Contemplation in immediacy cheats time at one extreme as contemplation under the aspect of eternity cheats it at the other. Both are alike detachments from the importunities of the flesh and the clamoring of the newsboy. They convey a negative freedom, the freedom from the temporal mean that lies between the two extremes of immediacy and eternity. What of positive freedom under the burden of the historical where essences are taken as signals for practice, and speculative construction is the theater for the actors' rôles? Here selection of what is sane must find its bounds of rationality within embodied progress.

Freedom in its positive sense is defined as harmony in performance. The reports and signals of material events when interpreted judiciously may become terms in knowledge; and such knowledge supervening upon animal adaptation makes possible some degree of understanding and mastery of the material conditions of human progress. This naturalistic and pragmatic way of treating knowledge is a central theme of *The Life of Reason*. Why, then, the apology for illusion and the proof of its necessity? We are wary of making injudicious interpretations of material events to breed illusion in the place of science. Wariness, however, is deemed unequal to cope with human events; for if it were able to, Santayana should speak of judicious interpretation and not of arbitrary concepts in history. Santayana's harmony in performance, like Spinoza's, embraces a union with nature, but is celibate in its distrust of the fickle passions of history. I have already protested this divorce of our knowledge of material events from our study of human events. Harmony of performance in respect to material events is human economy rendered efficient in its production of goods by knowledge of the material conditions of their production. This adjustment, furthermore, sustains life in the interests of

values and purposes, and is itself socially acquired. Harmony of performance, in this historical respect, is in the domain of social relations and social processes. It is noted and prized as a human event, or aimed at in our striving toward future realizations. The bees and ants, untroubled by noble fictions, pursue an automatic routine and fear no rumors of war and revolution. Having no illusions, they need no knowledge. Nor would we need knowledge if all our illusions were consistent with each other and happy in their issue. We could live confidently upon our stock of opinions without asking how we came by them or where they lead. We would live in a fool's paradise, but we would never have occasion to reproach ourselves.

If necessity of illusion is synonymous with necessity of opinion in the domain of human history, then historical study furnishes proof of determination. Every reconstruction of the past is the work of a reconstructor. His interests in the past, his purposes and assumptions in relating events, his methods of study and manner of presentation are themselves socially conditioned. His audience is contemporary and future. The books he writes become subject-matter for a history of historical writings. The present that interprets the past is in turn interpreted. This temporality of perspective is inescapable in dealing with human affairs, since the context of the historian is itself time-dependent. No man can extricate himself from the determinations of his social context and of his temporal perspective to stand nowhere, speaking a language not minted out of social communication for the purchase of goods trademarked "Made in Heaven."

Philosophers are not, in this respect, granted a leave of absence denied to other men. Opinions examined and refined, and baptized by the name of conceptions, are not redeemed from historicity and saved from social determination. Conceptions are opinions with a pedigree. In human affairs, the pedigree attaches to author, context, and tradition and is subject to an ever-running commentary. This commentary is the nemesis of every absolutist claim to a theory that is superhistorically guaranteed. As history continues to be written, there is a further word to dismiss the pretensions of every supposedly final word uttered about human affairs. From Plato to Bosanquet, philosophers in love with certainty and confi-

dent of some Absolute have patronized history. The actual deeds and enactments in their occurrence have been called "Becoming," and their contingency and irrationality taken as a prelude for a discourse on Being. As an account of the past, history is characterized as "the doubtful story of successive events." Yet, just as material events challenge observers to make constructions that will save the appearances, so human events have challenged philosophers to find some interpretation that will lead to understanding of the past and provide orientation for present actions.

Proponents of the *a priori* doctrine that the Real is the Good, or that the Rational is the Real, find reason in history by the device of turning the temporal into an illustration of their saving principle. With Augustine, Goodness is immanent in events as God's Providence, to be taken on faith in our assurance of His love. All existence with time is the working out of a supernatural plan, a drama of redemption with a preordained victory of the forces of good over the forces of evil. With Hegel, reason is immanent in events as the World-historical Spirit striving for freedom through men as the finite agents of its expression. History is the "slaughter bench" of conflicts in which each thesis generates its antithesis on the march to that final synthesis, the German world, where history ends with "All in free." The dialectic of this objective idealism, if we credit the claim, is history's own movement and not Hegel's rationalization. Objective historical reason produces in Hegel the full consciousness of its career and completion. The sun of history, rising in the East, has finished its day in the West. The purpose of history is fulfilled and both God and Hegel are content to be conservatives.

The interpretations of Augustine and Hegel are rationalizations in the grand manner, but skepticism is confirmed rather than lulled by their theories of history. They display the "divine madness" of metaphysical principles taken literally as moral agents. Uncommitted contemplative spirituality, absorbed in immediacy of essence, is all that Santayana naturalizes in banishing the alien substance of theodicy. The apology for opinions or illusions of conventional sanity remains for consideration. The natural sanity of atoms and the judicious interpretation of material events are given a clean bill of health by Santayana. Contemplative spirituality needs no bill at all, unless there are unaesthetic philistines

in our company, for the patient and the doctor are identical in the immediacy of enjoyment. But if essence be taken for true or false, the patient becomes a committed agent and the doctor of philosophy summons his skill in the diagnosis of human events. The pulse of action and the temperature of belief must be entered into the history of productive spirituality. The problem of positive freedom as harmony in past, present, and future performance is a problem of historical purposes. An understanding of what men have thought and done, and of how things have come to be as they are, deploys the interpreted past before the living actor. His exercise of options or choice among conflicting alternatives takes cues and directions from the rôles others have played; but his own sanity or rationality depends on what he does with what he knows—and to what ends.

IV

The Argument

When, with Santayana, we study Plato, Aristotle, and Spinoza, this intellectual history is transmitted wisdom for living men. The philosophers of the past whom we consult are not constrained by the continuant relations within which we cast our own lives, nor are they concerned with our choices. Their contribution is subject to our probate, and thus falls within temporality of perspective and the context of the interpreter. In the absence of a monopolistic world view, no universal persuasion harmonizes this endowment.

The predicament of the believer and the misbeliever, each rationalizing his faith to persuade the other, reveals the obstacles to rational agreement which exist in the absence of a common body of knowledge to which the claims of each could be submitted. The rejection of dogmatic certainty, however, does not necessitate the extreme predicament of Hamlet confronted by multiple alternatives and impotent for lack of conviction. Granting that our embodied progress is an imperfect field of reason, we need not make Santayana's divorce between natural and conventional sanity which leads to the Spinozistic renunciation of historical engagements found in Santayana's prescription of charity. Although our judgments are relative, rational communication can be established and reasonable decisions can be reached. Knowledge sobers and equips historical purposes, thus widening the margin of intelligent thought and action.

Suppose, with Santayana, that we go to Plato, Aristotle, and Spinoza for counsel and learn to appreciate their historical immortality enduring through the transmitted words of their books. The meaning they offer can be read by living men alone. The symbols are impotent ghosts, voiceless and sightless in the absence of an

interpreter. Santayana, bound between the covers of a book, is himself a fourth ghost playing host to the others; and we are like the living Stranger in the *Dialogues in Limbo,* seeking some guidance for rôles in which to cast our own lives. The example serves as an epitome of all intellectual history read as a record of transmitted wisdom by those who have choices among the options written in the record. Historical ghosts carry no material burdens and have no choices to make. The one-time substantial, ugly man called Socrates made his actual decisions and drank the fatal cup of hemlock. Plato's *Apology* is the essence of the immortalized meaning of the event. Whether the meaning is taken by us as a specific for our parts, or entertained only in a reader's soliloquy, can rouse no pang of feeling in the realm of ghosts. Our doubts and convictions cannot trouble disembodied ancestors. If they are said to teach us, the teachers' fame is the students' attribution. Could the once physical Plato have followed his historical ghost in its vicissitudes in the schools, he well might have been amazed by the versions. Men read as they run, and the courses are varied in their purposes. What they read, if the text is not corrupted, has its timeless lineaments as a kind of mask; but the mask of Plato is variously assumed by Augustine, Plotinus, Bonaventure, Ficino, Henry More, Grote, and Taylor.

This epitome should warn the reader that intellectual history has no final answers for his questions. If he has histrionic ability, he will rehearse uncongenial as well as congenial philosophies, and may, indeed, make an art and profession of his dialogue with ghosts. Yet he will have to answer for himself in his selection of theory to meet the questions he asks. The endowment of past teachers is then subject to probate, and falls with other contributions within temporality of perspective and the context of the interpreter. Skepticism goes begging when a single metaphysic has a monopoly, but thrives when the monopoly is challenged. For if there is one unquestioned metaphysic or religion, doubt is limited to modes and variations.

Having sure objects of faith and values univocally accepted, the Christian philosophers of the thirteenth century differed within but not upon the world view which set their purposes. The physical flux running to its eventual dissolution in each man seemed to them

to house a more than historical ghost. Inspired rhetoric became its own substantiation in the ontological proof of God. Nature translated as an effect requiring a cause was construed to yield a cosmological proof. For either proof, God was the Supreme Artist whose creative Word had shaped the world and whose Act in its immanence illuminated the soul with a natural and a revealed light of reason and moved the will seeking, in love, to return to its source and goal. The pilgrimage of the wayfarer was not in doubt, nor the need in each man of a saving grace donated from above. The steps on the way, the status of reason and faith, the general and the special influence of illumination—debate on these topics led to differences of emphasis and approach, but not to a skepticism of the Christian drama of salvation. The devil's advocate and the fool, whose folly of disbelief need only be stated to produce a refutation, were not scoffers in the audience, but villains playing in character in the stock company. But the misbeliever who holds that there is no God but Allah and Mohammed his chosen prophet, unlike the disbeliever, is not one who is simply blind to that which he should see. Rather, he firmly persists in mistaking God's Truth as the Christians see it, is equally in love with his own vision, and is no less ready with arguments to elucidate it. Here is the predicament upon which skepticism flourishes.

The Christian philosopher cannot appeal to faith, and hope to convert the misbeliever. If he appeals to reasoning, three possible lines of argument are open to him. The first attempts to persuade the misbeliever that his doctrines lack the merits of the theology expounded by the believer. This is done by comparing the adequacy of explanations, the guaranties of authority and tradition, and the scale of rewards and promises in each. Even where the antagonist is at a disadvantage in the contrast of cultures and less gifted in argumentation, successful persuasion is not easy. The misbeliever can still reply, "A poor thing, but my own." And when the antagonist admits no inferiority, he might well reverse rôles, were he as evangelically minded as the Christian, and invite his inviter into the Mohammedan faith. If neither can persuade the other—and the history of these two great religions reveals for either no great gains in the other's world—the move of winning over the opponent may be followed by the second move, that of con-

cluding a compact with him. Thus both might agree that God is, whatever the name he bears in monotheistic religions. Mutual concessions in respect to the founders of each faith would have to be made, however. The Christian could not grant that Mohammed is the only chosen prophet, to the depreciation of his own gospel; nor could the Mohammedan grant that the Christian had been favored with an only-begotten son who saved only those who forsook all other religions. The Christian charity that would embrace all infidels on its own terms is apt to be an insufferable generosity.

This compact between religions in the interest of common aspirations and functions supposes far less dogmatic rationalization than now exists. Men are not willing to make concession when they think that they have conclusive demonstrations for their own sectarian doctrines. When the protagonist is unable to persuade his antagonist or be persuaded by him, a truce in the form of religious toleration avoids much persecution and shedding of blood. It may even become in time more and more conciliatory. The third possibility supposes the failure of the first and the rejection of the second move. The misbeliever, whether Mohammedan or Communist, is the enemy to be crushed in a holy war. Argument now absolutizes partisanship in declaring the enemy's doctrine to be heretical, false, and pernicious, whereas the true doctrine is eternal, sacred, and incontrovertible. Can the Christian communism of the brotherhood of men make some common cause with the Marxian communism of workers? The opposed cries of "Godless Communism" and "Religion is the opium of the people" are the clamor of embattled opinions. No common cause can issue from rationalization by which men persuade themselves and not their opponents.

Like-mindedness requires communication. Words have a common meaning when there is some common need and circumstance in experience, or some common referent in knowledge. We are untaught by the evidence of social determination and temporal perspectivity if we think that reason *per se* can be appealed to here as a transcendent arbiter. When systems of doctrine clash in practice, persuasion, truce, or extermination comprise the possibilities if there is no common body of knowledge to which believers and misbelievers can submit their claims. Yet, while knowledge sobers and limits purposes, it does not dictate and prescribe them. If I should

propose to myself the task of finding a common ground for liberals and socialists, I could still ask why the effort should be made. Even if the rôle seemed feasible, what certifies the purpose? The doubt is not allayed by histories no more certain than my own if not satisfied by the embodied progress in which my opinions and actions are steeped and upon which I draw in making my judgments. My apology here is relative. The denial of Dante's certainty need not plunge one into the extreme predicament of Hamlet anxious to act but having no mastering conviction to pledge him to his work.

HAMLET. What have you, my good friends, deserved at the hands of fortune, that she sends you to prison hither?

GUILDENSTERN. Prison, my lord?

HAM. Denmark's a prison.

ROSENCRANTZ. Then is the world one.

HAM. A goodly one; in which there are many confines, wards, and dungeons; Denmark being one of the worst.

ROS. We think not so, my lord.

HAM. Why, then 'tis none to you: for there is nothing either good or bad but thinking makes it so: to me it is a prison.

ROS. Why, then your ambition makes it one; 'tis too narrow for your mind.

HAM. O God! I could be bounded in a nutshell, and count myself a king of infinite space; were it not that I have bad dreams.

GUIL. Which dreams, indeed, are ambition; for the very substance of the ambitious is merely the shadow of a dream.

HAM. A dream is but itself a shadow.

ROS. Truly, and I hold ambition of so airy and light a quality, that it is but a shadow's shadow.

HAM. Then are our beggars, bodies; and our monarchs and outstretch'd heroes, the beggars' shadows. Shall we to the court? for, by my fay, I cannot reason.

Rather, Hamlet reasons to his own paralysis of action. He divests himself of historical purpose until only the atoms are substantial and human events are but the atoms' shadows. Yet the ghosts of history have endowed our beggarly bodies with a worthy dress. We think ill of ourselves not because we have learned nothing from them and know nothing in science, but because we make inordinate demands for certainty in the imperfect field of reason constituted by our embodied progress. In the skeptical soliloquy of Santayana, Plato, Aristotle, and Spinoza are the naturalistic equivalents of faith, hope, and charity. The faith in substantial forms conveyed by Plato's ghost is thinned into essence timelessly presented and

enjoyed. The hope in an Aristotelian entelechy that perfects process is transformed from a power into an ideal of detached scientific contemplation for the spirit, and into a compulsion of animal faith for bodily needs. There remains for human events a Spinozistic charity born of the renunciation of special claims.

"May not the renunciation of everything," Santayana writes, "disinfect everything and return everything to us in its impartial reality, at the same time disinfecting our wills also, and rendering us capable of charity? This charity will extend, of course, to the lives and desires of others, which we recognize to be no less inevitable than our own; and it will extend to their ideas, and by a curious and blessed consequence, to the relativity and misery of our own minds." Thus the doctor of philosophy prescribes a deep draught of intellectual charity for Hamlet's "tragically single" destiny flanked by punishment and agreement. This renunciation dispells the bad dreams of ambition and disinfects the will from partisan engagements in the making of history. The beggarly body still persists in its habits and hungers, and this bondage no man escapes. Substance, "the dark principle of existence," writes Santayana, "is the soil, the medium, and the creative force which secretly determines any option like that of Hamlet." The principle *is* dark and the determination secret if we expect from nature an answer to the question of why men should live. Both question and answer are with Hamlet. And Hamlet, by a curious and hardly blessed consequence of Santayana's remedy, is both the puppet moved by hidden strings and the disillusioned spectator approving his own histrionic suicide. Santayana's apology for illusion, like Plato's apology for Socrates, commemorates the dead body of opinion and action by conferring an ideal life upon it in reflective consciousness.

Yet the life of reason has fruits also in consequences. The divorce that separates knowledge of material events from the further maintenance or transformation of that which we take as our progress—take, because we are beggars otherwise—can be moderated from Santayana's extreme skepticism of reason in history. The apology for opinions must still acknowledge their necessity in the proof of the relativity of our judgments; but within that relativity there is room for rational communication and reasonable decisions.

Hamlet has a burden of responsible action. Tragic dignity characterizes his choices when he acts neither as fortune's fool nor as Heaven's favorite, but enlists what he knows to give soberness and control to what he believes in and acts for. The disinfection of charity accompanies but does not generate performance. Taken alone, it is a sterile skepticism in the world of social action. To utilize what we know in science for our understanding and our making of history is to increase the margin of intelligent thought and action. Reason in history is not thereby rid of its risks and its relativity, but it may rise from the blunderings of trial and error to the dignity of planned excursions. While rationalization tends to confirm beliefs already entertained, an examination of science and society leads to revisions of theory and recastings of practice. Though assumed as a congenial task, the study of histories imposes a burden of purposes to be carried toward the future. Our knowledge provides no royal road for our purposes. Their progress, when compared to soaring rationalizations, is pedestrian. Yet our concepts are not arbitrary fictions, bad dreams, and sick illusions, though we limp and stumble along the dusty track in having only the imperfect counsel afforded by the embodied progress of our own day. I might wish to believe in some other, happier, and more authentic wisdom; but my apology is not feathered to fly beyond these domestic limits. I cannot otherwise conclude from the historical essay and think my judgment to be reasonable.

RATIONALITY AND IRRATIONALITY

BY

PAUL MARHENKE

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THE TERMS "rational" and "irrational" have two sets of synonyms. They are synonymous with "sane" and "insane" on the one hand, and with "intelligible" and "unintelligible" on the other. But "sane" is not a synonym of "intelligible," and "insane" is not a synonym of "unintelligible." This fact suggests that the terms "rational" and "irrational" have *at least* two different meanings. Philosophical lucidity would be considerably increased if it were true that they had also *at most* two. As a matter of fact, the terms are used with a great many different meanings both in ordinary and in philosophical discourse. Some of these will be discussed in this paper; others—I hope they are the unimportant ones—will have to be omitted. Those that I do discuss may be divided into two groups on a principle which is suggested by the two sets of synonyms just considered. The meanings that constitute the first group may be predicated of a being that has a mind or of a mental activity in which such a being engages. The meanings that belong to the second group can be predicated of something whether that something has a mind or not and whether it is a mental activity or not. The members of the first group therefore have something in common; the members of the second group, so far as I can see, have nothing in common, save the fact that they do not have in common what the members of the first group do have in common. This lack will give an unsystematic character to the second part of this paper, where these meanings are analyzed, but I do not know how this defect can be avoided.

The first group of meanings is illustrated in propositions such as that men are rational, animals irrational; that some men are rational, some irrational; that some actions are rational, some irrational; that some beliefs are rational, some irrational; that some inferences are rational and some irrational. The second group is illlustrated in propositions such as that knowledge contains a rational and an irrational element; that predictable occurrences are rational, whereas those that are not predictable are irrational; that the operation of a clock, being reducible to the operation of its

parts, is rational, whereas the operation of an organism, not being reducible to the operation of its parts, is irrational. The meanings of the terms "rational" and "irrational" that are involved in the first set of propositions are predicated either of creatures that possess or do not possess the faculty of reason, or of their actions, beliefs, or inferences. In the second set, what is said to be rational or irrational need not possess the faculty of reason, nor does it presuppose a being that has that faculty.

The conditions of significance are therefore quite different for the two sets of propositions. When we say that men are rational and distinguish them from animals as irrational, we presumably mean that men have rational minds, while animals, though they have minds, do not possess rational minds. Similarly, when we affirm that some men are rational and some irrational, we imply that they at least have minds. And again, when we characterize actions, beliefs, and inferences as rational or irrational, we imply that these are actions, beliefs, and inferences of rational or irrational creatures,—again, therefore, of creatures that have minds.

The entities which are said to be rational or irrational in the second set of propositions need not have minds or be minds, nor do they need to be activities of or processes in minds. When we say that nature is rational or that it is irrational, meaning by this statement that the events in nature are determined or that they are not determined, we obviously do not mean to imply that these events have minds or that they are minds, or that they are processes or activities in someone's mind. Since the conditions of significance are quite different in the two cases, one and the same entity may be irrational in one sense and rational in another. Thus it may be true that the feelings and actions of a sea cucumber are irrational in the sense that its feelings are not cognitive and that its actions are not motivated by reasons whether good or bad. It may also be true that its feelings and actions are rational in the sense that both would be predictable if we knew the laws governing the behavior of sea cucumbers.

That there are two groups of meanings, and not two meanings, of the terms "rational" and "irrational" is demonstrated by an examination of the two sets of propositions. We are all familiar with Aristotle's definition of man as a rational animal. Since Aristotle

undoubtedly did not think either that all men are rational or that all men are rational all the time, he must have thought that the definition is compatible with these propositions. But if the proposition "All men are rational" is to be compatible both with the proposition "Some men are rational" and with the proposition "Some men are irrational," then the term "rational" cannot have the same meaning in the universal and the particular proposition. In the particular proposition the meaning of the term has received a further specification. If the meaning had remained unaltered, "rational men" and "irrational men" could not both be subclasses of "rational men." As a matter of fact, the terms "rational" and "irrational" are used with a wider and a narrower meaning. When we assert that some men are irrational, we do not invariably mean that the irrationality of men is indistinguishable from the irrationality of animals, which Aristotle contrasted with the rationality of men. Sometimes, indeed, we do mean this; the idiots among us are probably irrational in this sense. But many lunatics are certainly not irrational in this sense. The irrationality of animals presumably consists in the fact that animals do not possess minds that are capable of performing the functions of thinking, judging, believing, and inferring. If so, a lunatic who suffers from a delusion of grandeur is not irrational in the sense in which animals are, since animals, by hypothesis, are incapable of holding beliefs, and are therefore incapable of suffering from delusions of grandeur. But since a lunatic is said also to be irrational, his irrationality must obviously be compatible with his rationality, and the meaning of the term "rational" must therefore have received a further determination when we characterize him as irrational.

Examination of the second set of propositions discloses a similar multiplicity of meanings of the terms "rational" and "irrational." An event, we might hold, is rational or intelligible when it is determined, and irrational or unintelligible when it is not. The event we designate as the formation of water, for example, is determined by the event we designate as the chemical combination of hydrogen and oxygen. The formation of water is therefore a rational or intelligible phenomenon. But the formation of water under these circumstances may also be considered as irrational. An event, we might hold, is to be regarded as rational only when it is reducible to

its determining conditions. The operation of a watch, for example, is reducible to the operation of springs, balance wheels, and cog wheels, since we can deduce the operation of a watch when we know the properties they have in isolation and in combinations other than those of watches. Such a reduction not being possible in the formation of water, water having properties which are not reducible to those that hydrogen and oxygen have either in isolation or in combinations other than that of water, its formation must be regarded as an irrational event. In general, the emergence of novelty, of whatever is not explainable on mechanistic principles, is irrational. The novel must be reducible to the familiar, it must be shown not to be novel, if it is to be rendered rational or intelligible.

With these preliminary explanations in mind we can return to a more detailed examination of the meanings of the terms "rational" and "irrational" that are comprised in our first group. We begin, then, with Aristotle's definition that men are rational animals. What are we to understand by a rational animal? We might hazard the suggestion that a rational animal is one that has the power of reason. But what, then, are we to understand by the power of reason? Is there a unanimity regarding the meaning of this term, either among philosophers or among others, that is at all comparable to the unanimity regarding the meaning of terms such as "the power of smelling"? The answer is, of course, that there is no unanimity among philosophers and that nonphilosophers use the term so vaguely as to make it virtually impossible to determine its meaning. Under these circumstances we need waste no time on the question of what either Aristotle or any other philosopher understood by a rational animal. We shall instead take the course of arbitrarily including in the concept of "reason" all or most of the characteristics that philosophers have said are connoted by this concept.

Reason is sometimes described as that faculty which is employed in the acquisition and development of knowledge. It is therefore called a cognitive faculty. With equal justification it might of course be described as that faculty which is employed in the acquisition and development of error. Reason has as much of a hand in the acquisition and refinement of the one as of the other. The several cognitive activities we ascribe to reason, some of them at

any rate, must therefore be so specified that they yield error as readily as they yield truth. By a being that has the power of reason we shall accordingly understand a being that can perform one or more of the following functions. (1) It can entertain beliefs and express them by means of propositions. (2) It can draw inferences, both deductive and inductive, from these propositions. (3) It can apprehend or intuit necessary connections, that is, it is able to recognize the *a priori* truth of a proposition. (4) It is capable of forming *a priori* concepts. The first two functions have been ascribed to reason by all or most philosophers. To say that the entertaining of beliefs and the asserting of propositions is a function of reason is to say that reason is discursive, that reason operates by means of concepts. The ability to think discursively and the ability to draw inferences are perhaps the sole characteristics that philosophers and nonphilosophers agree in ascribing to a being that has the power of reason. The third function has also been ascribed to reason by all or most philosophers. Some of them have held that there are two kinds of *a priori* propositions, the analytic and the synthetic, and they have distinguished the necessity that is apprehended in the analytic proposition as a logical necessity from that apprehended in the synthetic proposition as a metaphysical necessity. Others have denied the existence of *a priori* synthetic propositions and have accordingly held that the ability to apprehend the *a priori* truth of a proposition is confined to those that are analytic. The existence of the fourth function has been denied, with few exceptions, by all those philosophers who have denied the existence of *a priori* synthetic propositions. Those that believe in its existence make the distinction between *a priori* and *a posteriori* concepts in the following way. Concepts which have empirical instances or are analyzable into concepts which have empirical instances are *a posteriori*. Concepts which are used in the organization of experience but have no empirical exemplification are *a priori*. Mr. Broad, for example, thinks that the concepts of "cause" and of "physical object" are concepts of this kind, although he does not appear to believe in the existence of synthetic propositions that are true *a priori*.

To return to Aristotle's definition, then, we may say that a rational animal is one that performs one or more of these functions.

It is to be noticed that these functions are not all independent of one another. The ability to think conceptually is obviously implicated in the remaining functions. Also the ability to apprehend or intuit necessary connections is obviously required in the drawing of valid inferences. But even so, by combining the functions which are independent in all possible ways, the meaning of the term "rational" may be specified in a great many different ways. It would be fruitless to debate the question whether animals other than men are irrational in all or only in some of these senses. People who believe that their dogs, cats, parrots, or canaries are not irrational, undoubtedly hold that these creatures are rational in some of them, as for instance in the sense of being able to engage in discursive thought or in the sense of being able to draw inferences. All we need to assume in order to elucidate the contrast between rationality and irrationality is that there are some creatures, amebas and sea cucumbers, let us say, that do not engage in these activities, nor, of course, in the higher rational activities we have mentioned.

Animals, then, or some of them at any rate, are distinguished as irrational from human beings as rational, in the following ways. Animals are unable to engage in discursive thinking; they are incapable of referring to their experiences by means of concepts. They indeed have experiences, but they do not make assertions about them, and accordingly they do not have the ability of distinguishing between truth and falsity. Although they sometimes act as if they believed certain propositions to be true and others false, they do not actually hold such beliefs. Being unable to formulate propositions or to entertain beliefs, they are of course *a fortiori* incapable of drawing inferences, of intuiting necessary connections, and of forming *a priori* concepts. The so-called inferences that animals make are probably more accurately described as associations of ideas.

One further difference between rational and irrational creatures may be mentioned at this point. A rational creature, as we have described it, need not be a creature that is capable of voluntary actions. It might be a purely contemplative being, incapable of action. Now one of the differences between man and the animal world that is often emphasized is that man is capable of actions

that are motivated by reasons. By contrast, the actions of animals are not motivated by reasons. Birds do not migrate because they desire a warmer climate or a greater abundance of food. They do not build nests because they intend to lay eggs, or because they are solicitous of the future needs of their offspring. To be sure, they act as if these were their reasons. But their actions are not really motivated by them. Birds are creatures of instinct, impulse, and emotional drive; their actions are irrational.

It should not be necessary to point out that the distinction between rational and irrational action, as we have drawn it, is not the same as that between purposive and nonpurposive action. When we affirm that the actions of birds are irrational because they are not motivated by reasons, we do not deny that their actions are rational in the sense of being purposive. Actions such as we have mentioned are irrational in the one sense and rational in the other. When we characterize them as rational or purposive we contrast them with the irrational or purposeless activities of animals, as for example the aimless chatterings of a parrot. These two meanings of the term "rational" are not, however, members of the same group. The second meaning belongs to the second group. Proof of this contention would require an extensive analysis of the concept of purposive action; but in spite of the importance of this concept, it will receive no further mention when we reach the second group.

Rational creatures as creatures that are capable of performing one or more of the functions of reason have so far been distinguished from irrational creatures as creatures that perform none of the functions we have ascribed to reason. We now divide the class of rational creatures into two subclasses. The division is effected by increasing the connotation of the term "rational." The creatures that are rational in the new sense will then form a subclass of the creatures that are rational in the old sense. And similarly, the creatures that are irrational in the new sense will also form a subclass of the creatures that are rational in the old sense.

Reason, we have said, functions in the acquisition of our knowledge as well as in the acquisition of our errors. Anticipating for a moment the further specification of the meanings of the terms, we might say that there is a rational and an irrational use of reason.

One of the functions we have ascribed to reason is the entertainment of beliefs and the conceptual formulation of such beliefs in propositions. The beliefs we entertain may be divided into those that are rational and those that are irrational, into those that are in accordance with reason, as we say, and those that are not. If what is believed is an empirical generalization or a proposition that expresses a particular matter of fact, the belief is said to be rational, in accordance with reason, if it is in accordance with the evidence. If not, it is said to be irrational. If I believe that I am the Grand Lama of Tibet, but that everybody has joined a conspiracy to prevent me from taking over my temporal and religious powers, I shall be called unreasonable, and a jury of my peers will adjudge me irrational and commit me to an asylum if I persist in either of these beliefs. Irrational beliefs may indeed be held by rational people, but those whose beliefs cannot be shaken when the evidence confronts them are irrational. Again, belief in the established propositions of mathematics and logic may be called rational, belief in mathematical or logical contradictions irrational. One does not sacrifice one's reputation as a rational thinker by occasionally entertaining a contradiction, if one is amenable to reason. But a person who persists in the belief that a contradiction is true in the face of a demonstration to the contrary, gets the reputation of a "nut" if he restrains the impulse to convince others of the validity of his belief, and that of a "crank" if he does not.

One way, then, of narrowing the conception of a rational being is by making a distinction between rational and irrational belief. Another way, independent of the first, is by making a distinction between rational and irrational inference. We shall draw this distinction with respect to deductive inference only. One that is similar to this can of course be drawn also with respect to inductive inference, by making the requisite qualifications.

Logicians make a distinction between valid and invalid inference. They do not distinguish between rational and irrational inference. However, they have drawn the distinction in such a way that the aberrations from valid inference are not all comprised in what they call invalid inference. One who has observed the rational minds of students functioning in the derivation of consequences from premises will have encountered many examples of inference

that do not fall under the traditional conception of invalid inference. It is therefore desirable to have a term that covers all the departures from valid inference, and I shall choose to call these "irrational inferences."

There are two types of valid inference. The first type is governed by the rule that a proposition which is an instance of some general proposition previously proved or assumed can be asserted. The second is governed by the rule that when the proposition p has been asserted and a proposition of the form $p \supset q$ has been asserted, then the proposition q can be asserted. Since a proposition is always inferred from other propositions, the process of inference requires a body of propositions from which other propositions are inferred in accordance with these rules. In logic and mathematics the inferred propositions are derived from a body of propositions known as axioms or primitive propositions. These are either known to be true or assumed to be true. The propositions we can validly infer are therefore relative to the system of propositions we have chosen as axiomatic or primitive, whether they are propositions of logic and mathematics or not.

Inferences that proceed in accordance with these rules we shall call rational. Departures from rational inference occur when the rules of inference are violated. The first rule is violated when a proposition is asserted either on the authority of a proposition (which may be either a primitive proposition or a theorem) of which it is not a specific instance, or on the authority of a proposition which is neither an axiom nor validly inferrible from the axioms. Thus the proposition $p.\supset.p \vee q$ is a true proposition of logic. If I now assert the proposition $p.\supset.\sim p \vee q$ on the authority of this proposition, I have violated this rule, for this proposition is not an instance of the proposition $p.\supset.p \vee q$. Even if the proposition I infer is true, that is, if it is inferrible from some other proposition, the inference will still be irrational if the proposition cannot be asserted on the authority of the proposition that I cite in justification of the inference. The proposition $p.\supset:p \vee \sim p.\vee.q$, though true, cannot be asserted on the authority of the proposition $p.\supset.p \vee q$.

The second rule permits the assertion of q when p and $p \supset q$ can both be asserted. The rule is violated by drawing inferences that it does not authorize. (1) I violate the rule by asserting q or some

proposition other than q, when either p or $p \supset q$ cannot be asserted, that is, if the one or the other of these propositions is neither an axiom nor deducible from the axioms. (2) I violate the rule by asserting some proposition other than q, even though p and $p \supset q$ can both be asserted. (3) I violate the rule by asserting q when $p \supset q$ and some proposition other than p can be asserted, or when p and some proposition other than $p \supset q$ can be asserted.

I do not pretend that all these violations occur to the average reasoner. Only the abnormal reasoner commits most of them, and sometimes he commits them all. So-called invalid inferences, as distinguished from irrational inferences in general, have been singled out from among these, on account of the frequency of their occurrence. As we have observed, most of the violations of the rules of inference are not committed by people who have ordinary powers of ratiocination. Those that are committed resemble valid inferences and are mistaken for them. It is these that logicians have called invalid inferences. Violations other than these are of no interest to the logician, since it never occurs to the normal mind to commit them. But we, being interested in the characterization of the irrational mind, have to reckon with their possibility.

Inference, whether rational or irrational, is essentially a process of deriving propositions from other propositions. We cannot, therefore, say that the proposition q has been derived from other propositions, unless the reasoning has proceeded in accordance with the rules of inference or one or the other of the possible ways of violating these rules. I cannot be said to have derived the proposition $\sim q$ from the propositions $\sim p$ and $p \supset q$, unless I believe that the assertion of $\sim q$ when $\sim p$ and $p \supset q$ can be asserted is a valid rule of inference. Hence the mere progression from one proposition to another is not inference, when there is no presumption that the passage is authorized by a rule. Where no such presumption is present, there is no inference either rational or irrational. This is not to say that the progression cannot be explained when this presumption is absent. The progression may be explainable as an association of ideas. But the association of ideas is not inference.

Our initial conception of a rational being can now be narrowed in the same manner as before, by utilizing the distinction between rational and irrational inference. It would not conform to standard

usage, nor would it be tactful, to say that persons who draw irrational inferences are irrational. Moreover, if we did assign this connotation to the term "irrational," the creatures that are irrational in this new sense would undoubtedly be identical with those that are rational in the old sense of the term "rational." As a matter of fact, a person who is amenable to reason, one who can be made aware of his violations of the rules of inference, continues to be regarded as rational. He loses this reputation only when it is impossible to convince him that he has violated the rules.

Since the distinction between rational and irrational belief is independent of the distinction between rational and irrational inference, our initial class of rational beings can now be divided into four subclasses. Our rational and irrational believers may both be further subdivided into rational and irrational inferrers. We can now specify the meaning of the term "rational" in such a way that the members of the first subclass only can be considered as rational. This way of specifying its meaning also accords with ordinary usage. A person who is defective either on the side of belief or on that of inference is considered as irrational. A lunatic might draw perfect inferences, but we say that he is irrational since he cannot be convinced of the absurdity of his premises. And similarly a person whose premises are beyond reproach is regarded as irrational when his inferences are incurably defective.

This completes our discussion of the first group of meanings. I do not claim that I have made an exhaustive examination of all the meanings that belong to this group. I have, for example, omitted to consider the meanings the terms "rational" and "irrational" have when we distinguish between the rational and the irrational actions of otherwise rational creatures. But these meanings and others like them that I have omitted could easily be accommodated by the scheme I have described.

The various meanings of the terms "rational" and "irrational" that constitute our first group can be significantly predicated of minds, of creatures that have minds, of processes in minds, and of the actions of creatures that have minds. In brief, propositions of the form "x is rational" or "x is irrational" are significant when x either is a mind or involves a mind. The meanings that constitute our second group are such that propositions of this form are signi-

ficant whether x is a mind or not or whether x involves a mind or not. We shall now consider some of the more representative members of this second group.

Before we turn to the more familiar uses of the terms "rational" and "irrational" and their more familiar meanings, I propose to examine a meaning that is unfamiliar, at any rate to people who have no philosophical preconceptions. I refer to the meaning of these terms that is involved in the assertion of idealistic philosophers that knowledge contains a rational and an irrational element. Let us first ask ourselves whether this assertion is meaningful when knowledge is conceived after the manner of realists. Knowledge, as realists conceive it, is a system of true propositions which are *about* the world of nature. Realists, in other words, in common with most nonphilosophers, distinguish between knowledge and what knowledge is about. The object known does not depend for its existence upon being known; the very possibility of knowledge, in fact, presupposes the independent existence of something that can be known. There would be no knowledge unless there were rational creatures that construct it, but the object known is not constructed by them, and this object therefore owes its existence neither to them nor to its being known by them. Now knowledge, being a creation of rational creatures, may of course be characterized as rational. The rationality of knowledge is then distinguished from the irrationality of the object known, the latter not being a creation of reason. But is it this distinction that is meant when knowledge is said to contain a rational and an irrational element? Clearly it is not, since the object known, according to the realistic conception of knowledge, is not an element in the knowledge of it. We conclude, then, that this assertion is meaningless when knowledge is conceived after the manner of realists. For what elements of knowledge can we possibly distinguish as rational from what other elements as irrational? The elements of knowledge are propositions, and there is no way of distinguishing some of these as rational from others as irrational. The system as a whole, as well as every last element in it, is a product of the cognitive activities of reason. Within this system there is no way of distinguishing a rational and an irrational component.

The assertion, in order to be meaningful, therefore presupposes

an entirely different conception of knowledge. Suppose, then, we abandon the realistic conception according to which knowledge is a system of propositions which are *about* the object known. And when we abandon this conception we abandon the distinction between knowledge as a system of propositions and the objects known, the world of nature, let us say, which these propositions are about. In brief, let us assume that knowledge about nature is identical with nature. Now, if knowledge about nature is identical with nature and if knowledge is a construction of rational minds, it follows that nature is a construction of rational minds. Knowledge, that is, nature, according to this supposal, is therefore a construction in exactly the same sense in which a melody is a construction. As the latter is constructed by a musical mind, so the former is constructed by a rational mind.

A melody is undoubtedly a construction, for we can name the elements out of which it has been constructed. If, therefore, the analogy between knowledge and a melody is rigorous, we ought to be able to name the elements out of which knowledge has been constructed. Let us first name these elements with respect to the melody. There are two possible answers to the question, What are the elements out of which melodies are constructed? I take it that the more plausible answer would be that a melody is constructed out of tones and that these tones are themselves not melodies. A less plausible answer would be that the components of a melody are themselves melodies; that, when analyzing a melody, we never reach a component, down to the last tone and overtone, that is not a melody. Now, if knowledge is analogous to a melody, if it also is a construction, we may ask the analogous question, A construction out of what? As with respect to the melody, there are two possible answers, and both, as a matter of fact, have been given; but I shall not distinguish between their degrees of plausibility. One answer is that knowledge is constructed out of sense data which themselves are not knowledge. The other answer is that knowledge has no analytical components which are not knowledge, that even among the sense data we still encounter the constructive activity of thought. And hence at no point, however far the analysis be carried, do we find a component that is not knowledge, since wherever we encounter the constructive activity of thought, there we have knowledge.

This conception of knowledge is, of course, one that is quite familiar to philosophers. It is known as the idealistic conception of knowledge. The first answer to our question, to the effect that knowledge contains a component which is not knowledge, is the answer of Kant and, more recently, of Lewis. The second answer, that knowledge contains no components which are not themselves knowledge, is the answer of objective idealists, such as Natorp. According to the first answer, knowledge, that is, nature, is constructed out of concepts and sensory materials; according to the second, out of concepts alone. The assertion that knowledge contains a rational and an irrational element is therefore true only when knowledge is conceived as the first answer conceives it. For reason contributes only the concepts to the materials out of which knowledge is constructed; the sensory materials are not contributed by reason. But when knowledge is conceived as the second answer conceives it, knowledge dissolves without residue into concepts, and hence contains none but rational components. Let us see whether this distinction between a rational and an irrational element can be successfully maintained when knowledge is conceived as idealists conceive it.

According to Lewis, the analysis of knowledge yields two elements, namely: immediate data, such as sense data, which are given to the mind, and concepts which are produced by the activity of thought. These two elements are independent of each other. In spite of this alleged independence, these concepts are used in the interpretation of the immediate data. Empirical knowledge, it is said, arises through conceptual interpretation of the given. But since the two elements are independent of each other, the given presumably does not dictate its interpretation. Presumably it is amenable to any interpretation.

Lewis recommends these theses to us by advancing the following considerations in their favor. First, if there is no datum, then knowledge has no content and is arbitrary. Second, if there is no interpretation or construction which the mind imposes upon these data, then thought is superfluous and the possibility of error becomes inexplicable.

I do not believe that a theory of knowledge that does not grant the validity of Lewis' premises faces these consequences. Instead, I

believe that a theory of knowledge that begins with them has to face the following dilemma. If the data of sense and of conceptual interpretation are independent of each other, then knowledge is arbitrary and the distinction between truth and error vanishes; if, however, they are not independent, then there are forms which the mind does not impose and thought (in Lewis' sense) is superfluous. On the first hypothesis, the mind is not forced to be selective in imposing its forms upon the given. The given is amenable to any form, and this is possible only if it is formless. It is the formlessness of the given which presumably has been the reason why this nonentity has been designated as irrational. On the second hypothesis, the mind is forced to be selective in imposing its forms upon the given, because the given already has a form that is independent of mind. The given does not suffer the imposition of any form whatever without protest. On the second hypothesis, the possibility of error has indeed been vindicated, but only at the expense of limiting the activity of mind.

A theory that views knowledge as a construction cannot operate with the notion of the given. If all synthesis comes from the mind, knowledge can have no components that are not synthesized; for the notion of something that is utterly formless and chaotic is a self-contradictory notion. Objective idealism has therefore taken the consistent view that knowledge contains no component that is given. The Kantian view that knowledge contains a manifold of sensations presented under the forms of space and time which is only subsequently synthesized by means of concepts is accordingly abandoned. The unity as well as the multiplicity of this manifold is contributed by thought. The idealistic proof of the thesis that the object of knowledge is a product of the determinative activity of thought depends, of course, on the identification of the real with knowledge of the real. Since the real is something determinate, and since all determination is determination by thought, this identification entails that there can be nothing prior to all determination. For what indeed could be prior to all determination? "There is no being," says Natorp, "which is not posited by thought. Thinking is nothing but the positing of something." Accordingly, the existence of a manifold of sense which precedes the synthetic activity of mind is expressly denied. For whatever be the nature of any-

thing, the assertion that it has that nature is a determination of thought. Independently of such determination there is nothing that has any nature at all. Anything determinate, and everything is something determinate, owes its determination to thought. Therefore, when we strip away all determination, we are left with nothing at all. Knowledge does not contain an irrational residue.

It follows that the distinction between the given as a subject for conceptual determination and the conceptual forms which are impressed upon the given is a relative distinction only. Whatever is given as a subject for further determination has itself been constructed or determined in previous acts of conceptual determination. No materials are ever supplied to the mind which do not bear the impress of mind. The idealistic distinction between a rational and an irrational element in knowledge is therefore invalid.

I turn now to the more familiar ways of distinguishing between the rational and the irrational. The rational is being distinguished from the irrational when we distinguish between the knowable and the unknowable, between the describable and the indescribable, between the effable and the ineffable, between the intelligible and the unintelligible, between the explainable and the unexplainable. With respect to every one of these distinctions we appear to be distinguishing between what lies within the powers of reason and what lies beyond its powers. Let us see whether this is correct.

We are all acquainted with Spencer's doctrine of the unknowable. According to Spencer, knowledge is limited to the phenomenal world. The force which manifests itself in these phenomena, the absolute or the unconditioned, as Spencer calls it, is inscrutable and unknowable. This Spencerian agnosticism about the ultimate reality has been refuted innumerable times by the argument that the proposition "The absolute is unknowable" expresses some knowledge about the absolute, and that Spencer has therefore involved himself in a contradiction. Although the agnostic who admits the validity of this argument is an anomaly, Spencer eventually rose to the occasion. Mr. Jourdain makes the following comment on Spencer's recantation in a book that deals with the more informal aspects of logic.

"To the last (1900) edition of *First Principles* was added a 'Postscript to Part I,' in which the justice of this simple and well-

known criticism as to the contradiction involved in speaking of an 'Unknowable,' which had been often made during the forty odd years in which the various editions had been on the market, was grudgingly acknowledged as follows:

" 'It is doubtless true that saying what a thing is not, is, in some measure, saying what it is; . . . Hence it cannot be denied that to affirm of the Ultimate Reality that it is unknowable is, in a remote way, to assert some knowledge of it, and therefore involves a contradiction.'

"The 'Postscript' reminds one of the postscript to a certain Irishman's letter. This Irishman, missing his razors after his return from a visit to a friend, wrote to his friend, giving precise directions where to look for the missing razors; but, before posting the letter, added a postscript to the effect that he had found the razors."[1]

Now, Spencer could have avoided making these admissions if he had realized that the criticism which he finally faced so valiantly is nonsensical. For the paradox of an unknowable absolute that is also knowable depends upon a confusion of types. As soon as the proper typical distinctions have been made between the "knowability" of the absolute and the "knowability" of its being unknowable, the paradox disappears. After we have specified the type of "knowable," we can say without contradicting ourselves that the absolute is unknowable. Its unknowability in this sense does not preclude its being known in some other sense. In fact, if it is unknowable in one sense, we can always determine another sense in which it is known.

Paradoxes similar to this one can be manufactured from the distinction between the namable and the unnamable, the describable and the indescribable, the effable and the ineffable. The unnamable has been named when we say that it is the unnamable, and the indescribable described when we say that it is the indescribable. If there is something that is ineffable we must not say so, on pain of contradicting ourselves. For if we say that it is ineffable, we have by that very fact made it effable. The paradoxes disappear as soon as the typical ambiguity that inheres in terms such as "namable," "describable," and "effable" has been removed.

[1] Philip E. B. Jourdain, *The Philosophy of Mr. B*tr*nd R*ss*ll*, p. 70.

We cannot, therefore, base the distinction between the rational and the irrational upon limitations in our powers of reason. For the assertion that the efforts of reason to know and to understand are subject to limitations and that the separation of the rational from the irrational is determined by these limitations is nonsensical, unless we have determined the type of knowing and understanding that is involved. The distinction between the rational and the irrational is therefore relative to a type. What is irrational relative to one type may also be rational relative to a higher type. We might, for example, define the rational as that about which it is possible to make assertions. But unless we fix the type of these assertions we shall contradict ourselves. For, according to the definition, the irrational ought to be that about which it is impossible to make assertions. Hence, if there is anything irrational, we can make about it the true assertion that it is irrational. The irrational is therefore also rational. But once the type of the assertions that are mentioned in the definition of the rational has been fixed, the assertion that the irrational is rational will be of a higher type, and the contradiction disappears.

Similarly, when we assert that the absolute cannot be known we have to specify the type of "knowing" we are talking about. But since this assertion is also a "knowing," it must be "knowing" of a higher type. Since there is no upper limit to such types, we cannot properly speak of limitations of knowledge or of reason in any absolute sense. For any limitation that we may wish to set has to be specified by defining a type. "To state," writes Mr. Jourdain, "that all knowledge of such and such a thing is above a certain person's intelligence is not self-contradictory, but merely rude: to state that all knowledge of a certain thing is above all possible human intelligence is nonsense, in spite of its modest, platitudinous appearance."[2]

In the illustrations considered, the distinction between the rational and the irrational is effected by defining a type. We may next turn to those that do not require the removal of typical ambiguities. In the order named I shall discuss the distinction between the inferrible and the uninferrible, between the intelligible and the unintelligible, between the explainable and the unexplainable, and between the necessary and the contingent.

[2] *Ibid.*, p. 70.

The first of these distinctions depends upon the fact that every inference, whether deductive or inductive, is based ultimately on premises which are themselves not inferred. A given proposition may of course have been inferred from premises which are themselves inferrible from other premises. But eventually we must of course come to premises that are not inferred from other premises. The propositions of a system of logic or mathematics could therefore be classified as rational or as irrational, according as the propositions are theorems or axioms. Although philosophers have not drawn this distinction when the subject-matter consists of the propositions of logic and mathematics, they have drawn it when the subject-matter consists of propositions that assert matters of fact. A proposition, or the fact it asserts, is considered as rational if, and only if, the proposition is not an ultimate premise. Thus the unproved propositions of the science of mechanics or optics may be distinguished as irrational from the theorems as rational. Similarly, the evidence on which a problematic inference is based is either itself established by inference, demonstrative or problematic, or it is not so established. Either way, the evidence on which a problematic inference is ultimately based is irrational, according to the definition.

It would be a mistake to assume that this distinction between the rational and the irrational is an absolute distinction. The distinction was based solely on the fact that certain propositions are, as a matter of fact, not inferred from other propositions, and not on the fact that it is impossible to infer them. In logic the distinction between theorems and axioms is not absolute. What is theorem may also play the rôle of axiom, and what is axiom may also play the rôle of theorem. What is true of the propositions of logic and mathematics is of course also true of the propositions of any deductive science. It is always possible to transform its unproved propositions or axioms into theorems by an appropriate choice of a different set of axioms. If determinism were true, it would not even be so that propositions which express particular matters of fact are absolutely irrational. The future positions of the moon can be calculated only if we know its position at some other moment, for example, the present moment. The proposition which asserts that the moon is in such and such a position at the present moment is of

course irrational, since it has not been deduced, but established by empirical observation. But its present position can obviously also be calculated, provided we know its position at a previous moment. This proposition is therefore also rational, since it can be deduced. Hence, although some proposition asserting that the moon is at such and such a position will always have to be taken as uninferred, it is not true that this proposition is uninferrible. The evidence on which problematic inference is based would alone be irrational in the absolute sense. For since the evidential propositions are assumed to be true, they can in their turn not be established by problematic inference, a problematic inference never establishing any proposition as true. But if a proposition is to be regarded as rational, even if it is supported only by a problematic argument, the evidential propositions will also be rational. For any empirical proposition can be supported by a problematic argument.

The second distinction, the distinction between the intelligible and the unintelligible, can be drawn in many ways. Sometimes the distinction is assumed to be absolute when it is not, and sometimes what is said to be unintelligible is really quite intelligible. An enciphered or encoded message, for example, is unintelligible if it cannot be decoded or deciphered. But it is not absolutely unintelligible in the sense that it is impossible to decipher or to decode it. For by assumption a message was encoded or enciphered, and hence, if the code or cipher were known, it would be intelligible. What we mean by the statement that the message is absolutely unintelligible is that its code or cipher cannot be determined, on account of the absence of a sufficient number of clues that would make this determination possible. As it is, the message is compatible with any number of interpretations. But, to repeat, if perchance we should hit upon the code or cipher, the message would be intelligible. The distinction is therefore not absolute. Again, something is often said to be unintelligible when its analysis leads to inconsistent propositions. Thus, change and motion have often been declared to be unintelligible on this ground. But change and motion are not really unintelligible. The emergence of inconsistent propositions is a sign of the defective analysis and not a sign of the unintelligibility of change and motion.

One way of drawing the distinction between the intelligible and

the unintelligible depends upon the conception of determination. An event is said to be determined if there are laws that make it possible to predict it. Such events will also be intelligible if we identify the distinction between the intelligible and the unintelligible with that between determination and indetermination. In conformity with this definition the behavior of an electron is unintelligible, if we assume the truth of the principle of indeterminacy, since one cannot predict its future positions when its present position is known. For the possibility of such prediction requires that both the momentary position and the velocity of the electron be known. But the principle of indeterminacy precludes a knowledge of both, since the more accurately its position is determined the less accurate becomes the determination of its velocity.

The meaning of the proposition that nature is intelligible or that it is unintelligible can now be specified in terms of the determination or indetermination of events. There are three alternatives with regard to the determination or indetermination of the events of nature as a whole. (1) No event is determined by antecedent events. (2) Some events are determined by antecedent events, and some are not. (3) Every event is determined by antecedent events. On the first alternative, nature is completely unintelligible, on the third completely intelligible. On the second, we have our choice of considering nature as a whole as either intelligible or unintelligible. The assertion that nature is intelligible or that it is unintelligible is therefore ambiguous. We may mean either the first or the second alternative when we affirm its unintelligibility, and either the second or the third when we affirm its intelligibility.

The third distinction, the distinction between the explainable and the unexplainable, is usually identified with the distinction we have just made between the intelligible and the unintelligible. An event or a fact is explained when it is possible to subsume it under a law. It is unexplained when we cannot find such a law, and unexplainable when it is impossible to find one. That explanation consists in subsumption under a law may be illustrated by the following example. We find that a tire, previously inflated, has gone flat. Suppose that someone asks us for an explanation of this phenomenon. We shall perhaps succeed in satisfying his curiosity by showing him that the tire has a puncture and by informing him

that all tires with punctures go flat. It is possible, however, that he will not be satisfied with this explanation. He may demand further an explanation of the fact that all punctured tires go flat. We therefore explain to him that the pressure of the air on the inside of the inflated tire is greater than that of the air outside, and that this pressure difference tends to become annihilated when an aperture is produced in the wall of an inflated tire. If our interlocutor presses us still further for an explanation of the equalization of the pressure difference under these circumstances, we may perhaps deduce this phenomenon for him from the propositions that constitute the kinetic theory of gases. Sooner or later, in any case, we shall have to get rid of him and refuse all further explanation.

Hence, if one explanation is unsatisfactory, we show that the initial principle of explanation, the initial generalization under which the fact or the event is subsumed, can be deduced from a more inclusive generalization. Eventually, then, we shall have to bring the process of explaining to a terminus. Once a fact or an event has been subsumed under a law, we may either regard the connections which this law establishes between it and other facts and events as the required explanation, or we may seek a law of wider generality that establishes still more universal connections. But there is no law at which we arrive in this process of which we can say that it has the widest possible generality and that the process of explanation must stop when we reach it.

The explanation of a phenomenon, considered as a procedure of subsuming the phenomenon under a law, has been rejected by many philosophers as not ultimately satisfactory to reason. Reason seeks a final and definitive understanding of the phenomenon. But its explanation is only relatively satisfactory; for if we are not satisfied with the explanation given, we can always ask a further "Why?" and perhaps get a further explanation. The mystery of the tire going flat has therefore not become any clearer to reason when this phenomenon is subsumed under a law. Reason seeks explanations of a type that silences all further Whys.

Are there any explanations of this type, or is all explanation subsumption under a law? Mr. Meyerson, in several of his works, has attempted to show that the sciences employ a second type of explanation, the eventual aim of which is to satisfy the demand of

reason for finality. He distinguishes the type of explanation we have described as explanation by law from a second type which he designates as explanation by cause. These two types of explanation (Mr. Meyerson refers to them as type I and type II) are not identical, although, so he alleges, the second is often confused with the first. The explanation of a phenomenon is of type I when it is possible to find a law under which it may be subsumed. It is of type II when it is possible to show that the phenomenon is identical with something anterior to it; in other words, to explain a phenomenon is to identify it with its causes.

There is no doubt that we do seek to recover the consequent, or at least some of its properties, in the antecedent. Thus, water is identified with its analytical components. But when we make this identification, we do not mean to imply that water does not have properties that belong neither to hydrogen nor to oxygen in isolation. Mr. Broad has stated the case against the possibility of identification very clearly, as follows: "Oxygen has certain properties and Hydrogen has certain properties. They combine to form water, and the proportions in which they do this are fixed. Nothing that we know about Oxygen by itself or in its combinations with anything but Hydrogen would give us the least reason to suppose that it would combine with Hydrogen at all. Nothing that we know about Hydrogen by itself or in its combinations with anything but Oxygen would give us the least reason to expect that it would combine with Oxygen at all. And most of the chemical and physical properties of water have no known connexion, either quantitative or qualitative, with those of Oxygen and Hydrogen."[3] The identification of water with its analytical components is simply nonsense. The fact that materialists have held the nonsensical view that all change may be explained mechanically by showing that the new consists merely in new arrangements or combinations of the old, is no recommendation for Mr. Meyerson's thesis that there are two types of explanation. When the late William Jennings Bryan derided science for its failure to have explained "why it is that a black cow can eat green grass and then give white milk with yellow butter in it,"[4] he may have conceived the task of science as consist-

[3] C. D. Broad, *The Mind and Its Place in Nature*, p. 62.

[4] William Jennings Bryan, *In His Image*, p. 19.

ing in the reduction of the greenness of grass to the whiteness of milk and the yellowness of butter. And materialists may, if Mr. Meyerson is right, have contemplated the possibility of such reductions. But people who are not confused in their thinking do not seek to make such identifications. Scientists may have failed until now to explain the phenomenon to which Mr. Bryan refers. But they have at least succeeded in explaining why it is that grass is green. The explanation, according to the magazine *Time,* is as follows: "Grass is green because out of water and the chemicals of earth it, like all plants, manufactures a colorless substance called proto-chlorophyll. Proto-chlorophyll accumulates in certain cells of leaves called chloroplasts where it comes in contact with carbon dioxide in the air. When the sun is shining a molecule of proto-chlorophyll, stimulated by an atom of magnesium which holds it together, absorbs four quanta of energy from a sunbeam. The extra energy enables the proto-chlorophyll to attract carbon dioxide, kick off the oxygen which it does not require, absorb the carbon. At that instant the colorless proto-chlorophyll becomes chlorophyll and makes the grass green."[5] Although this explanation does not make use of the schema of identification, it nevertheless gave rational satisfaction to the man who sought it. But even if he still believes that he does not really understand why grass is green, he has at any rate not publicly regretted the expenditure of $577,000 to get this explanation.

It would be a mistake, however, to reject altogether the distinction between the two types of explanation. The distinction exists, but Mr. Meyerson has mistakenly concluded that an explanation of the second type can be demanded of anything whatsoever. The proper distinction between the two types is this. Explanations of type I are used when we seek to explain an event, explanations of type II when we seek to explain a thing. The difference between the two types is purely extrinsic, not intrinsic. In either type the explanation consists in subsuming what is to be explained under a law. When we observe an apparently new thing, we seek to show that it was not created out of nothing,—that it was already present in another form, although we had not observed it in that form before. It is in this manner that the chemist formulates his expla-

[5] *Time,* XXIV: 58.

nations. Suppose, to take an example, we have observed that a red powder gives rise to mercury and oxygen. We now ask for an explanation of this phenomenon. A chemist explains it by informing us that the red powder is a compound in which mercury and oxygen are chemically combined, and that the appearance of mercury and oxygen is due to the decomposition of this compound. This explanation is considered as satisfactory so far as the mercury and the oxygen are identified as components of the red powder; the new things that struck our attention are explained by showing that they existed already in the red powder. In general, we explain an apparently new thing by identifying it in one of its earlier stages.

It has been said that Mr. Meyerson's early preoccupation with chemistry led him to adopt the mistaken view that all explanations follow this pattern. But the explanation of an event or of the state of a thing does not follow this pattern. We can employ the schema of identification to explain the appearance of a thing, because things perdure. But it would be nonsense to explain an event in this manner, since it is nonsense to speak of an event as happening before it happened. The examples that Mr. Meyerson gives of the causal explanation of events are not explanations of the second type. However, they are all easily accommodated under the first type. Let us consider one of them. When a novelist explains the actions of his hero by showing that everybody acts that way under the same circumstances, we have, according to Mr. Meyerson, an explanation of type I. When, however, he shows that the present reactions of his hero are the consequences of temperamental predispositions which were present even in his childhood, his explanation is, according to him, of type II. Now it is clear that the latter explanation would have been of type II only if the novelist had shown that the present reactions of his hero really existed before they occurred. Merely to show that present reactions are connected with temperamental predispositions is not the identification of the later with the earlier. It is therefore not causal explanation, but explanation by law.

We can now deal rather briefly with the last distinction, the distinction between the necessary and the contingent. Nature, it has been said, is rational only so far as there are propositions about it

which are necessary, propositions the denial of which is impossible or absurd. Explanations that merely subsume what is to be explained under a law do not ultimately satisfy reason,—so it is alleged. For a law is an empirical generalization, and these are merely contingent, that is, their negations are possible. A world is therefore conceivable which is governed by laws that are incompatible with those of ours. We have therefore not succeeded in comprehending the phenomena of nature until we understand the necessity of their connection.

The history of philosophy has turned up many a proposition which was declared to be necessarily true by its proponents. "What has been done cannot be undone," "Nature abhors a vacuum," "The cause is equal to the effect," "There is no chance in nature," have all been proposed as necessary. Some of these propositions are indeed necessary, but their necessity consists in the fact that they are analytic. Since the days of Hume and Kant the remaining ones, those that are synthetic, no longer appear to be necessary. The proposition that there is no chance in nature, for example, is expressly denied by the principle of indeterminacy, and this principle does not appear to be absurd.

According to Mr. Meyerson, the search for necessities in nature is made in obedience to the principle of sufficient reason, which, in the formulation of Wolf, asserts that there is nothing without a reason why it exists rather than does not exist. So far as science seeks causal explanations, that is, explanations of the second type, its aim is to satisfy this principle. Science, then, according to Mr. Meyerson, seeks to find necessities in nature. The phenomena of nature cannot be considered as explained until the necessity of their occurrence has been demonstrated. But this search for necessity is not successful; it fails eventually because the contingent resists the application of the schema of identification.

The efforts of the mind to identify are frustrated by the differences which refuse to be identified. Accordingly, Mr. Meyerson finds all sorts of irrationals as he explores the highways and byways of scientific explanation. Thus, the principle of Carnot prevents the identification of the later with the earlier. Again, the secondary qualities cannot be explained by identifying them with their antecedents. Examples of irrationals could be mutiplied indefinitely, and Mr. Meyerson does so multiply them.

The eventual failure of scientific explanation is the consequence of the extrusion of these irrationals from the scientific view of the world. We begin our explanation of the existence of x at this moment by showing that it existed at an earlier moment. In other words, we explain why x exists at this moment rather than does not exist at this moment, by showing that it preëxisted. But the earlier and the later phase of x often are qualitatively different. Since its qualities at the later moment cannot be identified with its qualities at the earlier moment, the qualitative differences of the two phases are irrational, unexplained and unexplainable. Let us therefore remove the qualitative differences from the scientific picture of x. In the scientific picture, the earlier and the later phase of x are now qualitatively identical. But the existence of x at two different moments does not yet appear to be necessary. We still have to find a sufficient reason for its perdurance. But since the later moment cannot be identified with the earlier moment, the only way out is to remove time as an irrational from the scientific picture of x. In short, wherever we encounter a difference we substitute an identity in constructing the scientific picture of x. In this way we finally reach the conception of a universe from which motion, change, difference, and multiplicity have been excluded as irrational. It is therefore not surprising that Mr. Meyerson conceives the formula $a = a$ as the ideal toward which we strive in our attempts to understand the world scientifically. If Mr. Meyerson were right, one could not but marvel at the stupendous efforts that are made to reach this proposition. Reasoning in accordance with the schema of identification about the world seems to be the hard way of finally saying nothing about it.

REASON AS CUSTODIAN

BY

D. S. MACKAY

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FEW WORDS have come to mean so many different things as the word "reason." It is used as a general name for man's intellectual powers, but it also means the exercise of those powers in a certain way, as in argumentation or deductive proof, and it may denote any circumstance, alleged fact, motive, or statement of evidence offered in justification of a belief. For "reason" is one of those vagabond words that have begun to show the effects of a long and checkered career. It has kept such questionable company, has been invoked for so many incongruous and even conflicting purposes (indeed, who has not claimed some sort of reason or reasons in his own behalf?), and has appeared in so many different systems of thought that only a combined history of European philosophy and literature would suffice to define it. This essay has no such ambitious end in view. I shall not attempt to frame a single, comprehensive definition of the word in any ultimate sense. The failure of such attempts in the past has been instructive. For they have at least succeeded in demonstrating that all arguments in favor of one definition of reason as over against another are necessarily circular, since their validity depends upon the very conception of reason which they set out to defend. This illustrates what I took to be the point in Mr. Pepper's analysis, namely, that the degree to which a definition is arbitrary or not depends upon the interpretation of the system in which it operates. Unless we are prepared to adopt a single metaphysical system in terms of which we can establish, once and for all, the boundary line between the rational and the irrational, there is little use in our inquiring what reason is in reality.

However, the purpose of these essays, as I understand it, is not to offer a final and definitive statement on any of the topics set out for discussion. It is rather to suggest problems and procedures for the further study of them. To be sure, this involves a good deal more than analyzing the forms of language, defining terms, and formulating rules of logical syntax. It is just conceivable that a patient reader of this whole series should be able, at the close, to hit upon the precise definition of "reason" that would prove satis-

factory to everyone who ever intended to use the word hereafter. But such a definition, instead of promoting insight, would tend rather to prevent it. We should have merely succeeded in reaching a verbal agreement, stipulating that, whenever the word "reason" was to be used, a certain set of words could be substituted for it. In any event, there seems to be slight prospect of arriving at such philosophical like-mindedness. The time has not yet come for philosophers to beat their swords into the plowshares of logical syntax, and their spears into the pruning hooks of positivism.

Yet it must be admitted that logical positivism presents a serious challenge to all philosophical speculation. I have asked you to join me in speculating (as I suppose) about the nature and function of reason in general. Are we merely indulging in the idle pastime of combining words so as to give an impression of insight where there is only nonsense? Is there a genuine problem here, admitting of significant solution in terms of the given, or are there only pseudo problems, and sentences that are meaningless because incapable of any conceivable verification? It would be easy to reply that the question which the logical positivist raises concerning genuine problems and pseudo problems is itself a pseudo problem according to his own definition, since no assertable statement about the significance or nonsignificance of a metaphysical problem could possibly be verified by the tests which he prescribes. Hence, any utterance of his to the effect that metaphysics deals only with pseudo problems is, on his own showing, either the utterance of a tautology—that is, merely definitional—or else nonsense. In order to pontificate about the futility of metaphysics, the positivist must become a metaphysician in spite of himself and will then be hoist by his own petard.

It is tempting to press such objections against logical positivism. But, like all *tu quoque* arguments, they are inconclusive. The possibility remains that the positivist, even though he is inadvertently giving expression to metaphysical nonsense in his attack on metaphysics, is nevertheless correct in his contention that metaphysics is the expression of nonsense. In other words, even if it could be shown that the entire dispute over the validity of metaphysics has no theoretical content and is by definition nonsensical, it would still not follow that metaphysics *does* have some theoretical content and is *not* nonsense. Professor Carnap offers us a choice between

"syntactical sentences," that is, sentences concerning the form of linguistic expression, and "real object-sentences," that is, sentences expressed in or reducible to terms of the physical sciences.[1] Any other utterance, professing to be a statement about anything, he calls a "pseudo-object-sentence," which is at best a syntactical sentence masquerading as a real object-sentence.

If this choice of alternatives is exclusive, it raises very serious doubts about the significance and value of the topics chosen for these essays. Just what are we supposed to be doing when we discuss the nature of the mind or the general characteristics of reason? Mr. Dennes has given us an excellent illustration of how we can talk sensibly about these questions without attempting anything more than a logical analysis of our use of language. But surely philosophers who have deliberated with Spinoza about "the union between the mind and the whole of nature," or who have sought with Plato and Kant for the distinguishing marks of human reason, did not intend merely to stipulate the senses in which the words "mind" or "reason" were to be used in their writings. No doubt much misunderstanding and fruitless controversy might have been avoided by preliminary agreement on the definition of their terms. Yet no one, except perhaps some of the sophists of ancient Greece, has ever seriously maintained that philosophical issues could be settled by verbal definitions. Inability to agree on the definition of terms that have a comprehensive and pervasive significance in experience has generally been taken to be a symptom, and not a cause, of the metaphysical difficulties involved.

The current polemic against metaphysical speculation, on the grounds that it is concerned with artificial problems, springs from a confusion of principles of deducibility with principles of material implication. To begin with, a proposition is defined as a statement that must be either true or false. Any statement that does not purport to be either true or false is thus, by definition, not a proposition; it is the expression of a tautology, or else nonsense. A rather narrowly restricted pragmatic or operational theory of meaning is then applied to the interpretation of propositions. We are told that a statement has no content and is therefore not a genuine proposition unless it asserts something about a given "state

[1] Rudolf Carnap, *Philosophy and Logical Syntax* (London: Kegan Paul, 1935), p. 60.

of affairs." Its meaning consists in its verifiability, and actual verification comes about only through direct observation of the state of affairs to which the proposition refers. Thus, a genuine proposition (or what Professor Carnap calls "a *real* object-sentence") is said to contain only concepts that are reducible to the given and are combined according to the rules of logical syntax. It is then easy to show that "so-called metaphysical statements," because they do not satisfy these positivistic canons of truth and significance, are either disguised expressions of tautologies or else nonsense. What the logical positivist seems to overlook is that one statement may imply another in a metaphysical system, regardless of any determination of material truth or falsity, whether by scientific or nonscientific tests. There is no warrant for the assumption (1) that every logical system is a truth-value system, or (2) that every truth-value system is a system of material implication, or (3) that all propositions in a system of material implication must conform to a positivistic criterion of truth and falsity. In short, a metaphysical theory is, in its logical aspect, a system of strict implication in which the logical possibilities of a hypothesis may be elaborated, although their verification, empirical or otherwise, remains undetermined.[2] It may be granted that the most fruitful approach to metaphysics is through the methods and conclusions of the special sciences. A metaphysical theory of the mind, of individuality, of reason, or of anything whatsoever, should be reached inductively by an empirical method. But the only method by which it can be *validated* is dialectical.

These preliminary remarks are not intended either as a defense of metaphysics or as a refutation of logical positivism. There are, of course, metaphysics and metaphysics. The positivist may be right in asserting that what he takes to be metaphysics is devoid of theoretical content, and his opponent may be right in asserting that what *he* takes to be metaphysics is richer in content than any other theoretical activity. It is idle to argue what is or is not rightly to be called metaphysics. I have mentioned these attempts to identify philosophy with logical analysis, and the consequent rejection of metaphysics, only because they bring the principal problem of these lectures into such a sharp focus. In setting up a

[2] See Lewis and Langford, *Symbolic Logic* (New York: The Century Co., 1932), pp. 246, 261–262.

dichotomy in discourse between logical or mathematical tautologies, on the one hand, and "protocol sentences," on the other, logical positivism has given new point to the old difficulties concerning the formal or so-called *a priori* elements in human knowledge. Are we to understand that philosophy, so far as it is not confined to logical syntax, is but a highly generalized statement of scientific knowledge and that its arguments are all reducible to the terms and relations contained in the special sciences? I suppose that many statements in the preceding essays might be construed as being philosophical in the latter sense. Thus, when Mr. Loewenberg spoke of the interplay of acquiescence and transformation in a work of art, what he had to say might be taken to be a generalized description of any artistic production. Mr. Lenzen made reference to the principles of conservation, the interpretation of spectral lines, and other matters expressible in physical terms. Mr. Pepper referred to the empirical significance that can be attached to a logical set of definitions and postulates. Mr. Strong discussed the process of historical reconstruction in conformity with facts established by critical scholarship. Such statements as these are, in part at least, capable of verification and would presumably satisfy Professor Carnap's requirements for "real object-sentences." But I was under the impression that the statements were incidental to the main purpose of the arguments and were intended to illustrate or corroborate another kind of statement altogether, a statement that was neither the expression of a logical or mathematical tautology, on the one hand, nor an assertion about psychological or physical facts, on the other. For a philosophical theory about reason, whether it be constructive or critical, is hardly subject to the same tests as a psychological description of the reasoning process; and still less can it be verified by the experimental methods of the physical sciences. A philosophical theory is a *dialectical* elaboration of the possibilities implied by certain initial postulates in a system, irrespective of material truth or falsity. This field of logical possibility I take to be the proper domain of metaphysics.

The analysis of a piece of dialectical reasoning will therefore disclose more than the rules of logical syntax, to which the use of language is supposed to conform, and the various assertions that are supposed to describe given states of affairs. If the reasoning is to be cogent, the language must not only conform to its own rules

of syntax; it must also be relevant to the particular topic or theme under discussion. And if it is to deduce valid conclusions from its premises, the reasoning must exhibit the coherence with which the propositions go together to constitute a system. As relevancy is not guaranteed by the proper manipulation of symbols, so coherence is not secured through the material truth of propositions. The former depends on the significant context or universe of discourse within which the symbols have acquired their meanings. The latter depends on the way in which the propositions are combined, so that one is deducible from another even though their material truth or falsity remains undetermined. A number of propositions might conceivably be assembled at random, drawn out of a hat; each might be true, and grammatically and logically impeccable. Yet obviously such an assemblage of propositions would not constitute a piece of reasoning if it lacked the characteristics of relevancy and coherence. There must be some significant pattern of organization that influences both the selection of propositions and their consecutive order in the arguments. What is the nature and origin of this formative factor in reasoning?

This central issue, on which all the other questions converge, has been formulated by Mr. Lenzen and by Mr. Pepper, although from somewhat different approaches. Briefly, it has to do not so much with the definition of reason as with *the reason for definition*. Now one might readily find a reason or several reasons for this or that definition, depending on its particular context and purpose. But this would not answer the general question why we need definitions at all, and what constitutes their validity in principle. As Mr. Pepper put it, how far is it possible for a definition to be arbitrary—that is, dependent on the will or, perhaps, the mere caprice of its maker—and still remain applicable to anything? Whatever it may be to which a definition is relevant, whether fact or artifact, object or symbol, its application is limited by the postulates and other presuppositions of the deductive system to which it belongs.

Mr. Lenzen showed us how in the physical sciences experience gives rise to the principles of such a system. Inductive generalizations, he said, are transformed into postulates through a process of approximate definition that is abstractive rather than constructive in character. The principles so formulated are then applied constructively to new experimental data, and hitherto unknown

physical entities are discovered. Theories are reconstructed to fit the new objects, further inductive generalizations follow, these are in turn transformed into new postulates, and so scientific knowledge advances by a process of successive approximation. Now it may happen, as Mr. Lenzen pointed out, that we have to choose between the acceptance of a new type of physical entity and the abandonment of certain well-established principles, when we attempt to apply the latter to new experimental data,—as in the application of the principles of conservation to the analysis of nuclear disintegration in the atom. But the choice itself is a rational choice, an "act of reason," in the sense that it is not dictated by the observed facts alone. The logical possibilities within the hypothetico-deductive system are the controlling factor in the choice. However, as Charles Darwin once remarked, "no one can be a good observer unless he is an active theorizer." The hypothetical constructions of earlier theories come to be accepted implicitly in later observations. Thus, the theory that the lines in the spectrum result from differences in radiation has been so well established that it is as though, in observing the spectral lines, one were observing the radiation itself. "The rational factor is so deeply embedded in spectral analysis," said Mr. Lenzen, "that it is almost equivalent to observation."

The catch here is in the little word "almost." For the rational factor, consisting of hypotheses, definitions, postulates, and their implications, is never *literally* equivalent to observation. The terms and relations of a hypothetico-deductive system are not directly observable, but are formed by a process of abstraction out of the data of direct observation. The principles of any such hypothetical construction are expressed in more or less arbitrary definitions. Their relevancy to past experience is explained on the assumption that these principles are inductive generalizations transformed into postulates. But how, asked Mr. Lenzen, can they be applied to the coherent interpretation of *new* empirical data?

Thus, we are brought back to the same question that was raised by Mr. Pepper. A deductive system displays not merely different degrees but different *kinds* of arbitrariness, ranging from the most arbitrary type of definition, which is only an abbreviation in symbols, to the least arbitrary type, which is descriptive of some given field of facts. What, then, is the reason for definition? What is the

rational, formative factor, if any, involved in the principles of a deductive system, making it possible to extend the knowledge derived from past experience to the interpretation of new and even unpredictable data? This is the question that takes us to the core of the problem of reason as it has been debated from Plato's day to our own.

It has been debated, however, almost exclusively as a problem of theoretical knowledge. Philosophers are naturally more interested in those aspects of reason which directly concern their own vocation. But man's reason is not merely a discursive faculty. It is not confined to methods of acquiring knowledge and demonstrating its truth, nor is it only in their judgments that men express their rational capacities. Reason is also the mark of sanity and in this aspect its opposite is madness, not inconsistency. Indeed, the trouble with certain types of insanity is that they display too much rather than too little consistency within the confinement of their illusions. Monomanias, fixed ideas, hysterical fugues, and the like, are deemed irrational not merely because the victims are mistaken in their judgments, but because their unfortunate condition gives rise to impressions of which they themselves or those around them are wont to complain. Rational or normal behavior is, as a general rule, just that sort of behavior of which most of us never complain. Indeed, for clinical purposes, the medical notion of the "complaint" seems to provide a satisfactory working distinction between the normal and the abnormal, the rational and the irrational,—the presence of a complaint being taken as *prima facie* evidence of some sort of mental instability.

Besides these logical and psychological aspects of reason, there are also its political and social aspects: reason as embodied in customs, laws, and institutions. In this sense, we speak of actions that lie "within the bounds of reason," or of things that a "reasonable" man is expected to say or do under the circumstances. Here, something more than either consistency or sanity is intended. For it is possible to be both logical and in full possession of one's reason and yet, at the same time, "unreasonable" in one's attitude towards certain matters concerning which the collective expectations of a particular group, or of society as a whole, are firmly established. But it will hardly do to say that any attitude is reasonable which is in conformity with law or established custom, if only because the ap-

plication of the general rule to the individual case is supposed to agree with what might be expected of any reasonable person under the same circumstances. This "reasonable person," this man of sound judgment and unvarying good sense, may be no more than a legal fiction, serving as an example to anyone who has failed to take "reasonable" precautions, who has exceeded a "reasonable" limit of speed, or who has transgressed the normal limits of the law in some other way. But if he is a fiction, he is at least a necessary one for the normative purposes of justice and equity.[3] His intangible but effective participation in almost every judicial decision suggests that there is more to the notion of reasonableness than mere convention and social conformity. Reason in this context means sagacity.

It is no longer the fashion to speak of a single faculty from which man's rational activities and reasonable inclinations are derived. As Mr. Strong reminded us, it does not clarify the subject to be told that reasoning is a product of reason, whether conceived as a mental faculty or a cosmic principle. This is surely not the least important lesson of Kant's first *Critique,* although it was expressed in the negative doctrine of the thing-in-itself. Kant thought it useless to speculate about reason or its objects as ultimate realities. For if reason is assumed to be transcendental to experience,—if it is "a power of thinking objects which can never be given in sensuous intuition,"[4]—and if the world as we understand it consists only of objects that can be given in intuition and related under the categories of the understanding, then it follows that nothing in this world can be explained as an effect or a product of a faculty of reason. In other words, the notion of such an entity has no descriptive value.

However, it is possible to deny that there is a single faculty of reason and still maintain that there are certain characteristics which all rational activities possess in common. These common characteristics are expressed in the functions that distinguish man, as rational, from the other animals. Mr. Marhenke named four such functions, in the shape of a capacity, first, to entertain beliefs and

[3] On certain "jural postulates of civilized society," see Roscoe Pound, *An Introduction to the Philosophy of Law* (New Haven: Yale University Press, 1922), pp. 169 ff.

[4] H. J. Paton, *Kant's Metaphysic of Experience* (New York: The Macmillan Co., 1936), I:73.

express them by means of propositions; second, to draw inferences from these propositions; third, to apprehend necessary connections; fourth, to form *a priori* concepts. By virtue of these functions, man is able to engage in discursive thinking and to refer to his experiences in conceptual terms. But I suppose it will be admitted that a man may be irrational, in the sense of being unbalanced, and still be able to entertain beliefs, express them in propositions, and even draw inferences from them, however erroneous. I take it, then, that we are to look for the distinguishing marks of rationality in the third and fourth functions, namely, the capacity to apprehend necessary connections or recognize the *a priori* truth of a proposition, and to form *a priori* concepts. Since I am never quite sure what anyone means when he speaks of "concepts" as such, and even less when he calls them *a priori,* I may be permitted to state what seems to be common to these functions of reason in somewhat different terms.

I shall assume Dewey's definition of conceptions (not "concepts") as *standard meanings,* by means of which we identify the unknown, supplement the sensibly present, and place objects in a system of beliefs.[5] Now the application of these standard meanings is not confined to discursive thinking and systematic inference. In everyday life, we adapt our ordinary activities to standards of measurement, to professional and moral standards, to standards of good taste, of fashion, and of etiquette, with little or no reflection about them. We live by the clock and the calendar. We dress according to current standards of fashion, eat more or less standardized meals, and dwell in more or less standardized houses. The degree of irrationality in a person's thought, speech, or conduct is commensurate with the extent to which he departs from recognized standards. Thus, a man might choose to dress in the costume of an ancient Greek, dwell in a house built like an Eskimo igloo, eat his meals from the floor in the Japanese fashion, and worship the sun in the manner of the ancient Aztecs, and in our particular state of society he would be regarded as at least mildly eccentric. Yet he might conceivably have some reason for his nonconformity. How could such a "reason" be determined? Only, it would seem, through an appeal to some other standard or set of standards than those

[5] John Dewey, *How We Think* (New York: D. C. Heath & Co., 1910), pp. 126–127.

commonly accepted. In general, it may be said that failure or refusal to observe a given standard is rational only when that failure or refusal can be justified in terms of some other standard, whether it belongs to a much older tradition or to what (it is hoped) will eventually become a new tradition. Judged by conventional standards, new forms of art are often considered irrational or inartistic. Their devotees may defend radical departures in music, painting, or architecture on the ground that they are really a return to more primitive standards. As the late G. K. Chesterton remarked: "Men do not rebel against the ancient but against the recent. They do not so much revolt against it because it is old as because it was lately new.... The race of the Futurists is a race to see who shall get furthest back into the past."[6]

We may now draw together the threads of our discussion into a provisional hypothesis. We have not been looking for a mere verbal definition of reason, either in a single sense or in several senses of the term. Our problem concerns the nature of reason as exhibited in the kind of thinking and acting that we call rational. Any proposed "solution" of this problem is necessarily speculative. Its validity can be established, not by observation and description of causes and effects in human organisms and their environment, but by a dialectical procedure in which the implications of ideas are explored and logical possibilities deduced. To the literal minded it is no doubt annoying to be put off with answers that lay no claim to material truth. But philosophy is not for the literal minded. In this domain, the use of metaphor and analogy is indispensable, although the reasoning need be no less rigorous on that account. The point I wish to make is that the kind of logical rigor demanded by philosophical speculation is not the rigor of the exact sciences. The rejection of all metaphysical problems as pseudo problems results from the confusion of strict with material implication and of the intensional with the extensional meaning of terms. To ask what can be deduced in general from the various asserted or assertable statements about human reason in the fields of logic, psychology, history, and jurisprudence is not to ask whether certain propositions in which the term "reason" occurs are materially true or false. Our problem has to do with the essential characteristics of reason. The logical conditions of rational knowledge, the psycho-

[6] G. K. Chesterton, in *The London Illustrated News*, December 13, 1930.

logical conditions of sanity, the normative conditions of sagacity—what have all these in common which entitles them to be considered as different manifestations of reason in human experience?

The hypothesis suggested by the foregoing considerations has no special claim to novelty. It is simply this, that *reason is the guidance of thought and action in accordance with standard meanings.* It follows that, while the notions of consistency and conformity are necessary, they do not sufficiently define the nature of reason. To be rational is not merely to think or act according to certain standards, since the thinking might conform by accident and the action by compulsion. But reason, whether in its logical, psychological, or ethical aspects, involves at least implicit *reference* to the standards by means of which inferences and actions are controlled. There are, however, modes of experience such as reveries and dreams wherein the element of control or conscious guidance is at a minimum. These may be called rational in the vague sense of being intelligible or amenable to reason. But reason scarcely enters into their production. Then there are types of control, experimental and practical, of which the characteristic feature is not the reference to universal standards, but the reference to particular facts. In distinguishing rational from experimental control, I am not assuming that the one can be divorced from the other. I am not attempting to hypostatize reason. But it seems clear that learning to drive a car, for instance, and performing a successful experiment in a laboratory are not strictly processes of reasoning, nor are they characterized by the use of reason in any distinctive sense of the term, even though rational elements may be involved, as indeed they are in all observation and experiment. By the use of reason we *discover* literally nothing; we learn nothing that was not implied in what we already knew; we effect no changes in things or in the course of events. But what is more important, through the use of reason we change our attitudes toward the course of events, giving consistent direction to our learning and our discovery. This we do by relating the new to the old, that is, by referring our changing thoughts and impressions to the standards of knowledge and wisdom that constitute our heritage from the past. Thus reason is, as it were, the guardian and custodian of values in civilized life.

We are now in a better position to appreciate the significance of the problem of definition in relation to our analysis. The function

of a definition is to make explicit the reference to a standard by means of which thought or action is to be guided. A verbal definition expresses a standard usage of a word, a legal definition expresses a standard rule for the direction of conduct, a definition in ethics expresses a standard for moral judgments, a scientific definition expresses a standard for theoretical analysis or for the interpretation of experiments. To what standards are the definitions themselves to be referred? On what grounds is the validity of definitions to be determined? This is a very old problem and a very new one. If I ask you to consider it in one of its earlier versions, this is not because I believe the ancient philosophers had any superior insight into the problem, which may be lacking to our contemporaries. It is because the pertinent difficulties can be presented with less doctrinal complication and so attacked more directly.

The Socratic method, as is well known, was an attempt to formulate ethical standards by which differences in human conduct could be evaluated. A single form or idea was supposed to be present in a class of particular acts, and this form or idea was the common standard of reference for distinguishing the members of the class from its nonmembers. Search for these ideal standards (*παραδείγματα*) was for the sake of overcoming an underlying conflict among the sensations, desires, and opinions which pulled men now in one direction, now in another. The goal was a rational knowledge by which the mind could be made secure in its grasp of objects, in spite of the relative and fluctuating impressions of their sensible qualities. Without correct definitions, no one could be assured that he was in possession of reliable standards of reference, and so his opinions would continue to vacillate. What, then, is a correct definition? And just what is being asserted in an explicit reference to a standard?

In the *Meno,* where these questions are examined, the immediate topic of discussion is whether human excellence is a product of education or of native endowment. Can virtue be taught? Before this question could be answered, it was deemed necessary for Socrates and his companion to know what was meant by virtue, and in order to know this they had to know how to formulate a correct definition. It is clear that Socrates was not looking for definitions in the sense of mere logical or mathematical tautologies. Meno offers him such a definition, and it is promptly rejected. Virtue,

Meno suggests, is justice, courage, temperance, and the rest. There are different virtues for men and women, young and old, slaves and freemen. The definition of virtue consists only in the summing up of these differences into a single formula. It is a definition of the term in extension only. Socrates' objection to this positivistic procedure, here and elsewhere, is that it fails to express the essential identity of meaning in all the differences. If $x = a, b, c, d,$ etc., and if we assume that in defining x we are merely saying in abbreviated form on the left-hand side of the equation whatever we have to say about $a, b, c, d,$ etc., on the right-hand side, then our definition is inevitably tautologous. Nothing further can be deduced from it which we ourselves have not put into it. It conveys no information which we did not already possess before making the definition. Now Socrates, rightly or wrongly, assumes that true definitions have heuristic value because they are significant propositions stating the grounds from which certain consequences can be deduced. In order to conduct a rational inquiry into any subject, it is necessary to start from certain definitions. The point of departure must be an explicit reference to the standard meanings according to which the analysis or the interpretation of the subject is to proceed.

But how is it possible, asks Meno, to inquire into any subject at all? For either you do or you do not know what it is you are seeking. If you do not know what it is, how can you ever be sure that you have found it? And if you already know it, what is the use of seeking it? Challenged by this piece of sophistry, Socrates replies with a myth,—which is perhaps the best way to deal with a sophistry. It is the myth that the learning process is the soul's recollection of what it knew before birth and then forgot after its imprisonment in the body. Professing a desire to "prove" the truth of what he is saying, Socrates questions Meno's untutored slave boy, who, under skillful coaching, is induced to "recollect" the geometrical theorem that the square with twice the area of a given square is the square on its diagonal. So learning turns out to be but recollection. Unfortunately, the imaginative power of Plato's myth has tended to obscure the logical force of his analysis. For behind the piece of sophistry and the answering myth, neither of which is to be taken too seriously, there is a real problem in logic and more than a hint of Plato's solution.

In default of adequate definition, says Socrates, how are we to

proceed with an inquiry? By framing a hypothesis from which possible consequences can be deduced and from which other possibilities are definitely excluded. How, for instance, shall we go about finding out whether virtue is acquired by teaching, given by heredity, or possessed in some other way, if we do not yet know the nature of virtue? Let us make a hypothetical assumption that virtue is knowledge, and then let us see what follows. If virtue is knowledge, virtue can be taught, and the kind of knowledge of which it consists will determine the kind of teaching necessary to produce it.

Now, Plato was well aware of the underlying difficulty here. For what reason does anyone select one definition instead of another in order to deduce its possible consequences? Later on in the dialogue, Socrates is made to admit that "true opinion is as good a guide to correct action as is knowledge." If reference to a standard turns out to be only a matter of opinion, then how can the standard itself signify anything more than the mere fact of individual preference? In that event, every definition would indeed be arbitrary, in the sense that it would express only the will or bias of the person who made it. But if we are to reason correctly *from* our definitions, there must be reason *in* them. The consequence (*συμβαῖνον*) cannot be rational unless its ground (*ὑπόθεσις*) is also rational. How can the latter be rational if it depends upon an arbitrary supposition? Plato suggests the answer by means of a mathematical analogy.[7] Suppose a geometer is asked whether a given area can be inscribed in the form of a triangle within a given circle. He will reply that he cannot tell until he has offered some hypothesis to assist in the consideration of the problem. If a rectangle, "applied" to the diameter of the circle in a certain manner, "falls short" by a figure similar to the applied rectangle (in other words, if the construction is such that the area of the applied rectangle is equal to the given area), then one consequence follows; if this is impossible (according to the hypothetical construction), then some other consequence follows. Apparently, Plato was alluding here to an actual problem which had engaged the attention of geometers in his day and which required more than the straight line and the circle for its solution. They had succeeded in formulating the conditions under which the solution could be found, just as they had also been able to reduce a

[7] *Meno*, 87 A.

more celebrated problem, that of the duplication of the cube, to the problem of finding two mean proportionals. Both problems were eventually to be solved in much the same way by means of conics.[8]

The details of the geometrical theorem need not detain us, since we are concerned only with Plato's use of it for purposes of illustration. The selection of one hypothetical construction rather than another is seen to be arbitrary in the sense that it reflects an individual preference on the part of the geometer. But his choice, if directed toward a solution, is *subject to certain limiting conditions involved in the nature of the problem itself.* The mathematical model for the method of definition which Plato has in mind is that which later came to be known as the *Diorismos.* It consists in determining the conditions or limits within which the possibility of a solution to a given problem is to be found, whether in the original form of the problem or in the form to which it is later reduced. A *Diorismos* is therefore the definition of a mathematical hypothesis with reference to its limiting conditions in a given problem, and as such it came to be formally recognized as a necessary part of all geometrical analysis. The name has been forgotten, but the method remains in modern mathematics. "The reasoning of mathematics is now well understood," wrote C. S. Peirce.[9] "It consists in forming an image of the conditions of the problem, associated with certain general permissions to modify the image, as well as certain general assumptions that certain things are impossible. Under the permissions, certain experiments are performed upon the image, and the assumed impossibilities involve their always resulting in the same general way."

In the *Meno,* Socrates is asking in effect how this "image of the conditions of the problem" is formed, or, speaking more generally, how the limiting conditions for rational thought and action are determined. Some philosophers have invoked *a priori* concepts of the understanding, and others have appealed to sensuously intuited qualities out of which mathematical and other rational systems are constructed. If I read Plato correctly, he would derive the "image" or patterns of these limiting conditions from what he calls "true opinion." True opinion mediates between the flux of sensation

[8] Sir Thomas Heath, *History of Greek Mathematics,* I:299–303.

[9] Charles Sanders Peirce, *Collected Papers,* ed. by C. Hartshorne and P. Weiss (Cambridge: Harvard University Press, 1934), V:8.

and the forms of rational knowledge. But opinions have a tendency to vacillate, and they are of little value, says Socrates, "until someone chains them down by the consideration of the cause."[10] Reason, as a function of the human mind, is that which enables us to discern a logical system of implications among the particular objects of belief. Thus, in geometrical reasoning, one starts with "true opinions" about visible shapes as *sections* of finite space, and then, by means of hypothetical constructions, arrives at a knowledge of geometrical figures as *expressions* of infinite space.[11]

Definitions need not depend, therefore, upon an arbitrary stipulation that terms shall be combined in one way and not in another. The reason or ground for a definition is implicit in our common beliefs and practices. Some character or quality is analyzed out of these beliefs and practices to serve as a standard meaning for the guidance of further inquiry or further action, as the case may be. If the selection is rational, that is, if it is really a means of controlling the direction of thought or of action in accordance with the standard, then the selected definition will more or less accurately express the limiting conditions under which this control is to be achieved.

It is important to distinguish rather carefully here between a definition and an inference. A definition is not an inference, but a logical or mathematical statement by means of which a process of inference may be safeguarded and controlled. Most of our inferences, indeed, involve no definitions; they are made without any *explicit* reference to a standard. Yet their validity depends no less on conformity to requirements that are set forth later in definitions. It is not necessary first to have a definition of weight in order to infer that one body is heavier than another. But it is necessary to know something in general about the behavior of bodies, to which definitions of weight are relevant.

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[10] See *Phaedrus* 249 C, where it is said that to chain together true opinions of particular things by means of reason is itself "recollection" (*τοῦτο δ'ἐστιν ἀνάμνησις*), that is, the process of converting true opinions into a relevant and coherent knowledge of things is the process of which the myth is an imaginative adumbration, but not in any sense an "explanation." It is the *λόγος*, or the statement of rational grounds from which consequences are deducible, that differentiates genuine knowledge from true opinion; cf. the *λόγον δοῦναι* and the *δόξασθαι* in *Rep.* 531 E, *Sympos.* 202 A, *Phaedo* 76 B, 78 D.

[11] See H. F. Hallett, *Aeternitas*, p. 180.

Logic consists of the most general and at the same time the simplest statements of the limiting conditions for rational discourse. These conditions are the laws and principles of implication. Hence, we can give a qualified assent to the assertion that all principles and laws in logic are definitional. It does not follow that they are meaningless tautologies having nothing to do with the real character of anything except the forms of our language. I am reminded of the question asked by an unsophisticated visitor to an exhibition of modern art. After puzzling for several minutes over a picture labeled an "abstraction," he wanted to know from what the abstraction had been abstracted. If the principles and laws of logic are merely rules for the manipulation of meaningless symbols, one wonders how the symbols were formed so that they can be manipulated according to any rule at all.

A principle may be true by definition only and yet possess real meaning,—unless, of course, we arbitrarily define "definition" as a set of symbols independent of any meaning. As Professor Cohen has pointed out, in criticizing the symbolist school of logicians, independence of any one special meaning is not necessarily independence of all meaning.[12] Yet there would seem to be a measure of truth on each side of the dispute between the symbolist and the rationalist. The symbolic logician is correct in saying that the principles of logic have no real *positive* significance, that they make no significant *assertions* about reality. But he is mistaken in supposing that they have no real *negative* significance either. For the limits of possible types of order in our reasoning are surely as "real" as the actual conditions of existence that permit or withhold these possibilities. It is a truism but not an empty tautology to say with Jevons that the very nature of existence is such that a thing cannot be otherwise than it is; or with Bishop Butler, that whatever is, is what it is and not another thing. Hence, the rationalist is correct in his contention that logic is inseparable from metaphysics, since its principles and laws have ontological reference; and furthermore that logical implication is an element in the real meaning of things, although not, of course, the whole of it. But it does not follow that logic alone can convey any *positive* information about the nature of existence. Logic might be compared to a passkey that

[12] Morris R. Cohen, *Reason and Nature* (New York: Harcourt, Brace & Co., 1931), p. 185.

turns every lock but opens none. Its principles tell us not so much what we can do as what we cannot do, if we intend to reach the truth. I suppose that is why the most exact definition of logical principles is in negative terms, in order to make it theoretically adequate.

We have considered reason to be "the guide of action," but we have interpreted this to mean the control of thought as well as overt action in accordance with standards. Reference to a standard, whether implicit or explicit, limits the theoretical and practical possibilities with which we are confronted in any given situation. Such limitation, even when it has to do with the most general and abstract logical possibilities, is not a mere matter of definition, in the sense that it is nothing but an arbitrary stipulation or an expression of individual preference. Nor is this limitation subjectively imposed by the mind on the data it receives from real objects. I have argued that definitions possess a real and not merely a verbal meaning, because they make explicit the reference to a standard; and in so doing they clarify the limiting conditions in the problems to the solution of which our reasoning is directed.

The discussion up to this point has had to do with the nature of reason in relation to the logical conditions of inference and judgment. We have now to ask, and very briefly consider, what it is in human experience that is to be brought into conformity with standards, and what it is that needs to be reshaped within the limits of reason. Philosophers, following the classical tradition of Greek rationalism, have answered that it is our deceptive impressions of things and our uncritical, common-sense opinions about them. The primary function of reason is to clarify ideas, to reveal the universal in the particular, to trace out the coherent order that underlies the fragmentary, shifting appearances of objects in sense perception. The traditional distinction between reason and that which is subject to reason has been expressed in terms of form and matter, or form and content. Emphasis has thus been placed on the cognitive claims of reason. Rationalists and empiricists have debated its validity as though this were entirely a question of theoretical knowledge to be settled by logical analysis and epistemology.

But there is another tradition, which also goes back to Plato, and perhaps even earlier, to the Pythagoreans. This is the tradition that philosophy is properly a way of life and not merely a form

of theoretical activity. Rather, it is a theoretical activity converted into a way of life. In this tradition, reason and its subject-matter appear in a somewhat different light. That which needs to be brought into conformity with standards and reshaped within the limits of reason is now seen to be experience in the guise of hopes and fears, desires and passions,—all the various drives and impulses which Spinoza called the "affects." In this view, the cognitive claims of reason are subordinate to its ethical and social values. The problem of definitions and standards is not now a question of the eternal verities. Whether standards are immutable or not, their practical importance for reason is the rôle they play in individual careers and in the histories of institutions. The standards men live by, whatever ulterior validity they possess, are the standards that are operative in particular epochs and in relation to particular forms of association. They are economic, political, legal, moral: the standards relating to marriage and the family, to private property, to business and industry, to education, religion, and government.

Now, just as there is no human being whose beliefs are always perfectly free from contradiction, according to logical standards, so there is probably none whose actions are in constant agreement with the social standards of his day. Not even the "normal" mentality, which Trotter has described as the *resistive type of mind,*[13] is wholly immune from sudden impulses or entirely insensitive to novel suggestions. But when, as so often happens, the normal, resistive type of mind is unable to assimilate a strange piece of experience, it will simply reject its significance. Hence, even for this type there remains an undercurrent of mental conflict. There is potential instability in the awareness of imperative social standards, on the one hand, and sensitiveness to change and individual differences, on the other. This conflict has become especially acute of recent years, when whole peoples seem at times to have been carried away by something akin to collective madness. "Outside the comfortable and possibly diminishing ranks of the 'normal,'" says Trotter, "society is everywhere penetrated by a steadily increasing degree of what we may call in the broadest possible way mental instability."[14]

[13] W. Trotter, *Instincts of the Herd in Peace and War* (2d ed.; London, T. Fisher Unwin, Ltd., 1919), p. 557.

[14] *Ibid.*, 56.

Reason in society—reason as "embodied progress"—is therefore not only the direction of human conduct in accordance with standards; it is also its continual redirection or readjustment whenever given standards fail to meet the needs and conditions of changing situations. In this way, old standards acquire new meanings, and continuity of progress is possible. But until some measure of voluntary conformity has been restored, men suffer from what Spinoza has described as the "perturbations of the mind," and consequently they are not able to live in agreement, either within themselves or with one another. "So far as men live under the guidance of reason, thus far only they always necessarily agree in nature."[15]

During the past two hundred years, philosophers have paid comparatively little attention to this phase of the problem. They have not been concerned very much with the nature of reason in the sense of sanity and the control of emotional disturbances, or passions. This is not said with any view to adverse criticism, but only to direct attention to the neglect of one part of the philosophical tradition. It may well be that philosophers have had more important problems to think about, or that their most effective contribution to the cause of rational living will be found in answers to logical and epistemological questions. However that may be, the fact is worth noting that modern philosophy has increasingly abandoned one of its traditional tasks, namely, that of showing how reason can be put into practice so as to transform a conflict of desires and emotions into a rational art of living. This, at least, seems to have been Plato's thought in the *Gorgias* and in Books IV and IX of the *Republic*. In philosophy, he suggests, is to be found the true ἰατρικὴ ἐν ψυχῇ, or, as we say today, *psychiatry*, "the medicine of the mind."[16] And it was clearly Spinoza's intent in the *Ethics*, Part 5, where he calls the irrational emotions "a sickness of the mind" and proposes certain "remedies against the emotions."[17] Indeed, it was a dominant motive throughout most of Greek and early modern rationalism. Liberation from the bondage

[15] Spinoza's *Ethics*, tr. by A. Boyle (New York: E. P. Dutton & Co., New York, 1910), Pt. 4, Prop. XXXV.

[16] *Gorgias* 465 B; cf. *Rep.* IV, 437 ff., IX, 581 E–591 E.

[17] His friend Tschirnhaus in describing to Leibniz the last part of the *Ethics* said that it was not only about human blessedness or perfection, but also "de Medicina mentis, de Medicina corporis."—*Tusculanae Disputationes* IV, 10, § 23. Quoted by H. A. Wolfson, *The Philosophy of Spinoza* (Cambridge: Harvard University Press, 1934), II:263.

of the passions was to be achieved, not by the supernatural means offered in the religions of salvation, whether "Orphic" or Christian, but by the reshaping of human desires through the spirit and method of rational science, notably in the form of mathematics.

The recovery of this traditional rôle presents greater difficulties to philosophy today than it did in the seventeenth century, partly because the occasions for maladjustment have been multiplied in the industrial civilization of the twentieth century, and partly because such a vast range of knowledge from the life sciences can be brought to bear on the problems of readjusting human beings to their physical and social environments. Yet the contribution of philosophy to this problem is perhaps needed today more than in any previous age. At least, the effort to relate the philosophical problems of knowledge and the nature of reason to the actual conflicts and tensions of modern life might succeed in making these problems more significant and vital, even as exercises in dialectic.

REASON AND PURPOSE

BY

GEORGE P. ADAMS

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THE PRECEDING PAPERS have noted and analyzed many of the meanings ascribed to reason both in common usage and in the history of ideas. I propose, at the outset, to fasten upon one familiar phrase and to survey something of its content and significance. Men have spoken of the life of reason, denoting thereby a certain way of carrying on the enterprise of human living, including our knowing, doing, feeling, and imagining. There has hovered before men's minds the notion that, since they were human, this certain way of life was incumbent upon them, enjoined by the resources and the promise of human nature and the world in which its energies are deployed. The life of reason, transcending anything within the compass of the powers of the brutes, dimly and haltingly prefigured in the primitive and barbarian life of early man, becomes a significant option as the contours of civilization and culture begin to take shape. The phrase implies that there is no single facet of man's activities and interests which may not be brought within the orbit of the life of reason, stamped and fashioned with an impress believed to be rational. There are rational beliefs about man, nature, and the gods, set over against mythical fancy and irrational superstition. There is a rational art, outstripping the crudities of barbarian monstrosities. There are rational ends and purposes in terms of which men's activities and the institutional pattern of their lives may be organized. Within the inclusive ambit of this ideal and type of life, reason comes to be contrasted with and set over against many opposites. It is opposed to tradition and custom, to sheer force, to arbitrary decree and passing whim, to chance, contingency, and chaos, to our fragmentary and immediate contact with the things of sense experience. The life of reason stands for a kind of order to be wrought out and achieved within civilization and human experience, an order prized as rationally significant.

The contrasts which have just been mentioned suggest that the life of reason, the rational order of living, is something to be fashioned out of and separated off from surrounding areas of irrational

disarray. They suggest the picture of the life of reason as an island, given over internally to the rule of reason but surrounded by areas lacking any intelligible and rational structure, just as civilized Athens was encompassed by barbarian and less civilized peoples. But this picture would somewhat distort the perspective of the life of reason in Greek philosophy, especially that of Plato and Aristotle. For this philosophy did not view the life of reason as something that could be lived in complete isolation from the surrounding nature of things. To borrow a phrase current in a quite different context, the human life of reason needed a kind of "collective security." It could not thrive, alone, in a hostile environment ever threatening to overwhelm its proud isolation. It needed the support of an intelligible order whose habitat lies in the objective and cosmic nature of things.

Common both to the human life of reason and the rationality thought to reside in the cosmic nature of things is the idea of a certain type of order, arrangement, and organization. If there be any common ingredient in the manifold meanings of "reason," it may perhaps be found in the idea of something relational as distinguished from content, form as contrasted with matter. Whittaker has pointed out that both the Greek term *logos* and the Latin term *ratio,* from which "reason," in its philosophical usage has descended, sometimes denote simply "relation" or "order."[1] This may supply us with as good a clue as any to a common nature of those problems which have worried philosophers when they have been concerned with the character and the office of reason. Categories, definitions, axioms, postulates, plans of action, ends, rules and laws, schemata and implicative systems,—all such describe or prescribe some type of order, some species of relational structure. They are principles in terms of which some content is ordered and arranged.

The earmark of a principle is its possession of some degree of generality, of some wide and inclusive range of applicability. The items to which a principle applies, and which are caught up within some schematic order, type, or series, are particulars. A principle holds of more than one particular item. It organizes many particular items within the sweep of some orderly structure. In speaking thus, I am not necessarily ascribing any potency, magical or otherwise, to forms and principles. The question whether a principle, as

[1] Thomas Whittaker, *Reason and Other Essays* (Cambridge, 1934), p. 12.

distinct from particular items, is in any region and in any manner operative may be postponed without prejudice. The discernment anywhere of a principle of organization is the discovery of something which spreads beyond and transcends any one particular item. I shall take the common denominator of reason to be the existence, the awareness and, it may be, the employment of organizing principles. We are well within the bounds of traditional usage when we fasten upon a concern for some degree and type of universality as the common token of rationality. Universality, a spread beyond any one particular, endows the particulars with whatever order they may possess.

But, if by reason or rationality is meant *any* order pervading a plurality of particular items, does not the concept of reason become wholly neutral and colorless? Is there any imaginable state of affairs, comprising particular items, things, and events, which is lacking in some type of order? The existence of any aggregate of things is their coexistence. If they coexist, they have just that order, the relational structure, which characterizes the fact of their coexistence. In this inclusive and neutral sense, all instances of plurality and complexity are equally rational and intelligible. Hence, so Mr. Dennes has argued, any discrimination of one type of order as more rational than some other is but the expression of a liking or preference which animals such as we may have for certain kinds of order. It is as if a miscellaneous assortment of types of order was spread out before us, like dishes of food on a cafeteria counter, inviting our choice. I agree with Mr. Dennes in recognizing the inescapability of some notion and type of order. The most utter chaos and confusion which a tornado, earthquake, or war may leave in its wake do have some type of order. One bit of débris adjoins its neighbor, one particular happening follows upon another. The heterogeneous assembly of particular items, things, and events has a temporal and spatial order. Spatial contiguity and temporal sequence *are* types of order. They encompass and engulf the manifold of nature's particulars. We commonly mean by "nature" the totality, whether finite or infinite, of particular items which have a spatial-temporal order,—which exist, as we say, in space and in time. This type of order is pervasive and omnipresent throughout nature. This space-time order can have had no natural history, because all history transpires within the space-time matrix. Space-

time is the authentic *a priori* of all particular things and happenings which belong to nature.

This universality of the space-time order of nature is the source, I think, of a persistent motive within that temper and attitude in the history of ideas for which "naturalism" is the accepted name. The motive to which I refer finds expression in the tendency to measure all types of order in terms of this most pervasive space-time order. It confronts every supposal that some kind of order, more specific and restricted than that of space-time, does really characterize the structure of nature with a warning. Examine your supposed type of order for what it really is, and you will observe nothing whatever save particular items which are spatially and temporally contiguous. Does the metaphysics of common sense or of Aristotelian scholasticism imagine that there really exist in nature things or substances which own or support their qualities? But, the relation of being a quality of a substance is a relation neither of spatial contiguity nor of temporal sequence. We will, then, translate this spurious relation generating the category of substance into the *bona fide* relation of space-time. A thing is really the aggregate of spatially contiguous properties with continuing temporal status. Does the rationalist suppose that there really exist in nature implicative relations such that, from some one particular entity, one may infer the existence or the nature or some other item, distinct from the first? Look more carefully and see whether you observe anything over and above the temporal sequence of two otherwise distinct items. Does the teleologist imagine that there are plans and purposes in nature, in animal and human behavior? Again, examine more closely, refrain from surreptitiously reading anything into what you observe, and you will report nothing but some temporal series of happenings. One need but recall the dominant rôle played in mechanistic materialism by the principle of spatial contiguity, the successive impacts of contiguous things. Moreover, in comparison with the inclusive universality of the space-time order, all other types of order seem incidental and adventitious. That every region of existence does have a spatial-temporal order, that there is no other type of order which has the privileged status of space-time, that all other apparently different types of organizing principle are describable in terms of spatial contiguity and temporal sequence,—these premises define a famil-

iar metaphysical perspective. The issues of metaphysics hinge, in large part, upon the status which is accorded to forms and principles of organization other than those of space-time alone.

Naturalism becomes somewhat more flexible and mitigated when attention is concentrated upon types of order which supervene upon this universally pervasive order of space-time. Nature may then be viewed not only as the scene within which things exist and events happen, but also as a hierarchy of principles of organization, of types of order, of kinds of rationality. The deduction of the categories now becomes the natural history of organizing principles,—of all, indeed, save that denoted by space-time itself. The most notable metaphysical construction of this sort in our time is that of Alexander. Space-time is the universal matrix within which and out of which successive types of order have emerged and are still to emerge. Mind is an emergent from living existence, as life is an emergent from material existence. Mind and life are indeed new emergent qualities, but they also denote emergent types of order and principles of organization. Mind is a late-comer, partial and incidental, though Professor Alexander's mind contemplates and encompasses the entire cosmic panorama. With this impressive speculative achievement as a whole, I cannot, of course, be concerned. I mention it only because I want, in my own way, to make a very modest use of this idea of successive levels of principles of organization. I shall assume, without argument, that there are such different types of order. That is, I am assuming that strict naturalism, which uncovers everywhere nothing but spatial contiguity and temporal sequence, is not adequate to nature. In earlier papers I have given some ground for believing that there are, in nature and in history, principles of organization other than space-time. I am interested now not so much in the cosmic and nonhuman status of whatever principles of order there may be, as in the rôle which certain of these play in human intelligence and in the human life of reason. I am concerned with Marhenke's first type of rationality, that which pertains to creatures having minds.

Inorganic matter consists of elements and ingredients ordered and organized in such ways as may be disclosed to the student of physics. Living matter, plants and animals, exhibits, I assume, types of organization which supervene upon those which characterize matter as such. Perhaps I am wrong. That does not interest us

now. We may march on to the human scene and the birth of our human reason, in one quite definite and fundamental meaning of this many-sided term. We may contemplate, as does Alexander, the successive emergence of new qualities, attended by new principles of organization, as we survey the levels of natural existence. If now we compare the principle of organization of the epoch just prior to the appearance of reason with that stage in which reason has just come upon the scene, do we observe a transition from one type of order to another? Is this shift from the absence of reason to the presence of reason analogous to the transition, say, from matter to life, assuming, as I have, that a new principle of organization appears at that juncture of natural history? Well, however in the end we answer this question, our first reply must be, I think, this. No new principle of organization comes immediately upon the scene with the arrival of reason. What happens is that the human animal becomes aware of, becomes conscious of, those principles of organization in accordance with which he has been carrying on his life activities. He wakes up to a going affair which antedates his awakening. The old principles of organization, established patterns of behavior and response, have a new dimension added to them. They remain what they were before, at least for a time.

Now, the reason of which I am here speaking is reflection. It is the activity of reflective thought. The word "reflection" is quite appropriate. When one reflects, one bends back to see and to become aware of what it is that one is already doing. What formerly existed *an sich* now exists *an und für sich*. Assume that man is just another animal. Observe his behavior, his body and brain, his contrivances and institutions, all exhibiting principles of organization differing in any way you please from those of other animals, as the behavior and structure of tigers differs from that of robins. You have still left out the most striking difference. No other animal knows, presumably, that he is an animal. Man does know. This does not as yet make him another kind of animal in the same sense as that in which the brain, say, of a frog imparts to a frog a mode of behavior different from that of a salamander. Imagine a frog becoming aware of his frog structure and nature, becoming reflective and self-conscious, his frog nature remaining all the while just what it always was, and you have the sort of thing signified by the birth of reflective reason at the moment of its first appearance.

Such reflective reason is something more complex than bare momentary awareness, a mere rudimentary flicker of consciousness. Remember that reason has somehow to do with organizing principles and forms which have some measure of spread and generality. A feeling which but echoes and announces a particular occurrence, say a cut or a burn, is too narrow and thin to be spoken of as reflective reason. But when the organizing principle of some wide area of behavior is not only there, but also recognized as being there, in the texture and life of our human experience, then you have reflective reason. When such a principle is discerned as present, as characterizing the manner in which some going concern in human affairs is actually operating, then thought and reason have appeared. Insect activities are organized in the marvelous and intricate institutions of ant colonies, beehives, and the like. Human activities are organized in the no less complex institutions, customs, and patterns of family, guild, business, and nation. However, over and above all observable differences between the organizing principles of insect and of human life is the additional difference that men may discern and reflect upon the organizing patterns of their behavior and, presumably, insects do not. If there were no specific observable differences between the two sets of organizing principles, this distinction would still be present and it would be momentous. To say, then, that man is a rational animal is to say, so far, not so much that man organizes his behavior in ways which mark him off from the nonrational brutes, as, rather, that man is aware of and reflects upon the manner in which he carries on the business of living. Whether this does or does not entail any new and different way of living, any distinctive organizing principles, is another question. To say this is to say that men live before they reflect, that they speak before they discover the grammar of discourse, that they worship and erect shrines before they reflect upon what the act of worship may mean, that they weave and paint and adorn the body before they study aesthetics, that they pursue aims, engage in the arts of peace and of war, build tribal institutions, cities, and nations before they reflect upon the good life and the conditions of human happiness.

But now a strange thing happens, once any organizing pattern of life and experience is discerned and reflected upon. Reflective thought, instead of being only a colorless and neutral reflection of

some pattern of life, now turns around, scrutinizes, appraises, and criticizes the very principle of which it was originally the expression. It is not content merely to accept it as something factual. It examines its credentials, its claims, its validity. Protagoras and Gorgias, Thrasymachus and Glaucon, converse with Socrates, the dominant theme of subsequent European philosophy is sounded, and the venture of European rationalism is under way. This rationalism of which I speak is broader in its scope and richer in its content than any technical philosophy to which the term is conventionally applied. It denotes a temper and a particular set of motives. It defines a comprehensive attitude. It earmarks a characteristic bent and a persistent strain in the historical career of European civilization. It is what Mr. Edwyn Bevan has in mind when he seeks to single out the one distinguishing trait of European civilization: "For if the ancient classical culture and European culture since the Renaissance are phases in the manifestation of a single principle, we want some name which will include them both.... Perhaps the best way would be to speak of this type of culture as Rationalistic civilization.... What in the last resort gave its peculiar note to Hellenism as against all that existed outside it? Surely just the singular development of those mental faculties which we associate with rationalism, the critical intellect, the bent to submit traditions and beliefs to examination."[2] Such a statement as this may all too easily wear the appearance of a tiresome platitude. To formulate its meaning and its implications, however, soon leads us beyond the pale of platitudinous iteration. I should like to indicate, with the utmost brevity and in the large, something of that to which this precarious venture of reason is committed.

It implies the possibility of surveying from the outside the channels in which the specific energies of life have been moving and the forms which have determined their organization. Reflective reason stands off from the principles and forms which it contemplates and of which it becomes critically aware. These structures and institutions, these organizing principles, are embedded within the stream of nature and of history. Each of them moves within the context of nature's processes, with definite historical antecedents and determinants. Each is partial, biased, selective, in being the individually specific and limited thing that it is. If reason were but a name for

[2] *Hellenism and Christianity* (London, 1921), pp. 14–15.

some fresh derivative of nature and history, some different but wholly specific vital interest, some particular configuration of energies, it would be as limited, as contingent, as singular and exclusive as any other of the myriad forms deposited in the wake of natural and historical processes. It would be wholly tied down to a local perspective. It would be the partisan and the spokesman solely of the interests and the bias of the creature whose reason it is. Reason, as reflective and contemplative, names the possibility and the achievement of detachment, however truncated and partial it may be. It marks, at the very least, the interest and the effort to transcend the specific limitations of *my* world, and in some measure to hold commerce with *the* world. Disinterestedness, objectivity, and universality are but pale verbal symbols of this persistent motive. The ability to transcend the boundaries of my perspective, to discount the limitations and partialities, the preferences and interests which define the area belonging to me and mine, to my body, my perceptions, my group, my class, my nation, my race, even my humanity itself, is the achievement of reason. All communication and all human coöperation imply some measure of such detachment and transcendence. Common sense, common understanding, and a common good all exhibit stages and epochs in the journey from *my* world to *the* world. It is reason which is critical of each limited and partial area, of each vital and vested interest; it is reason which strives to break through the shell of every "centric" dilemma, egocentric, body-centric, or class-centric. It is reason as contemplative which takes up a position outside of any one specific partial and selective form in order to scrutinize and to appraise it. Reason as contemplative is mind set free from the exactions of the immediate, the vital, and the practical.

The distinction between existence and validity, between *de facto* and *de jure,* is the correlate of this detachment. Such a distinction, whenever it arrives, expresses a refusal to suppose that any existing structure, any going concern in nature, life, or history, derives its title to validity from the fact of its existence alone. An elementary illustration of this is found in the existence of a belief. A belief is an ingredient of a mind. It is a mental fact. It is an entity which has a history. It has antecedents and consequences. To think of a belief as a fact of nature, lying in whatever domain of nature we suppose to be occupied by minds, is to place that belief in its tem-

poral and spatial context. So to place it is to discover its causal context, its determinants. It is to explain the existence of the belief. So far, a belief, as something factual, is like any other item of nature. But we are not done with our human interest in existences such as beliefs when we accept them as facts and when we succeed in explaining them by discovering the natural, time-space context in which they exist. We are also interested in the question of the truth or falsity, the validity, which we are entitled to ascribe to the belief. Both true and false beliefs exist and are, in equal measure, capable of being noted, described, and explained. The one is as natural and as historical as the other. If there be any difference between true and false beliefs, it will lie not in this dimension of sheer existence, but in that of validity. Only to something which is, in some measure, detached from the provincial, the local, and the contingent nature of particular centers of existence will this distinction between existence and validity present itself.

I am not unaware of the ambiguities and the problems which lurk within this distinction between existence and validity. I have no desire to freeze the distinction at any one level, least of all to erect any wholesale and absolute barrier between these two dimensions. I am but recording the fact that there is an area of facts the whole of whose nature is not exhausted by an enumeration of their observable and factual characteristics. I have, in another place, described such facts as those which make a claim. A belief claims to be true, a decision and a deed may claim to be right, an end or a loyalty may claim to embody that which is a good. Examine the belief, the deed, the loyalty, as an existing fact. Admit into your report of them only their observable, factual natures and contexts. The claims which they make will then be reported as existent structures and events within a space-time context. The belief will be described as the observable behavior of the body. The rightness of the deed will appear, say, as the *de facto* feeling of approval in the mind of a spectator. The loyalty will appear as some matter-of-fact interest or preference of the agent. Look where you will, what can you report save particular facts and events in some spatial-temporal context? Validity evaporates into existence. Now, I conceive reason, as contemplative and reflective, to denote our perennial human discontent with anything given and factual, our refusal to suppose that observable factuality is, *ipso facto,* a warrant of

validity. Because a belief exists as mine is no guarantee of its truth. Because an interest and preference exist as mine is no guarantee of their validity.

Why, after all, does the human animal translate his factual feelings, likings, and preferences into judgments of value? Why transmute the factual statement "This is what I like" into the judgment "This is good"? To remind us of our human penchant for rationalizing our private whims and fancies, our interests and preferences, is to employ a double-edged sword. On the one hand, it does serve to unmask the false pretense that something wholly arbitrary, local, and contingent is indeed more than it is. On the other hand, these rationalizations, these very masqueradings of the irrationally factual in the guise of something objectively valid, evince just our human and rational requirement that our beliefs, preferences, loyalties, and interests are not worthy of our acceptance unless they are more than the reverberations of our own factual propensities. Their factual existence is no title to their validity. The least that can be said is that reason first transforms subjective proclivities into supposedly rational structures, having objective validity, and then exposes them as dear and respectable absurdities. It is reason which uncovers the failures of its own partial and inadequate achievements. Both the failures and their exposure as failures and frauds imply the capacity for disinterested detachment from the local, the arbitrary, and the merely factual. If we mean by "nature" the totality of factual existence, then reason is the spokesman for that which lends to some facts, structures, and events whatever measures of validity they may possess. In this sense we are entitled to say, hard as the saying may be, that reason, as contemplative, transcends nature. It transcends nature in the same sense that the awareness and consciousness of events is transcendent to them as events. It is an added and unique dimension, different from the addition of subsequent events lying in the same plane.

This, then, is something of what I suppose the life of reason to mean. There are specific principles of organization, characteristic of our human experience, which supervene upon the time-space order of things and events. They are the forms and patterns which are employed in the enterprise of human life and history. In the domain of experience as cognitive and theoretical, these are known

as categories. Elsewhere, in experience as an affair of life and practice, these organizing principles appear as laws, ends, customs, mores, and institutions. Reason, as contemplative and reflective, names the process in which men's minds become aware of these organizing principles and reflect upon them. The mind which does this may also proceed to scrutinize and to question their validity. The mind, as critical and contemplative reason, declines to accept them and to be guided by them merely because they happen to have arisen and to flourish. Reason denotes this endeavor on the part of mind, contemplative, detached, and disinterested, to survey the validity, the reasonableness, of organizing principles, both categories and institutions.

The mere idea of the life of reason as an organization of human energies and activities in the light of principles known to be reasonable and valid may seem now to be but a pathetic illusion, a bitter travesty of the brute irrational forces which are sweeping us along. Reason, as the spokesman for disinterestedness, detachment, and tolerance, appears to have fought a losing battle. The high hopes of European rationalism, that the mind, through its discernment of a rational good, could provide civilization with valid and reasonable principles of organization, would seem to have succumbed to disillusion. We now know who and what our masters are,—brute force, economic interests, the will to power, the imperialisms of class, nation, and race. I cannot repress my belief that there is a parallelism and analogy between what is today transpiring in the world of practice, of political, economic, and national life, and the habits of thought, the intellectual temper, which likewise have issued from our modern experiment. To put it very bluntly, I seem to discern that within modern naturalism and positivism which springs from the same soil as that which has brought forth our present social disarray. To say that every principle of organization which is thought to be objectively valid and reasonable is, in truth, the utterance of a factual preference and interest, is on all fours with the thesis that the apprehension of what is taken to be an intelligible order of nature is the report of something wholly factual, or exhibits some *de facto* bias on the part of the knower. It is to say that there is no rational good in the light of which all interests and preferences, including my own, are to be scrutinized, criticized, and revised, and that there are no ideals of

theoretical intelligibility in the light of which the nature of observed facts is to be discerned and interpreted. These theses appear to me as a tolerably fair translation, in abstract language, of the world of practice to which we have become habituated.

I can have, of course, no thought here of depicting the march either of events or of ideas which have brought us to where we are. Nor do I think of this parallel history as one of decline from some golden age, so that all we need do is painfully to trace our way back to some lost paradise. If the idea of the human life of reason appears now precarious, both in theory and in practice, both in the dominant structures of civilization and within some cloudy areas of our prevailing intellectual climate, the fault may lie as much in an inadequate account of the nature of reason as in the forces which have proved too much for reason to master and to organize. In the overwhelming complexities of this whole affair, every simple analysis and formula ought to be distrusted.

The reason of which I have been speaking, reason as contemplative, disinterested, and critical, lays claim to a kind of detachment from each specific form and organizing principle. It refuses to be identified with any one specific, partial, and selective interest or agency. In the rôle of speculative critic, reason is no single contestant or partisan. I want now to turn to another and quite different meaning of reason. Of the natural history of *this* reason there can be no doubt. It is that aspect of reason which has played a dominant rôle in the development of modern institutions and ideas. It is reason which has become domesticated within the perspective and pattern of much which we commonly take for granted, within our common sense. The meaning of the life of reason has largely become canalized within one specific type of organizing principle. It becomes identified with practical intelligence, with purposive behavior, with the intelligent ordering of means for the sake of some end. Reason becomes an observable trait and quality of animal and human behavior, a factual ingredient within nature, one whose development and history may be, in outline, traced. Man's reason is now prefigured in the cunning of the beasts. Animal behavior is modified through learning and experience. The animal body achieves aptitudes and skills, marvelously dexterous ways of meeting situations, solving problems, performing tricks, manipulating things so that they contribute to some vital end. What else, we ask,

can knowledge, intelligence, and reason mean save such aptness of the body? The snake's knowledge is the skill and cunning of the subtle movements of his body, subserving the vital interests which the snake is or has. Human intelligence and reason are prolongations of this generic type of adaptive responsiveness of bodily behavior to situations. Human reason is animal intelligence, expanded and deployed over a vastly greater territory. Man, lacking the poisonous fangs of the snake, more than makes up for this deficiency through the acquisition of instruments of speech. His thinking, his reason, his *logos*, the distinguishing trait of *his* intelligence, lies in the aptness with which he utters sounds and uses symbols. Reason in this sense is that domain of nature in which the sequence of events is intelligently guided, in which given resources are manipulated and exploited in the service of some end. Reason as practical intelligence is purposive behavior. This reason is not contemplative, but practical and instrumental; not detached, but vitally implicated in the maintenance and furtherance of specific forms and structures; not disinterested and impartial, but exhibiting the acme of selectiveness and exclusive single-mindedness. There is no doubt about this reason's having a natural history. It is an instrument acquired by animals just as are other specific structures and forms, other bodily aptitudes and the organs in which such aptitudes are displayed.

Reason as animal and practical intelligence is a quality of behavior which is suited to cope with unfamiliar circumstance, with problematic situations. This reason is nature's device for permitting animals to deal with an environment for which habitual, spontaneous, and instinctive responses are no longer adequate. Reason is a name for the intelligent way of meeting practical difficulties and solving problems. In the chapter "Reasoning," in his *Psychology*, James wrote: "Let us make this ability to deal with novel data the technical differentia of reasoning." James discriminates within this ability, as a whole, two aspects or qualities. They are sagacity and learning. Sagacity is the ability to discriminate within the whole problematic situation some partial, abstract ingredient or trait. But this abstracted item is of use only if it is already linked with the desired end. It then serves as a clue. This association between the clue and that to which it leads must have been previously learned. In terms of these traits of practical intel-

ligence, sagacity, and learning, James offers an adroit interpretation of the syllogism *Barbara* in the first figure. S is the total confused problematic situation. P is the goal, the solution of the problem. M is the clue. An M, which has through learning come to be associated with P, must be located within S. The major premise, M is P, is the product of learning, of past experience. The minor premise, S is M, results from shrewd and sagacious discrimination. Combine both the learning and the sagacity, and the conclusion follows. The problem is solved. S is P. Formal logic, if not itself put to some use, is now seen to be a schematic formulation of the way in which intelligent animals use their wits. Of these two powers, sagacity and learning, it is the former which is more heavily loaded with the quality of intelligence. Learning is more an affair of repetition, docility, plasticity, and habit. Sagacity is perspicuity and shrewdness. It brushes aside a mass of irrelevancies and fastens upon some one essential trait. But essential, of course, for the purpose in hand, for the end in view. And the purpose and end are wholly relevant to the specific needs and interests of the living creature. It goes without saying that this reason, as animal intelligence, will have no concern with any qualities which are intrinsically essential to an object in the animal's environment. The animal has its own life to live. Its attitude is propriocentric. Its energies are not to be deflected by reason as contemplative and detached. This human reason which is a prolongation of animal intelligence is characterized by a prodigious development of the powers of abstraction, made possible by the use of language and symbols. Words, ideas, and essences are "teleological weapons of the mind" (James), the products of an animal sagacity which has far outstripped the crass and bulky middle terms employed as clues by the less sagacious brutes. Through these weapons, man has acquired a long-range and far-flung mastery of his world, in the service of his ends.

Within that perspective which interprets the life of reason in terms of animal intelligence, thought and reason may be said to play a double rôle. That intelligence is evoked at all is a symptom of doubt and hesitation, of the failure of such sure and vigorous response as accompanies successful vitality. Thinking is instrumental. It is an interlude occasioned by the presence of complexity, conflict, and the inadequacy of acquired habit. It is the symptom of a problematic situation. Instead of acting and living, in the pri-

mary sense, one thinks and reflects, picking out some middle term which may lead once more to an adequate vital response. An idea is the token of a stoppage. It is a delayed response. It is a rehearsal and preparation for the resumption of the serious business of living. "The healthy know not of their health," wrote Carlyle, "but only the sick. . . . the beginning of inquiry is disease. . . . all science must have originated in the feeling of something being wrong. Had Adam remained in Paradise, there had been no Anatomy and no Metaphysics."[3] Thomas Hardy presumably had something of this in mind when he remarked, in speaking of Clym Yoebright, that "he already showed that thought is a disease of flesh." But reflective thought, as animal intelligence, heals the disease of which itself is a symptom. The token of the failure of life is the instrument through which living and doing can be resumed. The early Church Fathers regarded the positive institutions of civil society, the state, slavery, private property, as both the punishment and the remedy, *poena et remedium,* for man's fall. They were both the symptoms of man's fallen state and the disciplinary instruments of his salvation. Reason as animal intelligence is an unfortunate interlude in the business of living, but also the instrument which leads to its resumption. Knowing is the sign of failure and the promise of redemption. I know not how else to interpret that half of Dewey's philosophy which rests upon the distinction between having and knowing, consummations enjoyed and reflective procedures whose justification lies in what is ulterior and eventual. There is, to be sure, another half of that philosophy which may tell a somewhat different story.

This interpretation of the life of reason as practical intelligence, as purposive behavior, accords with certain of the most characteristic features of modern, West European civilization. It fits both into the framework of modern naturalism and into the accepted pattern of many of our characteristically modern institutions. I have expressed my conviction that the general intellectual temper and habits of thought which vaguely go by the name of naturalism and positivism cannot be wholly dissociated from those principles of organization within the modern scene, of whose fruition we are the unhappy spectators and victims. There is one aspect of our modern institutional pattern which affords a striking commentary upon

[3] Carlyle, *Characteristics* (Edinburgh, 1831), III:331.

this interpretation of reason as practical intelligence. I refer to Economic Rationalism. The term indicates precisely that mode of behavior in which there is the maximum of intelligent foresight, of sagacious discrimination and manipulation, of calculating shrewdness in the organization of resources and services for the sake of the accredited ends of economic enterprise. In its stricter meaning, a rational economy is one in which control is exercised through a process of calculation. "A rational capitalistic establishment is one," writes Max Weber, "with capital accounting, that is, an establishment which determines its income-yielding power by calculation according to the methods of modern bookkeeping and the striking of a balance."[4] Our word "control," which epitomizes the technique of experimental science, and the generalized procedure of practical intelligence, has its etymological origin in the art of bookkeeping. The rationalisms of the great metaphysical constructions of the seventeenth century reflect the impact upon men's minds of the achievements of mathematics. Economic Rationalism is the employment of mathematical calculation in the ordering of practical undertakings. In a somewhat wider sense, Economic Rationalism denotes the employment of a rational technology, the practical mastery of means and instrumentalities for the sake of a precisely formulated end. The basic category of practical intelligence, of purposive behavior, is that of means and ends. To organize, manipulate, and exploit given resources and material in the service of any defined end requires rigor and discipline. It exemplifies that temper of "asceticism within the world" which, according to Max Weber, was the contribution of Puritanism to modern Economic Rationalism. The life of reason, rational activity, is now drawn within the organizing principle of means and ends. When so taken, economic activity becomes the type of all rational activity. That this is so has been noted by various writers, for instance, von Mises. He writes: "The spheres of rational action and economic action are therefore coincident. All rational action is economic. All economic activity is rational action."[5] Von Mises goes on to say that purely or narrowly economic activity differs from rational activity in the large, only through its employment of exact calculation, economic rationalism in the strict sense.

[4] *General Economic History* (New York, 1927), p. 275.

[5] *Socialism* (London, 1936), p. 14.

This rational control of instruments, this preoccupation with means, is of course reflected in modern Utilitarianism. The end is obvious and taken for granted. Everybody knows that pleasure or happiness is the end. "Action based on reason," again to quote von Mises, "action therefore which is only to be understood by reason, knows only *one* end, the greatest pleasure of the acting individual."[6] The only problems arising in practice concern the choice and the invention of means. All practical problems are technical. This dissolution of moral problems, those concerned with ends, into technical problems which have to do with means, is but one aspect of the coalescence of existence and validity. It marks the shift from reason as contemplative and detached to reason as practical intelligence.

There is a ruthless and overriding quality which attaches to any plan of action conceived as the mastery of means in the service of an end. The end controls and dominates the use of means. Any one end, no matter what it is, viewed as an end, is a little absolute. *Fiat quaestus et pereat mundus.* For the end is the exclusive locus of value. Means are obstacles to be overcome, Within the logic and organizing principle of purposive behavior, it *is* the end and that alone which justifies the means. This reason, as practical intelligence, is engaged in ever-increasing measure as the area of masterful control widens. How admirable is the reason displayed in the ruthless and successful domination already or about to be achieved over a whole continent by the shrewd planning and adroit cunning of two or three dictators!

But this expansion in the area of intelligent mastery marks at the same time a contraction in the total range of our experience to which reason is pertinent. Reason as animal intelligence has everything to do with the organization of means. With the determination and clarification of ends, it can have nothing to do. These are dictated by feeling, desire, and passion. It follows that since intelligence is directed upon means, and since means are instruments to ends which are set up by the nonrational proclivities of our nature, reason, in the famous words of Hume, "is and can be nothing but the slave of the passions." The life of reason as a name for the recognition of reasonable and valid organizing principles with which to illumine and to guide every major human activity becomes

[6] *Ibid.*, p. 112.

an anomaly. And in Hume's trenchant analysis, this withdrawal and disability of reason invades animal intelligence itself. For intelligence as practical employs the category of means and end. This relation depends upon the principle of causality. The causal principle, for Hume, has no reasonable validity. Here, then, is a principle, *the* principle employed in all practical activity, with which reason has nothing to do. The reason which is a slave of the passions and the instrument of sagacious practice, is a misnomer. The belief upon which we act when we manipulate causes in order to achieve effects is nonrational. Its natural history may be traced. It is psychological matter of fact, so Hume says, that the customary conjunction of two events does engender in us the expectation that the one event will be followed by the other. But this psychological fact supplies no warrant for the validity of the belief. Our habit of expecting, in the absence of which we would not act at all, is one thing. It affords no valid basis for ascribing an analogous habit to nature, which is quite another thing. The belief is natural and nonrational.

I am interested just now not so much in the adequacy of Hume's analysis of the causal principle as in the wider context of his criticism. Here is an organizing principle, indispensable for practical activity and mastery. We employ it in every instance of purposive behavior. Does reason presume to set itself up as the critic and judge of its validity? Why, this practical principle says to reason: "Hands off. You have no competence to judge me. If I should submit my claims to your jurisdiction, you would declare them invalid. Hence I propose to go my own way, regardless of anything you may say or think. Keep to your own business, whatever that may be. About the only thing you can do is to make tautologous pronouncements, perhaps to discern some relations between shadowy ideas. You have nothing to do with practical activity. You are not to interfere with the business of living."

How marvelously has Hume caught and expressed the temper of whole wide areas in the career of modern energies and institutions, the autonomy of economic ends and motives declining to submit themselves to the jurisdiction of any noneconomic principle, the autonomy of the national state with its claim to sovereignty and finality, the claim that the state's struggle for supremacy transcends all other values, the autonomy of class or of race, bent upon

the conquest of power, the autonomy of the individual, making his interests and preferences the sole criterion of that which he acknowledges as right and as just. Hume is discerning and expressing some of the major forces shaping our institutional fabric and our intellectual climate. Like the *deus absconditus* of Calvinistic theology, reason has retreated, leaving the world of nature, experience, and life to be the scene of relations, patterns, and organizing principles which are wholly factual, contingent, and nonrational. This withdrawal of reason is a long-drawn-out chapter in a story another chapter of which is the bifurcation of nature, the withdrawal of mind and secondary qualities from the realm of princiciples actually operative within nature. The trouble is that when we try to put mind back into nature, all that we apparently succeed in restoring is animal intelligence and purposive behavior. Reason as critical, reflective, and contemplative, as the source of ideal standards which render provisional and tentative every assumed finality, has become domesticated neither in our practice nor in that metaphysics which rejects metaphysics.

For the rôle of reason as contemplative, detached, and disinterested is to render problematic every factual item in our human experience. In experience as cognitive, reason is the source of whatever ideals of theoretical intelligibility there may be with which we accost given data of observation and perception. In experience as practical, reason is the source of whatever ideals of the good and the right there may be with which we confront our *de facto* likings and preferences. This is to say that the factually given, items observed or interests and desires, have no finality as criteria of our judgments or of our plans of action. Whatever finality these may have is simply that of the material with which we have to work. It is to say that immediate experience does not exhaust the nature or the meaning of any given item. It is to say, furthermore, that there are types of order and, in this sense, of rationality other than spatial contiguity and temporal sequence of otherwise unrelated particulars. The reason which Hume banished from the order of nature and from human practice was a reason which had already confessed its impotence. For Hume leaves us with the violent contrast between a reason which has contracted into the meager dimension of self-evident truths, trifling and analytic, and a world of irrational, atomic matters of fact, held together if at all only by spatial-tem-

poral relations. It is idle and futile for this reason to dictate to facts what they may tell us, or to dictate to human purposes and interests the course of their career. The alleged self-evidence and finality of axioms is just on the point of dissolution into verbalism and tautology. And this supposed finality of self-evident axioms is the correlate of an analogously alleged finality of each given impression in its utter particularity and isolation.

The ultimate ingredients of existence, impressions or facts, have for Hume no real relations save those of spatial contiguity and temporal sequence. To fit even these relations into the presuppositions of his philosophy is for him a source of considerable wavering and perplexity. But let this go. What Hume takes to be self-evident is the complete indifference of every particular impression or fact to its habitat, its context, its associates. Herein lies its isolation, its atomicity, its finality. The most that Hume can concede is the factual existence of neighboring atomic impressions or facts in space and time. Now space and time as Hume conceives them are forms which allow the maximum of indifference. Space is that form in which things can be moved without themselves undergoing change. And Newtonian time is wholly irrelevent to the events which are said to occur in it. From these premises it follows that particular things and events are indifferent to the spatial-temporal contexts in which they exist, and all other particulars within these contexts. Now, to come upon any thing or event which is not indifferent to its context is, at the same time, to come upon an organizing principle, a relational structure, other than that of space-time alone. Also, to come upon such things is to come within sight of individuals and individual structures. Individuality denotes relevancy to context, sensitivity and responsiveness to what is not contiguous and immediate. An individual structure has a type of order which supervenes upon spatial contiguity and temporal sequence. Measured in terms of the space-time continuum, everything individual is irrational, a brute datum holding within its own boundaries its own ineffable *quale,* something to be felt and immediately experienced, never to be understood or rendered intelligible. It is the office of reason as contemplative and reflective, incessantly to prod given facts so that they may disclose their implications, their possibilities, the meanings which they may convey, the types of rationality which they exemplify. Reason is the antidote of the immediacy and finality of

given fact. It checks and softens the exclusiveness and harshness of dominant ends and interests arising within any partial area. To say that such reason is formal and abstract is, in a sense, true. But these terms are only too likely to send us off on a wrong scent. For the reason which is exhibited both in the achievement of knowledge and in such regions of practical life as have attained some measure of disinterestedness and coöperation in a common and significant human enterprise, is not comprised within any self-evident axiom or analytical judgment. It is that which fructifies the given, rendering it both problematic and amenable to ideal standards. It marks our human sensitiveness and response to something other than the immediate, the factual, the practical. I have called it reason as contemplative and detached. I have contrasted it with animal intelligence and purposive behavior. If I have portrayed this contrast with too harsh and too strident colors, it has only been to set forth as unambiguously as possible the tension which pervades our characteristically human experience. Human behavior is intelligent so far as it is informed by ends and purposes and by our mastery of means and powers. It is rational so far as these ends and purposes are themselves informed and tempered by that concern for disinterestedness, objectivity, and universality which it is the office of reason to provide. Reason pronounces the interests and preferences which prompt my behavior to be, borrowing a phrase from Justice Holmes, "no more than the system of my limitations." In making this pronouncement, reason is on the way to the discovery and the fashioning of structures of thought and of life whose significance is more than local and partial, structures which make possible a common understanding and a common good.