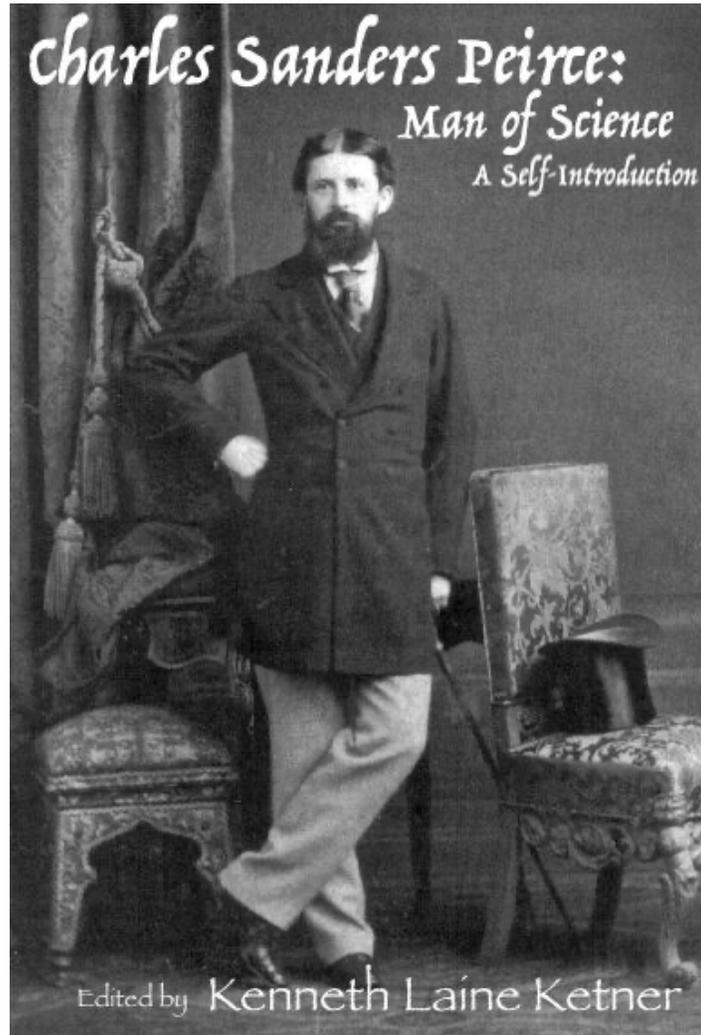


CHARLES SANDERS PEIRCE
MAN OF SCIENCE
A SELF-INTRODUCTION



Charles Sanders Peirce, Member, National Academic of Sciences, Berlin, 1875.

EDITED BY
Kenneth Laine Ketner

Copyright 2021 by Kenneth Laine Ketner



CHAINMAKER PROJECTS

CHARLES SANDERS PEIRCE: MAN OF SCIENCE

TABLE OF CONTENTS

Preface by Kenneth Laine Ketner.	3
Biographical Summary.	4
A System of Science.	7
One Hundred Fifty Years Later.	8
A Note on Textual Resources, and An Outline of Peirce's System of Science .	10
A SELF-INTRODUCTION	13
A Brief Intellectual Autobiography.	14
Two Influential Early Essays.	21
Some Consequences of Four Incapacities.	21
How to Make Our Ideas Clear.	22
A SYSTEM OF SCIENCE	27
Presuppositions of Science: Religion and Common Sense.	27
Prologue.	27
Common Sense.	27
Religion.	31
Faith.	32
Science Presupposes God.	34
The Nature of Science.	36
Mathematics, The First Science.	38
Mathematics.	38
Diagrams.	40
Diagram Observation.	41
Two Kinds of Deduction.	41
Cenoscopy (Philosophy)	43
Phaneroscopy	44
Normative Sciences	53
Normative Science	53
Esthetics (As Purpose or Ideal)	55
Ethics (As Self-Control)	56
Logic as Semeiotic (The Theory of Semeiosis or Sign Action)	59
Stecheotic (Basic Definitions)	59
Critic (Theory of Argumentation)	65
Methodeutic (Methodology)	67
Metaphysics	70
Answers to Questions Concerning My Belief in God	71

PREFACE

KENNETH LAINE KETNER

... if I were asked to nominate the two native Americans of greatest intellectual genius, I think they would both be 19th-century figures—Willard Gibbs and ... C. S. Peirce.

C. P. Snow¹

ALTHOUGH now considered by many to be the founder of serious philosophic study in the United States, late in his career, which was a study in extremes of triumph and misery, Peirce sometimes complained, usually without bitterness, that most of his contemporaries did not fully understand or appreciate his work. He was aware that he had something valuable to give mankind, and often felt frustrated that circumstances were preventing him from making that contribution. Today that complaint is still valid, although the flow of scholarship is now in the direction of responding to it. The response will be possible because almost all the books and essays that Peirce wrote, even without support from publishers or universities, have survived and are beginning to appear in convenient editions. In effect, Peirce overcame his lack of resources by writing out his contributions any way he could, sometimes with homemade ink and scrap paper, so that there would be at least one copy of his thoughts surviving him. In this prologue for a set of materials designed to introduce readers to the work of the man widely considered to be the most original and profound American intellect, let us pursue the question of his complaint from within the context of his era and of ours. As a necessary preparation for that task, we should first quickly review the status of Peirce's writings, both published and unpublished.

He published a great deal during his lifetime, more than received opinion has registered. Perhaps the reason for this misregistration was that many of his publications were unsigned, or appeared in government scientific reports not widely distributed to the public, or in reference works (for example, the thousands of definitions he contributed to *The Century Dictionary*). Recent bibliographic research has identified almost all such items.² That he was a severe recluse has been a favored allegation among some students of his life and work. A look at the evidence shows this to be false, for as late as 1906, as a member, he attended meetings of the National Academy of Sciences, often presenting papers. He also published accounts of those meetings. He expressed pride in his election to the National Academy on the basis of his work in logic, which he understood broadly as the science of scientific method. Another nonreclusive theme one can detect is the amount of influence Peirce exercised upon others during his lifetime, and the amount of influence of others upon him. It is also fashionable to proclaim that Peirce's intellectual ability or output suffered because he lacked a permanent academic chair. Such a position, it is further said, would have provided him with appropriate critical feedback from students and colleagues, which he is supposed to have needed to forestall certain difficulties considered to exist in his works. Yet, by looking over his complete published output one can see that he was constantly, almost until the day he died, responding to and arguing with friends and detractors. Even more pronounced instances of mutual influence are found in his correspondence. Whether there are difficulties in his works is a matter for argumentation, not uninformed speculation.

For the most part, Peirce's manuscripts (like his publications, also voluminous) have survived and are widely available for study.³ Some scholars have described these as fragmentary. It is true that one can find a few that fit this category, but one can also find several virtually complete and unified book manuscripts or complete series of lecture notebooks. Furthermore, his system—whether expressed in a series of fragments or in complete essays—is present for examination. At the moment, in addition to holdings at Harvard, there are four other centers at which scholars are welcomed to pursue studies of these and related materials.⁴ The effort to make Peirce's writings more widely available in conveniently accessible format began in 1923 and continues today.⁵

From Peirce's vast literary production, which has been estimated to be enough to fill more than one hundred volumes,⁶ it is difficult—especially in an introductory work—to present a

representative selection of Peirce's writings within a narrow scope. That difficulty is increased by the fact that he was a systematic thinker, whose work is poorly appreciated if broken up and perused in isolated chunks. However, clues from study of Peirce's life career suggest a way to organize a set of introductory texts, and these same considerations will begin to suggest an answer to the complaint initially mentioned. In this way we can start to understand why some of his contemporaries misunderstood him, something that will help us to overcome this barrier insofar as it still affects us.

BIOGRAPHICAL SUMMARY

A genuine culture was beginning to struggle upward again in the seventies: a Peirce, a Shaler, a Marsh, a Gibbs, a Ryder, a Roehling, a Thomas Eakins, a Richardson, a Sullivan, an Adams, a LaFarge were men that any age might proudly exhibit and make use of. But the procession of American civilization divided and walked around these men.

Lewis Mumford⁷

THE FIRST and most important thing one notices by looking carefully at Peirce's total life, especially if one avoids preconceived conclusions about it, is that he was not a philosopher in the contemporary sense, but was a scientist and mathematician. You, dear reader, at this point might have experienced a voice from your inner dialogue, which said, "That can't possibly be true." If I may join your dialogue, it is clear that the key word of that statement, *philosophy*, should be explicated. If we today look back upon a figure from the past, surely we bring our own vocabulary (at least initially) to that task. So the issue amounts to a question about the meaning of the word *philosophy* in our time. It is clear that philosophy today is usually and upon first presumption considered to be a discipline within the humanities, as opposed to being a part of the sciences—let us label this sense as philosophy_H. *This* is the perspective from which most persons would judge the matter now; and, that is the sense in which the above claim states that Peirce is not a philosopher_H. One of the lessons to be gained from reading the intellectual autobiography presented below is that Peirce had concluded that philosophy is (or could easily become) a science that is embedded within a context of other sciences or presuppositions of science; it isn't even the most basic science, a position he reserved for mathematics. This simple fact has been systematically overlooked and ignored by many commentators on Peirce, who usually approach his works from the standpoint of philosophy_H. To proceed in that manner is to invite a serious misunderstanding of what he believed he had accomplished. Indeed, this simple fact is a convenient touchstone for judging the accuracy of any account of Peirce's works one might encounter. Another barrier has to do with his laboratory cast of mind; a reader who lacks experience with the inner life of a laboratory has a distinct disadvantage to overcome in understanding him.

Perhaps we could identify philosophy in Peirce's sense as philosophys. This means that he should be compared to scientific philosophers_S such as Aristotle, Bacon, Gilbert, Leibniz, Faraday, Maxwell, Clifford, Helmholtz, Heisenberg, Bohr, or Einstein—and contrasted with philosophers_H such as Plato, Ockham, Hegel, James, or F. C. S. Schiller. His boldly announced allegiance to Aristotle as scientist and distaste of the Hellenic tendency to mingle philosophy and practice⁸ are very unphilosophic_H.

It is not surprising that he would have that outlook, for he was born on September 10, 1839, into the family and extended circle of friends of Benjamin Peirce, professor of mathematics and astronomy at Harvard, an acknowledged leader among American scientists. His father, realizing the son's intellectual gifts, took charge of his early education, submitting him to strict intellectual exercises that especially emphasized rigor, detail, and long perseverance. Charles also made a study of chemistry at a tender age. His graduate degree was in chemistry (a topic which, at the time, incorporated physics), and throughout his life he often referred to himself simply as a chemist or physicist who had in effect been born in a scientific laboratory, for such was the atmosphere of his father's house and social orbit.

When about twelve years old, in his brother's room he came across a copy of Whately's *Logic*, read it, and began his lifelong fascination with that subject, understood as the scientific study of scientific method. After his undergraduate degree from Harvard in 1859, wanting direct experience with the methods of science, he entered the employ of the United States Coast Survey, then the premier government scientific agency. He spent the Civil War years on field surveys in Louisiana or working on astronomy in Cambridge with his father, the Survey's consulting geometer. In 1865, he made his academic debut with a series of lectures at Harvard entitled "On the Logic of Science."⁹ During 1867, he commenced astronomical work at the Harvard Observatory that eventually culminated in *Photometric Researches*, a pioneering attempt at mapping our galaxy, the Milky Way.¹⁰ During the early seventies he was one of the participants in the well-known Metaphysical Club, an informal but serious Cambridge discussion group consisting of Peirce, William James, O. W. Holmes, J. B. Warner, and sometimes Frank Abbot and John Fiske. In November of 1872, his father, now superintendent of the Survey, commissioned him to take charge of its pendulum experiments, by which means one could determine the relative force of gravity at various locations on the globe. With sufficient information of that kind one could more accurately determine the shape of the earth, thus permitting one to make more accurate maps, not to mention increasing knowledge of the value of the force of gravity, which is among the most important physical constants. During the seventies and early eighties, he traveled widely in the United States and in Europe, conducting gravity surveys. In the course of his research, he discovered a serious error in what was then regarded as the best pendulum work in Europe. He defended and sustained his critique at a meeting of the International Geodetic Association in Geneva in 1877. Based on this and related work, he designed the Peirce pendulum, which became the standard apparatus for this kind of research. As a result of these efforts, he became world famous as a mathematical physicist in geodesy.¹¹

As a consequence of the need in pendulum research for very accurate measurements, in 1879 he was directed by the Survey to study the possibility of using a wavelength of light as a standard for the length of the meter. This he succeeded in doing shortly thereafter in a "Report on the Spectrum Meter,"¹² tendered to the Survey. Peirce's findings on that topic later contributed to the work of Michelson and Rowland. During 1879 to 1884, while retaining his full-time position with the Survey, Peirce accepted a part-time position as lecturer in logic at the Johns Hopkins University. There he was closely associated with members of the mathematics department under J. J. Sylvester. He was abruptly dismissed from his position in Baltimore, probably because some members of the governing board of Hopkins were told he had taken up residence with Juliette Froissy (who later became his third wife) before concluding his divorce from Melusina Fay (his second wife, who had deserted him, according to their divorce decree). He returned full time to Survey work, but a number of changes had begun to take place in its policies, perhaps the most important being that its new leaders no longer insisted upon the kind of high standards Peirce brought to his physical and geodetic research. For this and other reasons, Peirce resigned from the Coast Survey in 1891, after first submitting an exhaustive summary report upon his long gravity researches.¹³ Perhaps this all too brief account of his scientific accomplishments¹⁴ helps one to understand why in 1895 Peirce remarked that "My philosophy may be described as the attempt of a physicist to make such conjecture as to the constitution of the universe as the methods of science may permit, with the aid of all that has been done by previous philosophers."¹⁵

He understood those "previous" colleagues as philosophers—in other words, theoreticians of sciences such as physics, chemistry, astronomy, or of the psychical or historical disciplines. While undertaking his astronomical, geodetic, and metrological researches, Peirce was also busily involved in helping to create modern mathematical logic. His very important role there has been ill-treated, misdescribed, or ignored, as Hilary Putnam has recently explained.¹⁶ His works in this area are well documented in the autobiography reprinted below. Indeed, his researches in formal logic (roughly that part of *Semeiotic*—or general logic—that he labeled as critic) were important contributions toward a number of contemporary developments, the most notable among which is computer science. In fact, Peirce's legacy to computing may include more than having provided

some of its software—it is also likely he contributed somewhat to hardware and to a kind of limitative thesis similar to that advanced by Turing.¹⁷

The end of his government employment meant a serious loss of income for Peirce, and he spent the nineties attempting to secure an adequate means of support for himself and his chronically ill wife Juliette. He participated in a number of money-making schemes, including projects such as the commercialization of acetylene gas or development of hydro-electrical power. More than once, some well-known businessmen cheated him of his share in such projects. His luck, which favored him in earlier days, had inexorably and irreversibly turned. On March 13, 1897, he wrote the following to his old friend, William James:

I have learned a great deal about philosophy in the last few years, because they have been very miserable and unsuccessful years—terrible beyond anything the man of ordinary experience can possibly understand or conceive. Thus, I have had a great deal of idleness & time that could not be employed in the duties of ordinary life, deprived of books, of laboratory, everything: and so there was nothing to prevent my elaborating my thoughts, and I have done a great deal of work which has cleared up and arranged my thoughts. Besides this, a new world of which I knew nothing, and of which I cannot find that anybody who has written has really known much, has been disclosed to me, the world of misery. It is absurd to say that Hugo, who has written the least foolishly about it, really knew anything of it. I would like to write a physiology of it. How many days did Hugo ever go at a time without a morsel of food or any idea where food was coming from, my case at this moment for very near three days, and yet that is the most insignificant of the experiences which go to make up misery? Much have I learned of life and of the world, throwing strong lights upon philosophy in these years. Undoubtedly its tendency is to make one value the spiritual more, but not an abstract spirituality.... On the other hand, it increases the sense of awe with which one regards Gautama Booda.¹⁸

This letter led eventually (with background assistance from James) to Peirce being invited to give a series of eight lectures about one year later at the Cambridge Conferences, a kind of auxiliary education activity conducted just off Harvard Yard. In those 1898 lectures Peirce began to set down his mature thought. Surviving correspondence also shows that the Harvard philosophy department was solidly impressed with them, especially Josiah Royce and James. Subsequent essays by both men confirm that these lectures and other works by Peirce had a lasting and profound influence upon their own research, although the Peirce/James debate is one that still continues today. Yet, still no steady employment or other source of adequate income came Peirce's way; eventually he came to spend most of his time on his homestead, Arisbe, near Milford, Pike County, Pennsylvania. He was able to continue publishing articles and book reviews, and occasionally to give other public presentations—notably his 1903 Lowell lectures,¹⁹ which followed other lectures before the Lowell Institute in 1866 and 1892.²⁰ But more important, he continued to write essays and even complete whole books, for which he could find no publisher, yet which have survived and will appear in due time.

Around 1910 full-time misery once again sought him out. He contracted cancer, possibly as a result of being exposed to radiation at the April 1904 National Academy of Science meeting, where "Professor Barker... showed one specimen of a salt of uranium... [that] shone so brightly as to be visible all over the darkened... hall."²¹ As the disease reached its terminus, he often asked for pen and paper, writing eventually having become the only way available to him of bearing his pain. At about ten o'clock on the morning of April 19, 1914, he died in the arms of a concerned young neighbor lad who had come to offer assistance.²²

A SYSTEM OF SCIENCE

Mr. Charles Peirce has now been for many years the principal representative in this country of a type of investigation in Logic which seems to me, as a student of the subject, to be of very great importance. The general nature of this importance I can best indicate by saying that the study of the methods of science and the comparative study of the types of concepts which have been developed in the various sciences, seem to be at present matters of great theoretical and practical significance.

Josiah Royce²³

PEIRCE'S SYSTEM is not a system of philosophy, but is a system of science, the organizing principle of which is method.

I have now sketched my doctrine of Logical Critic, skipping a good deal. I recognize two other parts of Logic. One which may be called *Analytic* examines the nature of thought, not psychologically, but simply to define what it is to doubt, to believe, to learn, etc., and then to base critic on these definitions is my real method, though in this letter I have taken the third branch of logic *Methodetic*, which shows how to conduct an inquiry. This is what the greater part of my life has been devoted to, though I base it upon Critic.²⁴

Peirce's intellectual career is in effect a lifelong search for a correct account of the nature and function of methods that permit the discovery of truth by those that have the will and capacity to learn from experience, a personality type he designated as scientific intelligence. Moreover, the method whereby Peirce conducted this lifelong effort was itself science, aided by a powerful historical consciousness by means of which he sought in the history of science lessons for his own project. He concluded that scientific intelligences do not begin their activities in an intellectual vacuum—there are presuppositions of science and scientific method. Basically these fall into two large classes: religion and common sense. Peirce distinguished sharply between religion and theory of religion (or theology). Roughly, the difference is parallel to that between someone like Gautama and someone who equates religion to following a creed or living according to a mechanical recipe (the kind of orthodoxy that the early pragmatist Jesus spent his career disclaiming). One might say that Gautama or Jesus acted, without thinking or theory or premeditated recipe, in good ways because their instincts were good. What disturbed Peirce about theology was that it proposed to give mankind a stone when bread was needed—the stone of theory, which is not right instinct (which would be the bread of religion on his approach). Within metaphysics he admitted theorizing about religion, but always insisted that such metaphysics could influence true religion only by a slow, almost evolutionary process of percolation. Scientific activity is based upon religion, no matter if the particular scientific intelligence is aware of it or not, because the ideals of that method presuppose a search for the truth about a reality not yet known. The influence of Boole is strong here, in a way not yet fully studied.²⁵

Common sense is that set of instinctive beliefs that all normal human beings do not doubt. Peirce considered that these were the result of evolutionary process over millenia. Like religion, such original beliefs are not theory and, again like religion, there is a place in his system for theorizing about them (critic, under critical common-sensism), but again one should not take the theory in place of the fact of the presence and current nature of such beliefs in all humans. These themes bear a strong resemblance to those pursued by Wittgenstein in *On Certainty*.

The system proper begins with mathematics. This is the fundament of his entire intellectual effort. A good way of accurately describing Peirce's career would be to say that he was a student of the method of mathematics in all its ramifications. He regarded mathematics as diagrammatic thinking.²⁶ His treatment of diagrams in this sense arose from his study of researchers such as Helmholtz and Listing. Again and again, the general notion of diagram appeared throughout his system, and it, along with his concept of mathematics, is a central unifying theme. His treatment of method in mathematics makes abduction (guessing),

observation, and experiment basic there, a stance that is in sharp contrast to the deductivism of today.

His sub-science of philosophy, which in the system of science is labeled as cenoscopy, is thoroughly based upon his studies of mathematics. A mythical conception of Peirce can be developed if this important fact is discounted.²⁷ The first and perhaps most important application of mathematics comes in phaneroscopy. There Peirce applied the results of his studies of the mathematical graph theory of Euler, Kempe, Clifford, and Listing.²⁸ These results led him to a fundamental doctrine, which he called cenopythagoreanism: namely, that the classification of basic concepts should be according to their external valency. That notion, taken directly from graph theory within nineteenth-century topology, became the basis for phaneroscopy and the existential graph approach to logic.

Now functioning under the control of results based upon the cenopythagorean principle, Peirce continued to work out the additional branches of his system. He argued that logic was the third of the normative sciences, preceded there by aesthetics and ethics. Again by operating under the inspiration of mathematics, he explicated the several branches of logic (or semeiotic). There is a contemporary study, called semiotics, that proposes to trace its history to Peirce, but his semeiotic (logic) is radically different from this phenomenon. Within semeiotic, Peirce included branches for basic definitions (which he called stecheotic), formal logic (roughly what he designated as critic), and methodology. Perhaps critic is the most difficult to anthologize, for it is principally technical formal logic, the aim of which is to analyze reasoning instead of aiming to create a calculus for reasoning.²⁹ Methodology, of course, was his ultimate destination, and all that preceded it within the system contributed toward its final explication. The most well-known of Peirce's doctrines, pragmatism,³⁰ is a theorem of methodeutic—he often remarked that pragmatism amounted to little more than a description of a typical (generalized) laboratory experimenter's procedure.³¹ After thus securing a methodological base, and only then, did Peirce consider it possible scientifically to undertake first philosophy in the central sense, the problems of metaphysics, in Aristotle's sense of "first science." Thus, Peirce's Copernican revolution is to make metaphysical philosophy depend upon science, which he understood as reliable methods for seeking truth in all areas of study. That is in opposition to the usual image in which metaphysical philosophy is considered to be prior to science. In these matters he was a pioneering developer of method for interdisciplinary research.

ONE HUNDRED FIFTY YEARS LATER

He is in the very front rank of American thinkers (I, for example, owe more to his writings than to those of anyone but Royce) and his Logic when published will unquestionably (in spite of certain probable obvious oddities) be recognized all over the world as an epoch-making work.

William James³²

FIVE YEARS after George Orwell's apocalypse, the one-hundred-fiftieth anniversary of Peirce's birth was celebrated. When recalling that occasion it is appropriate to ask whether and in what ways Peirce's contributions to mankind have been helpful, or will continue to be helpful, as he thought they would be. This is a large subject and, like other subjects taken up in this introduction, can only be considered briefly. The first contribution is displayed in the fact that Peirce's development of *pragmatism* (which in his mature period, he preferred to label *pragmaticism*) has deeply influenced a great many thinkers in various fields of research. Judgments by James and Royce about Peirce's importance have appeared above; let us add a sample remark from one more—Dewey:

The readers who are acquainted with the logical writings of Peirce will note my great indebtedness to him in the general position taken. As far as I am aware, he was the first writer on logic to make inquiry and its methods the primary and ultimate source of logical subject-matter.³³

But today Peirce's influence is international, not limited by regional boundaries. Neither is it limited to mathematics, natural sciences, or philosophy: for instance, the psychiatrist and novelist Walker Percy³⁴ stated, "I... suspect that the state of the behavioral sciences vis-a-vis language is currently in such low spirits, not to say default, that Peirce's time may have come." Perhaps a similar remark is in order for biology, literary criticism, and art.³⁵

One reason for this is the fact that his works address problems with which we still wrestle. Of course, the writings of all thinkers of quality possess this property to some extent, but Peirce's output has it more strongly. Probably this is because he was ahead of his time, this being yet another of the barriers to his works, one that is slowly falling away. There is space to exemplify but one such problem to which his findings may indicate progress, once his genuine conclusions are better known.

At the International Congress of Mathematicians in 1900, David Hilbert presented a challenging series of questions, the twenty-third of which asked if there was a mechanical way (a precise finite determinate algorithm) that would decisively establish the truth or falsity of any statement within the predicate calculus³⁶—a calculus, by the way that Peirce had helped to develop. In 1936, A. M. Turing showed³⁷ that if a mechanical algorithm was assumed, then on the most reasonable meaning of "mechanical," the answer to Hilbert's question was *no*. Turing's method was classically Peircean. First, he asked for the meaning of "mechanical," which he produced using the technique Peirce had called pragmatism and had introduced as the pragmatic maxim in the Metaphysical Club early in the eighteen-seventies in Cambridge, the very technique that had inspired James, Royce, Dewey, and a host of others. The result of Turing's application of pragmatism (he did not call it that, and may never have known of Peirce) was later named a Turing Machine. Basically, a Turing Machine is not an actual machine at all (yet its principles can be instantiated in actual machines), but instead is a way of constructing a kind of general diagram in which later states of modification of the diagram are completely determined or caused by previous states. Thus, it is a machine in the requisite sense: namely, that its rules must function to cause it to change its states (change the marks in its diagram) deterministically as opposed to nondeterministically. That is to say, there is no provision in the "machine" for creating, experimenting, or serendipity. Turing was able to show that if "mechanical algorithm" is what one means by the method of mathematics, then that pragmatically implies that there are items such a method cannot produce. Yet these are items (theorems, computations) that human mathematicians *can* produce through an exercise of their nondeterministic ingenuity, creativity, experimentation, and observation—processes Peirce called abduction, induction, and deduction (his general semeiotic or logic of science, in other words). It is likely that Turing's results are very similar to Peirce's results, except expressed in an alternative but equivalent language (or notation if you will). Peirce took the positive mode and said that mathematics is an experimental, observational, hypothesis-seeking and hypothesis-confirming science, just as all other sciences are, the only difference being that mathematics proceeds with operations upon written or mental diagrams, where "diagram" includes figures as well as algebras, or even words. Turing, who took the negative mode, coming from an opposite direction, began by assuming that algorithmic mathematical method was mechanical and, by using pragmatism and experiments with diagrams, showed that such an assumption was absurd, thus establishing that mathematical method as a whole could not be strictly mechanical. The results achieved by both Peirce and Turing amount to approximately the same thing, and that it would profit us immensely now to return to Peirce's more elaborate and interconnected system of science to pursue further details and ramifications of this matter. There are several other major contemporary issues, ranging from the arts to physics, to which the same assertion could be accurately applied.

A NOTE ON TEXTUAL SOURCES, AND AN OUTLINE OF PEIRCE'S SYSTEM OF SCIENCE

I have seen a good deal of Charles. S. Peirce, because he has worked for me in my mathematical library, and he is a genius, if there ever was one.

George A. Plimpton³⁸

ALL OF the writings of Peirce included here have been prepared either from original places of publication or from the annotated xerographic copy of the Harvard Peirce papers housed at the Institute for Studies in Pragmaticism at Texas Tech University. Their publication here is by permission of the Department of Philosophy at Harvard University. Extensive references to Peirce's works have been inserted within the "Brief Intellectual Autobiography" in the hope that scholars who want to follow his intellectual career with Peirce himself as a guide will thereby be facilitated. Such insertions (throughout the selections below) are indicated with braces: { }. Editorial emendations to Peirce's papers, to indicate such things as an obviously dropped word or punctuation, are enclosed in brackets: []. Peirce's punctuation, terminology, and spelling have been retained in almost all cases. Nineteenth-century authors were allowed more variation in the latter than is tolerated today. Titles of the selections in almost all cases have been composed by the editor, but by using terminology Peirce favored and in the sequence of his classification of the sciences. Naturally, in order to compress selections for this project, it has been necessary to break up otherwise whole essays. Readers are encouraged to seek the full contexts for further study.³⁹ Maybe the obvious disadvantage (incompleteness) of this method of presentation will be overshadowed by its advantage, namely, that themes of Peirce's mature writings are presented according to his own scheme of organization, with an introduction that is his intellectual autobiography.

Here is an outline of the selections of Peirce's writings presented in this volume. It is crucial for readers to approach the selections in the order of this system of organization.

- I. A Brief Intellectual Autobiography
- II. Two Influential Early Essays
 - A. Some Consequences of Four Incapacities (Peirce's anti-Cartesianism)
 - B. How to Make Our Ideas Clear (Introduction of the Pragmatic Maxim)
- III. A System of Science
 - A. The Presuppositions of Science: Religion and Common Sense
 - B. The Nature of Science
 - C. Mathematics: The First Science
 - D. Cenoscopy (Theoretical Science without special instruments)
 1. Phaneroscopy
 2. Normative Sciences
 - a. Esthetics (as Purpose or Ideal)
 - b. Ethics (as Self-Control)
 - c. Logic as Semeiotic (The Theory of Semeiosis or Sign Action)
 - i. Stecheotic (Basic Terminology)
 - ii. Critic (Theory of Argumentation)
 - iii. Methodeutic (Methodology)
 3. Metaphysics
- IV. Idioscopy (Instrumented Sciences employing resources given above).

Kenneth Laine Ketner
Lubbock, Texas
<https://www.kenketner.net/>

NOTES

1. *Saturday Review*, December 13, 1975.

2. Peirce's enormous lifetime publication record is given in *A Comprehensive Bibliography of the Published Works of Charles Sanders Peirce*, available on the internet at <https://www.depts.ttu.edu/pragmaticism/> (includes downloadable versions of the *Comprehensive Bibliography* and most of the publications). This bibliography was also published in hardback (2nd revised edition), edited by K. L. Ketner (Bowling Green: Philosophy Documentation Center, 1986). Within that bibliography, works by Peirce are assigned numbers that will often be used here in references, or to suggest items for additional study (thus, P 373 refers to the definitions he wrote for the *Century Dictionary*). For some reason, in many essays that discuss Peirce with any detail, there is an almost mechanical claim that Peirce published only one book, *Photometric Researches* (P 118). That is disconfirmed by even a cursory glance through *Comprehensive Bibliography*, some early counterexamples being P 18, 102, or 161.

3. The great bulk of surviving Peirce manuscripts are in the care of the Department of Philosophy at Harvard University, and are listed (with synopses) in R. S. Robin, *Annotated Catalogue of the Papers of Charles S. Peirce* (Amherst: University of Massachusetts Press, 1967), as supplemented by "The Peirce Papers: A Supplementary Catalogue," by R. S. Robin, *Transactions of the Charles S. Peirce Society* 7 (1971): 37-57. Traditional reference forms for these materials are MS (and sometimes L, for letters) followed by a number assigned by Robin. Microfilms of these manuscripts and of Peirce's professional correspondence have been prepared and may be purchased from the Harvard University Photographic Service.

4. Institute for Studies in Pragmaticism at Texas Tech University; Peirce Edition Project at University of Indiana at Indianapolis; Institut de Recherche en Sciences de la Communication et de l'Education Universitaire de Perpignan; and Philosophisches Seminar Universitaet Hamburg.

5. Morris Cohen's anthology, *Chance, Love, and Logic* (New York: Harcourt, Brace and Company), appeared in 1923. A much wider undertaking was *The Collected Papers of Charles Sanders Peirce*, an eight-volume set edited by C. Hartshorne and P. Weiss (Vol. 1-6) and A. Burks (Vol. 7-8) (Cambridge, Mass.: Harvard University Press, 1931, 1958). That edition will continue to be valuable for some time, yet its editorial policy of breaking up or rearranging otherwise whole and unified texts may be one source of the false opinion that Peirce was a fragmented or disjointed thinker. Thus, for example, the *Collected Papers* presents the following (Vol. 2, p. 2): "All that you can find in print of my work on logic are simply scattered outcroppings here and there of a rich vein which remains unpublished. Most of it I suppose has been written down; but no human being could ever put together the fragments. I could not myself do so." Peirce, however, continued (although Hartshorne and Weiss did not!): "I could only do it in five or six years of hard work devoted to that alone. Since I am now 63 years old and since all this is matter calculated to make a difference in man's future intellectual development, I can only say that if the *genus homo* is so foolish as not to set me at the task, I shall lean back in my chair and take my ease. I have done a great work wholly without any kind of aid, and now I am willing to undergo the last great effort which must finish me up in order to give men the benefit of what I have done" (published in Eisele, *New Elements*, Vol. 4, p. 162, see below).

The majority of Peirce's extensive (mostly unsigned) book reviews are collected in *Charles Sanders Peirce: Contributions to The Nation*, 3 vols., ed. K. L. Ketner and J. E. Cook (Lubbock: Texas Tech University Press, 1975-1979). His important correspondence with Victoria Lady Welby is published in C. S. Hardwick, ed., *Semiotic and Signifies* (Bloomington: Indiana University Press, 1977). Peirce's extensive works within mathematics have been gathered in five books as *The New Elements of Mathematics*, ed. C. Eisele (The Hague: Mouton, 1976). Presently a new critical edition of Peirce's work, based on a chronological plan, is being prepared as *Writings of Charles S. Peirce*, ed. M. H. Fisch et al. (Bloomington: Indiana University Press, 1982-). Peirce's important contributions to the history of science have been presented in C. Eisele, ed., *Historical Perspectives on Peirce's Logic of Science: A History of Science* (Berlin: DeGruyter, 1985).

6. *Writings of Peirce*, Vol. 1, p. xi.

7. *The Golden Day: A Study in American Literature and Culture* (Boston: Beacon Press, 1953).

8. *The Collected Papers*, Vol. 1, pars. 616-619.

9. This set of lectures has been reconstructed from manuscript in *Writings of Peirce*, Vol. 1.

10. Victor Lenzen, "Charles S. Peirce as Astronomer," in E. Moore and R. Robin, eds., *Studies in the Philosophy of Charles S. Peirce* (Amherst: University of Massachusetts Press, 1964), pp. 33-50.

11. Victor Lenzen, "Charles S. Peirce as Mathematical Geodesist," *Transactions of the Charles S. Peirce Society* 8 (1972): 90-105.

12. MSS 1072-75.

13. Victor Lenzen, "An Unpublished Scientific Monograph by C. S. Peirce," *Transactions of the Charles S. Peirce Society* 5 (1969): 5-24.

14. For additional details, see: Carolyn Eisele, *Studies in the Scientific and Mathematical Philosophy of Charles S. Peirce*, ed. R. M. Martin (The Hague: Mouton, 1979).

15. MS 867. See also Victor Lenzen, "Charles S. Peirce as a Mathematical Physicist," *Transactions of the Charles S. Peirce Society* 11 (1975): 159-166.

16. Hilary Putnam, "Peirce the Logician," *Historia Mathematica* 9 (1982): 290-301.

17. Kenneth Laine Ketner, "The Early History of Computer Design: Charles Sanders Peirce and Marquand's Logical Machines," *The Princeton University Library Chronicle* 45 (1984): 186-224.

18. Peirce to James, William James papers, Houghton Library, Harvard University, published by permission of

- Harvard University.
19. *Comprehensive Bibliography*, P 1005.
 20. *Ibid.*, P 17 and P 471.
 21. *Charles Sanders Peirce: Contributions to The Nation*, Vol. 3, p. 165.
 22. Victor Lenzen, "Reminiscences of a Mission to Milford," *Transactions of the Charles S. Peirce Society* 1 (1965): 3-11.
 23. *MS L 75c*, 1902.
 24. *New Elements of Mathematics*. Vol. 3, p. 207.
 25. *Contributions to The Nation*, Vol. 3, pp. 197-199, 206-208.
 26. Kenneth Laine Ketner, "Peirce on Diagrammatic Thought," in K. Oehler, ed., *Zeichen und Realität* (Tübingen: Stauffenburg Verlag), pp. 305-319.
 27. Kenneth Laine Ketner, "Who was Charles Sanders Peirce?" *Krisis* 1 (1983): 10-18.
 28. Compare *MS 482* or *Collected Papers*, Vol. 4 pars. 350f., although in the latter the editors got the diagrams mixed up—compare *MS 479*.
 29. For a good selection of papers on critic, see *Collected Papers*, Vol. 3.
 30. Originally Peirce had used "pragmatism" to identify this doctrine, but shortly after the turn of the century, he announced that he wished his own approach to be known as "pragmaticism," a word (he said) that was ugly enough to be safe from kidnappers—see *Collected Papers*, Vol. 5, par. 414. Peirce held very strict views on terminology in all sciences, including philosophy: see Kenneth Laine Ketner, "Peirce's Ethics of Terminology," *Transactions of the Charles S. Peirce Society* 17 (1981): 327-347.
 31. Compare *Comprehensive Bibliography*, P 1078, *MSS* 320, 322, and *L 427*.
 32. *MS L 75c*, 1902.
 33. John Dewey, *Logic, The Theory of Inquiry* (New York: Henry Holt, 1938), p. 9n.
 34. Walker Percy, *The Message in the Bottle: How Queer Man Is, How Queer Language Is, and What One Has to Do With the Other* (New York: Farrar, Strauss, & Giroux, 1975), p. 159.
 35. See: Joel Weinsheimer, "The Realism of C. S. Peirce, or How Homer and Nature Can Be the Same," *American Journal of Semiotics* 2 (1983): 225-264; Frances Williams Scott, "Process from the Peircean Point of View: Some Applications to Art," *American Journal of Semiotics* 2 (1983): 157-174.
 36. J. E. Hopcroft, "Turing Machines," *Scientific American* 250 (1984): 86f.
 37. "On Computable Numbers, with an Application to the Entscheidungsproblem," *Proceedings of the London Mathematical Society* 42 (1937): 230-265. For a fascinating biography of Turing (including a non-technical discussion of Turing machines), see Andrew Hodges, *Alan Turing: The Enigma* (New York: Simon and Schuster, 1983).
 38. *MS L 75c*, 1902.
 39. See *Suggestions for Further Reading*; pp. 91-92 below. Works about Peirce are also listed in *Comprehensive Bibliography*, and an update of the large secondary literature is given in C. J. W. Kloesel, "Bibliography of Charles Peirce, 1976 through 1980," *The Monist* 65 (1982): 246-276 (reissued in E. Freeman, ed., *The Relevance of Peirce* [LaSalle: Open Court, 1983]).
- The following are also highly recommended: H. G. Herzberger, "Peirce's Remarkable Theorem," in L. Sumner, J. Slater, and F. Wilson, eds., *Pragmatism and Purpose* (Toronto: University of Toronto Press, 1981), pp. 41-58; K. Oehler, section on Peirce in *Die Welt als Zeichen* (Berlin: Severin und Siedler, 1981); *Peirce Studies* 1, "Studies in Peirce's Semiotic" (Bloomington: Indiana University Press, 1979); *Peirce Studies* 2, "Peirce's Conception of God: A Developmental Study," by D. M. Orange (Bloomington: Indiana University Press, 1984); Josiah Royce, *The Problem of Christianity*, ed. of 1968, ed. J. E. Smith (Chicago: University of Chicago Press, 1913), esp. pp. 275f.; David Savan, "The Unity of Peirce's Thought," in *Pragmatism and Purpose*, pp. 3-14; Thomas A. Sebeok and Jean Umiker-Sebeok, *You Know My Method: A Juxtaposition of Charles S. Peirce and Sherlock Holmes* (Bloomington: Gaslight Publications, 1980).

CHARLES SANDERS PEIRCE
MAN OF SCIENCE

A SELF-INTRODUCTION

A BRIEF INTELLECTUAL AUTOBIOGRAPHY

[From *MS L 107*, 1904.]

CHARLES Santiago Sanders Peirce¹ (b. 1839), son of the mathematician Benjamin P., brought up in a circle of physicists and naturalists, and specially educated as a chemist, derived his first introduction to philosophy from the K.d.r.V. and other celebrated German works, and only later made acquaintance with English, Greek, and Scholastic philosophy. Accepting unreservedly Kant's opinion that the metaphysical conceptions are merely the logical conceptions differently applied, he inferred that logic ought to be studied in the spirit of the exact sciences, and regarded Kant's table of Functions of Judgment as culpably superficial. He also thought that Kant's reply to the question how are synthetical judgments *a posteriori* possible was altogether insufficient, and that an exact inquiry into it would probably throw some light upon judgments *a priori*. Appointed in 1864 Lecturer on Logic {P 16} in Harvard University, he divided all reasoning into, 1st, the deductive, including all necessary inference together with all probable inference to which the calculus of probabilities is properly applicable (rejecting inverse probabilities not founded on positive information), 2nd, the inductive, including all experimental testing of hypotheses (for he considers a physical experiment to be in a general sense of the same nature as a geometrical reasoning, which is performed by internal experimentation) but excluding, 3rd, the "abductive," or the process of forming and accepting on probation, a hypothesis by which to explain surprising facts. He put forth a "critic," or mathematical deduction of the validity of these modes of reasoning, founded upon the principle that nothing is subject to logical (any more than to ethical) criticism except so far as it is subject to self-control. What one does not in the least doubt one should not pretend to doubt; but a man should train himself to doubt. His account of validity of induction is that its premisses do not lend the slightest probability to its conclusion, but that we are justified in provisionally accepting the conclusion by the postulate that any error in that conclusion will ultimately be corrected by the further application of the same method. This postulate will only be true if the inductive conclusion be understood to be limited to a "possible experience" (a Kantian conception modified) of future similar experiments. But he already held it to be impossible to conceive anything otherwise than as an object of possible experience, and that of the kind that "experiment," or purposive arrangement of conditions, may bring; and in 1877, in two articles in the *Revue philosophique* {P 129, 162}, he put forth the doctrine he called *Pragmatism*, namely, that every concept (as distinguished from a generalized sensation, such as 'red') is equivalent to a conditional purpose, should one have certain desires and certain types of experience, to act in a certain general way. In 1867, he published in the *Proceedings of the American Academy of Arts and Sciences* of Boston, five papers {P 30-34} in which he professed to limit himself to incontrovertible assertions. In one of these, "On the Classification of Arguments" {P 31} (partly repeating a paper he had distributed {P 18} the year before) he undertook to reduce all inference to *substitution* (an idea adopted afterwards by Taine and Jevons) without, however, maintaining that substitution was an elementary operation; and indeed he subsequently showed that the substitution of B for A is never logically justified unless it be justifiable first to insert B and unless it be subsequently justifiable to omit A. This paper also studied the relation between particular judgments and negative judgments. Another of the papers of 1867 proposed a new list of categories {P 32}, which will be given below.

In 1868² he contributed three papers {P 26, 27, 41} to W. T. Harris's *Journal of Speculative Philosophy* in which he endeavored to prove and to trace the consequences of certain propositions in epistemology tending toward the recognition of the reality of continuity and of generality and going to show the absurdity of individualism and of egoism. In 1870, he published, in the *Memoirs of the American Academy of Arts and Sciences*, an extension of the Boolean algebra of logic {P 52} to render it applicable to the logic of relations, and developed this branch of logic somewhat further than DeMorgan had done. Especially he demonstrated that all relations between four or more correlates are reducible to compounds of triadic relations, while triadic relations can never be defined in terms of dyadic relations exclusively. In the *North American Review* for October 1871, in a review of Frazer's edition of Berkeley's Works {P 60}, he argued in favor of Scotistic realism.

In 1877-8 he published a series of articles in the *Popular Science Monthly* {P 107, 119-123} (two of them appeared also in the *Revue Philosophique* {P 129, 162}) in which he enounced the principle he called *pragmatism*, that is, that every concept (in contrast to qualities of feeling, images, experiences, etc.) is definable in terms of a possible purpose of conduct under hypothetical general conditions, and that from this can be deduced the best rule for rendering ideas clear, namely, "Consider what effects that *might conceivably* have practical bearings we conceive the object of our conception to have; then, our concept of those effects *is* the *whole* concept in question." But since P not only admits the difference between a commensurable and an incommensurable length, but has specially insisted upon abnumerable (*abzählbar*) multitudes (this had better be translated *Menge* though incorrectly, because students of philosophy would not know the correct term *Mächtigkeit*) it is evident that he understands "conceivably practical bearings" in a peculiarly wide sense. In the same articles he discussed the "uniformity of nature" {P 122} and undertook to demonstrate that while it afforded opportunities for inductive reasonings, it does not constitute the general ground of validity of such reasonings. He also argued that as a fact there appears to be as little orderliness in the universe {P 122} as we can conceive that a universe should have, and further that the degrees of orderliness of the universe is relative to the mind that contemplates it, consisting merely in the breadth (*Umfang*) of that mind's interests. In 1880-3, while lecturing on logic in the Johns Hopkins University, he developed in several papers in the *American Journal of Mathematics*, a theory of necessary reasoning {P 167}, a paper on the logic of number {P 187} in which he distinguished between finite and infinite collections in substantially the same way that Dedekind did six years later, and by means of the conception of correspondence, which is Gauss's conception of the *Abbild* (employed also by P in his *Quincuncial Projection of the Spheroid* {P 135, also 183} of 1879), he deduced the validity of the Fermatian inference {also P 187} (sometimes unsuitably termed mathematical induction). He also produced a general algebra of logic {P 296} in which subscript letters are attached to letters on the line signifying relations, these subscripts indicating individual correlates, while the letters Σ and Π with the same subscripts show whether the individuals are to be selected universally or existentially, that is, by the interpreter of the proposition or by the utterer of it. He further produced an algebra of dyadic relations {P 268} to which the third volume of Schröder's *Algebra der Logik* {O 435(I), O 468(II), O 610(III)} is devoted; but P is not so entirely satisfied with that method as Schröder was. {cf. P 620, 637, 627, 449} He also distributed a brochure entitled *A Brief Description of the Algebra of Relatives* {P 220}. Closely connected with this is his edition of his father's book called *Linear Associative Algebra*.³ To a volume of papers by his students entitled *Studies in Logic* {P 268} (Boston, 1883), some of them contributions of prime importance, he contributed a note on the algebra of dyadic relations, and a discussion of the validity and rules of scientific induction. He rests this wholly on the principles of the calculus of probabilities, yet denies that the inductive argument lends the slightest probability to the conclusion, and refutes the principle of inverse probabilities as applied by Laplace without statistical information. He makes the justification of induction to consist in the fact that if the conclusion is erroneous, the same method, persisted in further, will bring a correction of it. In 1884, he presented to the United States National Academy of Sciences, a memoir {P 303} in collaboration with his student, J. Jastrow, describing experiments which show that there is no Differenz-Schwelle in sensation, or that if there be it is almost incredibly small. The philosophical interest of this consists in part in its bearing upon *Synechism*, or the principle of universal continuity, which does not mean that there is no discontinuity, which is involved in all existence. It was also shown by these experiments that a perception might be so slight (*petite*, Leibniz), that the greatest effort of attention under the most exceptionally favorable circumstances would fail to make the subject aware of it, so that he could answer the question which of two alternative characters it had, and yet if the subject was required to answer at random, in 60 percent of the cases his answer agreed with the objective fact. Upon this phenomenon, P, in 1887, in a communication {P 352} to the American Society for Psychical Research, based an attack upon the book called *Phantasms of the Living*, and was drawn into a considerable controversy with Mr. E. W. Gurney, which is printed in the *Proceedings* of that Society {O 353, P 354, O 381, also P 640}. The same year he contributed a paper {P 347-8} on the evidences of immortality

to the volume *Science and Immortality*, Edited by S. J. Barrows, Boston: 1887, in which he expressed the opinion that current views of cosmology, especially those of Spencer, were unsound in being too thoroughly mechanical. {cf. P 474, 525} But he thought there was no extant evidence for immortality unless the catholic miracles be admitted to be such. In 1891-3, in *The Monist* {P 439, 474, 477, 480, 521, 525}, he outlined a hypothesis capable of being subjected to inductive tests, which hypothesis, called *tychism*, was that the laws of nature, although real, are results of a process of evolution, and as such are not yet and never will be exactly fulfilled by the facts, which depart from the laws in the same way, although vastly less than, observations do. He had intended to complete this series of papers by one or more concerning *Synechism*, but was not encouraged to do so. In 1896 in two articles {P 620, 637} in *The Monist* reviewing Schroeder's *Algebra der Logik*, he described a logical method called *entitative graphs*, using diagrams instead of algebraic symbols. He also considered the foundations of the logico-mathematical doctrine of multitude, the so-called "cardinal numbers" of G. Cantor, and proved that every multitude is exceeded by another multitude and that the infinite multitudes form a single simple *wohl-geordnet* series, or as he would say in English, a simple Cantorian series. Beyond that series the individual members of collections lose their separate identities in consequence of becoming essentially indefinite, and the multitude passes into continuity. In 1901 in a review {P 802} of the first three chapters of Pearson's *Grammar of Science*, in the *Popular Science Monthly*, P argued for the reality of natural law and against the doctrine that we reason from "first impressions of sense." In 1903, in connection with a course of lectures {P 1005} on Logic before the Lowell Institute in Boston, he wrote a *Syllabus of Logic*, {MS 478; P 1035} but it was only in part printed owing to the small fund for the purpose. In the same year he gave a course of lectures {P 1004} in Harvard University on *Pragmatism*. In 1905 he expects to publish one article (and hopes that more may be accepted) in *The Monist* on Pragmatism. {More were published: P 1077-80, 1124, 1126, 1128, 1171, 1193.} P wrote all the philosophical definitions in *The Century Dictionary* {P 373}, and some of these relating to logic in Baldwin's *Dictionary* {P 761-78, 806-970}.

Although Peirce is much given to raising doubts about his own philosophy, yet the alterations it has undergone since 1866, except for the introduction of the problematical tychism and a few minor corrections (of which the most important relate to the precise nature, definitions, and grounds of validity of induction and abduction), and an increasing insistence on the exclusion of psychological premisses from logic, consist in the extension of his inquiries to new problems and the greater fullness of his positions. In order to understand his doctrine, which has little in common with those of modern schools, it is necessary to know, first of all, how he classifies the sciences. He divides all science into Science of Research, Science of Review (comprising such works as those of Comte and Spencer, and the doctrine of the classification of the sciences itself), and Practical Science. That of the third branch, though elaborately worked out, need not detain us; and that of the second has not engaged his attention. The classification of Science of Research is shown in outline in the following scheme.

MATHEMATICS
 PHILOSOPHY {Coenoscopy (Bentham)}
 Phenomenology, or Ideoscopy {Phaneroscopy}
 Normative Science
 Esthetics
 Ethics
 Logic {Semeiotic}
 Speculative Grammar {Stechiotic}
 Critic
 Methodeutic {Speculative Rhetoric}
 Metaphysics
 IDIOSCOPY (Bentham), or SPECIAL SCIENCE
 Physics
 Nomological Physics, i.e. Physical Geometry, Dynamics, General Physics, etc.
 Classificatory Physics, Chemistry, Crystallography, Biology, etc.
 Descriptive Physics, Geognosy, Astronomy, etc.
 Psychics

Nomological Psychics, i.e. General Psychology, Psychical Chronometry, etc.
Classificatory Psychics, Special Psychology, Linguistics, Ethnology, etc.
Descriptive Psychics, History, Criticism, etc.

This classification (which has been worked out in minute detail) is to be regarded as simply Comte's classification, corrected. That is to say, the endeavor has been so to arrange the scheme that each science ought to make appeal, for its *general principles*, exclusively to the sciences placed above it, while for instances and special facts, it will find the sciences below it more serviceable. Mathematics merely traces out the consequences of hypotheses without caring whether they correspond to anything real or not. It is purely deductive, and all necessary inference is mathematics, pure or applied. Its hypotheses are suggested by any of the other sciences, but its assumption of them is not a scientific act. Philosophy merely analyzes the experience common to all men. The truth of this experience is not an object of any science because it cannot really be doubted. All so-called 'logical' analysis, which is the method of philosophy, ought to be regarded as philosophy, pure or applied. Idiocracy is occupied with the discovery and examination of phenomena, aided by mathematics and philosophy. It is extremely doubtful which of its two wings should be placed first. The three main branches of philosophy are distinguished as follows. Phenomenology considers the phenomenon in general, whatever comes before the mind in any way, and without caring whether it be fact or fiction, discovers and describes the elements which will invariably be present in it, that is, the categories. Normative science considers the phenomenon only so far as it can be controlled, compares purpose with performance, and ascertains the general principles of the relation between them. Metaphysics is still more special only considering the phenomenon in so far as it is a sign of what is real. [The first of] the three branches of normative science, or the science of the phenomenon in so far as it is controllable, philosophical esthetics (which becomes something very different from the study which the noun usually designates) [.] studies the characters which will belong to the phenomenon so far as it is controllable, that is, the characters of what is aimed at. Thus, the question, What is the *summum bonum*, is regarded as an esthetical question. If pleasure be defined as that quality of feeling which is common and peculiar to all experiences that we desire, P is inclined to deny that there is any such thing as pleasure, and to think that that which is common and peculiar to such experiences is an intellectual character, the realization of the ideal, or reasonableness. Ethics studies in the controllable phenomenon the act and process of controlling it. This study is the very heart of normative science, and emphasizes more strongly than the others that dichotomy which is the constitutive characteristic of normative science. For it is the study of the controlled and the uncontrolled as they appear in effort and resistance. This abstract ethics which can derive no principle from metaphysics or from psychology can plainly have little in common with ordinary ethics. Logic is of a much more special kind for it studies the relation of the phenomenon to the essential character of the phenomenon as controllable, that is, its reasonableness, or embodying an idea. That which embodies an idea is a sign, and it is best to make logic the science of the general properties of signs. Since P maintains that every thought, percept, image, feeling, etc. is a sign[,] ordinary logic, so far as it can be separated from metaphysics and psychology will be included in the abstract logic. Finally, under the head of metaphysics will be included, not merely ontology, but also whatever philosophy can determine respecting causation, the freedom of the will, the connection of mind and matter, optimism or pessimism, immortality, theology, time and space, etc.

Peirce's studies of philosophy have mostly been concerned with phenomenology,⁴ logic, and some parts of metaphysics. In phenomenology, he is of opinion that there are two sets of categories, a long list and a short one; and he admits that there may possibly be still others.

Though he devoted two years to the study of the long list, he attained no satisfactory results. The shorter list is called by [the] easily remembered designation of the *cenopythagorean categories*. These are *Firstness*, *Secondness*, and *Thirdness*. *Firstness* is the mode or element of being by which any subject is such as it is, *positively* and regardless of everything else; or rather, the category is not bound down to this particular conception but is the element which is characteristic and peculiar in this definition and is a prominent ingredient in the ideas of quality, qualitiveness, absoluteness, originality, variety, chance, possibility, form, essence, feeling, etc. *Secondness* is that mode or element of being by which any subject is such as it is in a second subject regardless of any third; or rather, the category is the leading and characteristic element in this definition, which is prominent in the ideas of dyadic relativity or relation, action, effort, existence, individuality, opposition, negation, dependence, blind force. Secondness has two grades, the *genuine* and the *degenerate* (just as a pair of rays is called a "degenerate" conic) and this is true in several ways. Every genuine secondness has two correlative aspects, of which one is more active or first, the other more passive or second; and these two together make a total secondness between two correlative subjects. There is a long chapter of these dichotomic distinctions of secondness. *Thirdness* is that mode or element of being whereby a subject is such as it is to a second and for a third; or rather it is the characteristic ingredient of this definition, which is prominent in the ideas of instrument, organon, method, means, mediation, betweenness, representation, communication, community, composition, generality, regularity, continuity, totality, system, understanding, cognition, abstraction, etc. That the three categories are independent of one another is proved as follows. Secondness involves Firstness, but it is discriminated from it by the circumstances that we may consider non-relative characters of subjects neglecting their dyadic relations. But a dyadic relation cannot be a result of non-relative characters, since if it were so there would be, besides the possession of non-relative characters of two objects, some connection between these facts; and this would be itself a dyadic relation. So Thirdness involves Secondness and thereby involves Firstness too; but it can be discriminated from Secondness by the circumstance that Secondness may occur either with or without Thirdness. Thirdness cannot be reduced to Secondness and Firstness, since if this were possible every triadic relation could be expressed in terms of dyadic relations and of non-relative attributions. Now no triadic relation can be so expressed, for it would appear in such expression as a composite relation formed of dyadic relations. Now composition is itself a triadic relation. On the other hand, there is no independent Fourthness or more complex mode or element of being; since it is easily demonstrable that every tetradic relation consists in a compound of triadic relations. Thirdness is subject to two grades of degeneracy. All genuine thirdness has a mental character.

Logic is by P made synonymous with semeiotic, the pure theory of signs, in general. Its first part, speculative grammar, {cf. *New Elements of Mathematics*, Vol. 3, pp. 207-210}, corresponding to stecheology (*Elementarlehre*), classifies and describes signs. A sign is anything, A, in a relation, *r*, to something, B, its *object*, this relation, *r*, consisting in fitness to determine something so as to produce something, C, the *interpretant* of the sign, which shall be in the relation *r* to B, or at least in some analogous relation. Thus, the sign involves the idea of a possible endless series of interpretations. In what relation this entire series, taken as a whole, stands to the object, B, depends upon circumstances.

NOTES

1. {Two informative variant beginnings from *MSL* 107}:

Peirce, Charles Santiago Sanders, b. Cambridge, Mass. 1839 Sep. 10, son of Benjamin P, the leading American mathematician of his day, and his wife Sarah Hunt Mills P. dau. of U.S. Senator Mills (the predecessor of Webster) who died early in Northampton, Mass. where he had established a noted law school. C.S.P. took the degrees of A.B. (1859), A.M., and S.B. in chemistry in Harvard. From Boyhood he has been devoted to Logic, considered as the theory of reasoning, especially in science, and of logical analysis. Moved chiefly by his desire to obtain an intimate knowledge of scientific reasoning, he made original investigations in the history of the pronunciation of English (*N.A. Rev.* 1864) {P 13}, "Multiple Algebra" (*Proc. A.A.A.S.* 1875-7 and *Am. J. of Math.* 1882), Colors (*Am. J. Sci. and A.* 1877) {P 100}, "The Doctrine of Chances" (*N.A. Rev.* {P 21}), and *Pop.*

Sci. Monthly, 1878), "Certain Phenomena of diffraction Spectra" {P 134} (*Am. J. Math.*), and as an officer of the U.S. Geod. Survey of gravity.

Charles Santiago Sanders Peirce (b. 1839) son of the mathematician Benjamin P., reared in circle of physicists and naturalists, and specially educated as a chemist, laid the foundation of his philosophical conceptions in a study of the *K.d.r.V.* Accepting unreservedly Kant's opinion that metaphysical conceptions can only be the conceptions of formal logic in different application, he was struck with the want of thoroughness of Kant's study of formal logic, and undertook a reexamination of the subject. In 1864, he was appointed lecturer on logic in Harvard University, and devoted his lectures to the criticism of the reasoning of physicists, as he did a course in 1866 before the Lowell Institute in Boston. In 1867 he published a classification of reasonings (in which he reduced all reasoning to substitution, an idea afterward followed out by Taine), a New List of Categories (Firstness, Secondness, Thirdness), an improvement of Boole's algebra of logic, etc. He had, by his studies of physical reasoning, already been led to question the rejection by modern philosophers of any mode of real being other than individual existence and actual happening; and studies of Aquinas, Scotus, Ockham, etc. led him to a rejection of nominalism expressed in three papers in the *Journal of Speculative Philosophy* (Vol. II) and in the *North American Review* for October 1871 (Review of Frazer's Berkeley). In 1870, he produced a memoir on the application of Boole's principles to the logic of relations; and the study of this branch of logic profoundly modified his conceptions of logic.

2. {From a variant passage} In 1868 he contributed three papers to W. T. Harris's *Journal of Speculative Philosophy* in which he insisted that while it is necessary to be deliberate, circumspect, and critical in adopting any opinion, and to be upon the alert for symptoms of error in our belief yet that which we do not genuinely doubt cannot possibly be subjected to any real criticism, and that which we never have doubted neither has nor needs any logical support. For instance, to say that a mathematical demonstration rests upon or appeals to a logical principle is meaningless except in the sense that a certain similarity or affinity of form may be traced between the demonstration and the principle. For the demonstration being evident, it can no more be supported by a principle of logic than the principles of logic can be supported by the demonstration. Hence, philosophy can have no other starting point than the total of beliefs which we bring to it. Moreover, it cannot [ever] be good logic to suppose any principle to be first or ultimate. For that is to suppose it inexplicable, while no hypothesis is acceptable for any other reason than that it explains the known facts. Resting on these principles, he offered various proofs of the following propositions; 1st, that we have no power of immediate introspection. That every experience has a double aspect is a datum of perception; and this double aspect is well explained in all its features by the theory that we are conscious. But that we are conscious is an inference, not a datum of perception. 2nd, there is no cognition which is logically first, but every cognition is logically determined by previous cognitions. 3rd, all cognition is of the nature of a sign, and must be interpreted in a subsequent cognition to be a cognition at all. In this absolutely present instant there is no cognitive consciousness. 4th, of the absolutely incognizable there is no conception of any description. Upon these four propositions he based a doctrine of *Synechism*, or principle of the universality of the law of continuity, carrying with it a return to scholastic realism. From the same propositions he deduced the different modes of validity of the different kinds of logical inference.

3. {From a variant page} His father had in 1870 distributed a work called *Linear Associative Algebra*. In 1882, the son edited a new edition of that work {P 188} in which he showed its connection with the logic of relations. C. S. Peirce regards universal science, or Cenoscopy (Bentham's word), as consisting of Mathematics, which merely studies hypotheses without any concern for their truth, and Philosophy, which studies whatever can be inferred from ordinary experience.

4. {From a variant} As to phenomenology, he is of opinion that there are at least two sets of categories. After devoting two years to the study of one of these, which corresponds with Hegel's categories, he became discouraged by the difficulty of attaining any satisfactory approach to certainty, and abandoned the subject. On the other hand, he has found another set, corresponding to Hegel's three stages, more easy to investigate and extremely useful. He calls these the *cenopythagorean categories*. They are three in number, *Firstness*, *Secondness*, and *Thirdness*. *Firstness*, or the mode of being of that which is such as it is regardless of anything else, as exemplified by simple Qualities of feeling; *Secondness*, or the mode of being of that which is such as it is relatively to a second object but regardless of any third; and *Thirdness*, or that which is such as it is in bringing a second into relation to a third. That thirdness cannot be reduced to any combination of secondnesses follows at once from the fact that combination is itself a triadic relation; so that a combination of secondnesses would itself involve an irreducible thirdness. On the other hand, [there] can be no irreducible Fourthness or mode of being defined by a relation between more than three correlates, since it is easily shown that every such relation is definable as a triadic relation among triadic relations. The most characteristic form of thirdness is that of a *sign*: and it is shown that every cognition is of the nature of a sign. Every sign has an object, which may be regarded either as it is immediately represented in the sign to be and as it is in its own firstness. It is equally essential to the function of a sign that it should determine an *Interpretant*, or a second correlate related to the object of the sign as the sign is itself related to that object; and this interpretant may be regarded as the sign represents it to be, as it is in its pure secondness to the object, and as it is in its own firstness. Upon these considerations are founded six trichotomic divisions of signs (of which only two were recognized in 1867). For in the first place a sign may, in its own firstness, either be a mere idea or quality of feeling, or it may be a "sinsign," that is, an individual existent (and P. holds, with Hegel, that existence consists in the blind reaction of the existent with the rest of the universe in which it exists), or it may (like a word) be a general type

("legisign") to which existents may conform. In the second place a sign may, in its secondness to its object as represented (according to the statement of 1867, which may have indirectly influenced Stout's psychological division of signs) either, as an "Icon," be related to that object by virtue of a character which belongs to the sign in its own Firstness, and which equally would belong to it though the object did not exist, or, as an "Index," may be related to its object by a real secondness, such as a physical connection, to it, or it may, as a "Symbol," be related to its object only because it will be represented in its interpretant as so related, as is the case with any word or other conventional sign, or any general type of image regarded as a schema of a concept.

TWO INFLUENTIAL EARLY ESSAYS

Some Consequences of Four Incapacities

[From *The Journal of Speculative Philosophy*, Vol. 2, 1868, pp. 140-141]

DESCARTES is the father of modern philosophy, and the spirit of Cartesianism—that which principally distinguishes it from the scholasticism which it displaced—may be compendiously stated as follows:

1. It teaches that philosophy must begin with universal doubt; whereas scholasticism had never questioned fundamentals.

2. It teaches that the ultimate test of certainty is to be found in the individual consciousness; whereas scholasticism had rested on the testimony of sages and of the Catholic Church.

3. The multiform argumentation of the middle ages is replaced by a single thread of inference depending often upon inconspicuous premises.

4. Scholasticism had its mysteries of faith, but undertook to explain all created things. But there are many facts which Cartesianism not only does not explain, but renders absolutely inexplicable, unless to say that "God makes them so" is to be regarded as an explanation.

In some, or all of these respects, most modern philosophers have been, in effect, Cartesians. Now without wishing to return to scholasticism, it seems to me that modern science and modern logic require us to stand upon a very different platform from this.

1. We cannot begin with complete doubt. We must begin with all the prejudices which we actually have when we enter upon the study of philosophy. These prejudices are not to be dispelled by a maxim, for they are things which it does not occur to us *can* be questioned. Hence this initial skepticism will be a mere self-deception, and not real doubt; and no one who follows the Cartesian method will ever be satisfied until he has formally recovered all those beliefs which in form he has given up. It is, therefore, as useless a preliminary as going to the North Pole would be in order to get to Constantinople by coming down regularly upon a meridian. A person may, it is true, in the course of his studies, find reason to doubt what he began by believing; but in that case he doubts because he has a positive reason for it, and not on account of the Cartesian maxim. Let us not pretend to doubt in philosophy what we do not doubt in our hearts.

2. The same formalism appears in the Cartesian criterion, which amounts to this: "Whatever I am clearly convinced of, is true." If I were really convinced, I should have done with reasoning, and should require no test of certainty. But thus to make single individuals absolute judges of truth is most pernicious. The result is that metaphysicians will all agree that metaphysics has reached a pitch of certainty far beyond that of the physical sciences;—only they can agree upon nothing else. In sciences in which men come to agreement, when a theory has been broached, it is considered to be on probation until this agreement is reached. After it is reached, the question of certainty becomes an idle one, because there is no one left who doubts it. We individually cannot reasonably hope to attain the ultimate philosophy which we pursue; we can only seek it, therefore, for the *community* of philosophers. Hence, if disciplined and candid minds carefully examine a theory and refuse to accept it, this ought to create doubts in the mind of the author of the theory himself.

3. Philosophy ought to imitate the successful sciences in its methods, so far as to proceed only from tangible premises which can be subjected to careful scrutiny, and to trust rather to the multitude and variety of its arguments than to the conclusiveness of any one. Its reasoning should not form a chain which is no stronger than its weakest link, but a cable whose fibres may be ever so slender, provided they are sufficiently numerous and intimately connected.

4. Every unidealistic philosophy supposes some absolutely inexplicable, unanalyzable ultimate; in short, something resulting from mediation itself not susceptible of mediation. Now that anything *is* thus inexplicable can only be known by reasoning from signs. But the only justification of an inference from signs is that the conclusion explains the fact. To suppose the fact absolutely inexplicable, is not to explain it, and hence this supposition is never allowable.

In the last number of this journal will be found a piece entitled "Questions concerning certain

Faculties claimed for Man," which has been written in this spirit of opposition to Cartesianism. That criticism of certain faculties resulted in four denials, which for convenience may here be repeated:

1. We have no power of Introspection, but all knowledge of the internal world is derived by hypothetical reasoning from our knowledge of external facts.
2. We have no power of Intuition, but every cognition is determined logically by previous cognitions.
3. We have no power of thinking without signs.
4. We have no conception of the absolutely incognizable.

These propositions cannot be regarded as certain; and in order to bring them to a further test it is now proposed to trace them out to their consequences. We may first consider the first alone; then trace the consequences of the first and second; then see what else will result from assuming the third also; and, finally, add the fourth to our hypothetical premises

How to Make Our Ideas Clear

[From *The Popular Science Monthly*, Vol. 12, 1878, pp. 286ff.]

I

WHOEVER has looked into a modern treatise on logic of the common sort, will doubtless remember the two distinctions between *clear* and *obscure* conceptions, and between *distinct* and *confused* conceptions. They have lain in the books now for nigh two centuries, unimproved and unmodified, and are generally reckoned by logicians as among the gems of their doctrine.

A clear idea is defined as one which is so apprehended that it will be recognized wherever it is met with, and so that no other will be mistaken for it. If it fails of this clearness, it is said to be obscure.

This is rather a neat bit of philosophical terminology; yet, since it is clearness that they were defining, I wish the logicians had made their definition a little more plain. Never to fail to recognize an idea, and under no circumstances to mistake another for it, let it come in how recondite a form it may, would indeed imply such prodigious force and clearness of intellect as is seldom met with in this world. On the other hand, merely to have such an acquaintance with the idea as to have become familiar with it, and to have lost all hesitancy in recognizing it in ordinary cases, hardly seems to deserve the name of clearness of apprehension, since after all it only amounts to a subjective feeling of mastery which may be entirely mistaken. I take it, however, that when the logicians speak of "clearness," they mean nothing more than such a familiarity with an idea, since they regard the quality as but a small merit, which needs to be supplemented by another, which they call *distinctness*.

A distinct idea is defined as one which contains nothing which is not clear. This is technical language; by the *contents* of an idea logicians understand whatever is contained in its definition. So that an idea is *distinctly* apprehended, according to them, when we can give a precise definition of it, in abstract terms. Here the professional logicians leave the subject; and I would not have troubled the reader with what they have to say, if it were not such a striking example of how they have been slumbering through ages of intellectual activity, listlessly disregarding the enginery of modern thought, and never dreaming of applying its lessons to the improvement of logic. It is easy to show that the doctrine that familiar use and abstract distinctness make the perfection of apprehension has its only true place in philosophies which have long been extinct; and it is now time to formulate the method of attaining to a more perfect clearness of thought, such as we see and admire in the thinkers of our own time.

When Descartes set about the reconstruction of philosophy, his first step was to (theoretically) permit skepticism and to discard the practice of the schoolmen of looking to authority as the ultimate source of truth. That done, he sought a more natural fountain of true principles, and professed to find it in the human mind; thus passing, in the directest way, from the method of authority to that of apriority, as described in my first paper. {See *The Fixation of*

Belief below.} Self-consciousness was to furnish us with our fundamental truths, and to decide what was agreeable to reason. But since, evidently, not all ideas are true, he was led to note, as the first condition of infallibility, that they must be clear. The distinction between an idea *seeming* clear and really being so, never occurred to him. Trusting to introspection, as he did, even for a knowledge of external things, why should he question its testimony in respect to the contents of our own minds? But then, I suppose, seeing men, who seemed to be quite clear and positive, holding opposite opinions upon fundamental principles, he was further led to say that clearness of ideas is not sufficient, but that they need also to be distinct, i.e., to have nothing unclear about them. What he probably meant by this (for he did not explain himself with precision) was, that they must sustain the test of dialectical examination; that they must not only seem clear at the outset, but that discussion must never be able to bring to light points of obscurity connected with them.

Such was the distinction of Descartes, and one sees that it was precisely on the level of his philosophy. It was somewhat developed by Leibnitz. This great and singular genius was as remarkable for what he failed to see as for what he saw. That a piece of mechanism could not do work perpetually without being fed with power in some form was a thing perfectly apparent to him; yet he did not understand that the machinery of the mind can only transform knowledge, but never originate it, unless it be fed with facts of observation. He thus missed the most essential point of the Cartesian philosophy, which is, that to accept propositions which seem perfectly evident to us is a thing which, whether it be logical or illogical, we cannot help doing. Instead of regarding the matter in this way, he sought to reduce the first principles of science to formulas which cannot be denied without self-contradiction, and was apparently unaware of the great difference between his position and that of Descartes. So he reverted to the old formalities of logic, and, above all, abstract definitions played a great part in his philosophy. It was quite natural, therefore, that on observing that the method of Descartes labored under the difficulty that we may seem to ourselves to have clear apprehensions of ideas which in truth are very hazy, no better remedy occurred to him than to require an abstract definition of every important term. Accordingly, in adopting the distinction of *clear* and *distinct* notions, he described the latter quality as the clear apprehension of everything contained in the definition; and the books have ever since copied his words. There is no danger that his chimerical scheme will ever again be overvalued. Nothing new can ever be learned by analyzing definitions. Nevertheless, our existing beliefs can be set in order by this process, and order is an essential element of intellectual economy, as of every other. It may be acknowledged, therefore, that the books are right in making familiarity with a notion the first step toward clearness of apprehension, and the defining of it the second. But in omitting all mention of any higher perspicuity of thought, they simply mirror a philosophy which was exploded a hundred years ago. That much-admired "ornament of logic"—the doctrine of clearness and distinctness—may be pretty enough, but it is high time to relegate to our cabinet of curiosities the antique *bijou*, and to wear about us something better adapted to modern uses.

The very first lesson that we have a right to demand that logic shall teach us is, how to make our ideas clear; and a most important one it is, depreciated only by minds who stand in need of it. To know what we think, to be masters of our own meaning, will make a solid foundation for great and weighty thought. It is most easily learned by those whose ideas are meagre and restricted; and far happier they than such as wallow helplessly in a rich mud of conceptions. A nation, it is true, may, in the course of generations, overcome the disadvantage of an excessive wealth of language and its natural concomitant, a vast, unfathomable deep of ideas. We may see it in history, slowly perfecting its literary form, sloughing at length its metaphysics, and, by virtue of the untirable patience which is often a compensation, attaining great excellence in every branch of mental acquirement. The page of history is not yet unrolled which is to tell us whether such a people will or will not in the long-run prevail over one whose ideas (like the words of their language) are few, but which possesses a wonderful mastery over those which it has. For an individual, however, there can be no question that a few clear ideas are worth more than many confused ones. A young man would hardly be persuaded to sacrifice the greater part of his thoughts to save the rest; and the muddled head is the least apt to see the

necessity of such a sacrifice. Him we can usually only commiserate, as a person with a congenital defect. Time will help him, but intellectual maturity with regard to clearness comes rather late, an unfortunate arrangement of Nature, inasmuch as clearness is of less use to a man settled in life, whose errors have in great measure had their effect, than it would be to one whose path lies before him. It is terrible to see how a single unclear idea, a single formula without meaning, lurking in a young man's head, will sometimes act like an obstruction of inert matter in an artery, hindering the nutrition of the brain, and condemning its victim to pine away in the fullness of his intellectual vigor and in the midst of intellectual plenty. Many a man has cherished for years as his hobby some vague shadow of an idea, too meaningless to be positively false; he has, nevertheless, passionately loved it, has made it his companion by day and by night, and has given to it his strength and his life, leaving all other occupations for its sake, and in short has lived with it and for it, until it has become, as it were, flesh of his flesh and bone of his bone; and then he has waked up some bright morning to find it gone, clean vanished away like the beautiful Melusina of the fable, and the essence of his life gone with it. I have myself known such a man; and who can tell how many histories of circle-squarers, metaphysicians, astrologers, and what not, may not be told in the old German story?

II

THE PRINCIPLES set forth in the first of these papers lead, at once, to a method of reaching a clearness of thought of a far higher grade than the "distinctness" of the logicians. We have there found that the action of thought is excited by the irritation of doubt, and ceases when belief is attained; so that the production of belief is the sole function of thought. All these words, however, are too strong for my purpose. It is as if I had described the phenomena as they appear under a mental microscope. Doubt and Belief, as the words are commonly employed, relate to religious or other grave discussions. But here I use them to designate the starting of any question, no matter how small or how great, and the resolution of it. If, for instance, in a horse-car, I pull out my purse and find a five-cent nickel and five coppers, I decide, while my hand is going to the purse, in which way I will pay my fare. To call such a question Doubt, and my decision Belief, is certainly to use words very disproportionate to the occasion. To speak of such a doubt as causing an irritation which needs to be appeased, suggests a temper which is uncomfortable to the verge of insanity. Yet, looking at the matter minutely, it must be admitted that, if there is the least hesitation as to whether I shall pay the five coppers or the nickel (as there will be sure to be, unless I act from some previously contracted habit in the matter), though irritation is too strong a word, yet I am excited to such small mental activity as may be necessary to deciding how I shall act. Most frequently doubts arise from some indecision, however momentary, in our action. Sometimes it is not so. I have, for example, to wait in a railway station, and to pass the time I read the advertisements on the walls, I compare the advantages of different trains and different routes which I never expect to take, merely fancying myself to be in a state of hesitancy, because I am bored with having nothing to trouble me. Feigned hesitancy, whether feigned for mere amusement or with a lofty purpose, plays a great part in the production of scientific inquiry. However the doubt may originate, it stimulates the mind to an activity which may be slight or energetic, calm or turbulent. Images pass rapidly through consciousness, one incessantly melting into another, until at last, when all is over—it may be in a fraction of a second, in an hour, or after long years—we find ourselves decided as to how we should act under such circumstances as those which occasioned our hesitation. In other words, we have attained belief.

In this process we observe two sorts of elements of consciousness, the distinction between which may best be made clear by means of an illustration. In a piece of music there are the separate notes, and there is the air. A single tone may be prolonged for an hour or a day, and it exists as perfectly in each second of that time as in the whole taken together; so that, as long as it is sounding, it might be present to a sense from which everything in the past was as completely absent as the future itself. But it is different with the air, the performance of which occupies a certain time, during the portions of which only portions of it are played. It consists in an orderliness in the succession of sounds which strike the ear at different times; and to perceive it there must be some continuity of

consciousness which makes the events of a lapse of time present to us. We certainly only perceive the air by hearing the separate notes; yet we cannot be said to directly hear it, for we hear only what is present at the instant, and an orderliness of succession cannot exist in an instant. These two sorts of objects, what we are *immediately* conscious of and what we are *mediately* conscious of, are found in all consciousness. Some elements (the sensations) are completely present at every instant so long as they last, while others (like thought) are actions having beginning, middle, and end, and consist in a congruence in the succession of sensations which flow through the mind. They cannot be immediately present to us, but must cover some portion of the past or future. Thought is a thread of melody running through the succession of our sensations.

We may add that just as a piece of music may be written in parts, each part having its own air, so various systems of relationship of succession subsist together between the same sensations. These different systems are distinguished by having different motives, ideas, or functions. Thought is only one such system, for its sole motive, idea, and function, is to produce belief, and whatever does not concern that purpose belongs to some other system of relations. The action of thinking may incidentally have other results; it may serve to amuse us, for example, and among *dilettanti* it is not rare to find those who have so perverted thought to the purposes of pleasure that it seems to vex them to think that the questions upon which they delight to exercise it may ever get finally settled; and a positive discovery which takes a favorite subject out of the arena of literary debate is met with ill-concealed dislike. This disposition is the very debauchery of thought. But the soul and meaning of thought, abstracted from the other elements which accompany it, though it may be voluntarily thwarted, can never be made to direct itself toward anything but the production of belief. Thought in action has for its only possible motive the attainment of thought at rest; and what ever does not refer to belief is no part of the thought itself.

And what, then, is belief? It is the demicadence which closes a musical phrase in the symphony of our intellectual life. We have seen that it has just three properties: First, it is something that we are aware of; second, it appeases the irritation of doubt; and, third, it involves the establishment in our nature of a rule of action, or, say for short, a *habit*. As it appeases the irritation of doubt, which is the motive for thinking, thought relaxes, and comes to rest for a moment when belief is reached. But, since belief is a rule for action, the application of which involves further doubt and further thought, at the same time that it is a stopping-place, it is also a new starting-place for thought. That is why I have permitted myself to call it thought at rest, although thought is essentially an action. The *final* upshot of thinking is the exercise of volition, and of this thought no longer forms a part; but belief is only a stadium of mental action, an effect upon our nature due to thought, which will influence future thinking.

The essence of belief is the establishment of a habit, and different beliefs are distinguished

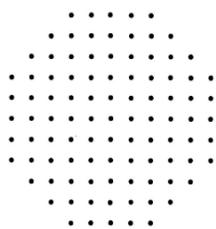


Fig. 1.

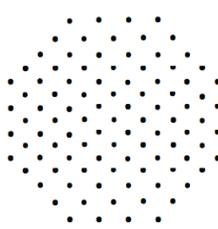


Fig. 2.

by the different modes of action to which they give rise. If beliefs do not differ in this respect, if they appease the same doubt by producing the same rule of action, then no mere differences in the manner of consciousness of them can make them different beliefs, any more than playing a tune in different keys is playing different tunes. Imaginary

distinctions are often drawn between beliefs which differ only in their mode of expression;—the wrangling which ensues is real enough, however. To believe that any objects are arranged as in Fig. 1, and to believe that they are arranged in Fig. 2, are one and the same belief; yet it is conceivable that a man should assert one proposition and deny the other.

Such false distinctions do as much harm as the confusion of beliefs really different, and are among the pitfalls of which we ought constantly to beware, especially when we are upon metaphysical ground. One singular deception of this sort, which often occurs, is to mistake the sensation produced by our unclearness of thought for a character of the object we are thinking. Instead of perceiving that the obscurity is purely subjective, we fancy that we contemplate a

quality of the object which is essentially mysterious; and if our conception be afterward presented to us in a clear form we do not recognize it as the same, owing to the absence of the feeling of unintelligibility. So long as this deception lasts, it obviously puts an impassable barrier in the way of perspicuous thinking; so that it equally interests the opponents of rational thought to perpetuate it, and its adherents to guard against it.

Another such deception is to mistake a mere difference in the grammatical construction of two words for a distinction between the ideas they express. In this pedantic age, when the general mob of writers attend so much more to words than to things, this error is common enough. When I just said that thought is an *action*, and that it consists in a *relation*, although a person performs an action but not a relation, which can only be the result of an action, yet there was no inconsistency in what I said, but only a grammatical vagueness.

From all these sophisms we shall be perfectly safe so long as we reflect that the whole function of thought is to produce habits of action; and that whatever there is connected with a thought, but irrelevant to its purpose, is an accretion to it, but no part of it. If there be a unity among our sensations which has no reference to how we shall act on a given occasion, as when we listen to a piece of music, why we do not call that thinking. To develop its meaning, we have, therefore, simply to determine what habits it produces, for what a thing means is simply what habits it involves. Now, the identity of a habit depends on how it might lead us to act, not merely under such circumstances as are likely to arise, but under such as might possibly occur, no matter how improbable they may be. What the habit is depends on *when* and *how* it causes us to act. As for the *when*, every stimulus to action is derived from perception; as for the *how*, every purpose of action is to produce some sensible result. Thus, we come down to what is tangible and practical, as the root of every real distinction of thought, no matter how subtile it may be; and there is no distinction of meaning so fine as to consist in anything but a possible difference of practice.

To see what this principle leads to, consider in the light of it such a doctrine as that of transubstantiation. The Protestant churches generally hold that the elements of the sacrament are flesh and blood only in a tropical sense; they nourish our souls as meat and the juice of it would our bodies. But the Catholics maintain that they are literally just that; although they possess all the sensible qualities of wafer-cakes and diluted wine. But we can have no conception of wine except what may enter into a belief, either—

1. That this, that, or the other, is wine; or,
2. That wine possesses certain properties.

Such beliefs are nothing but self-notifications that we should, upon occasion, act in regard to such things as we believe to be wine according to the qualities which we believe wine to possess. The occasion of such action would be some sensible perception, the motive of it to produce some sensible result. Thus our action has exclusive reference to what affects the senses, our habit has the same bearing as our action, our belief the same as our habit, our conception the same as our belief; and we can consequently mean nothing by wine but what has certain effects, direct or indirect, upon our senses; and to talk of something as having all the sensible characters of wine, yet being in reality blood, is senseless jargon. Now, it is not my object to pursue the theological question; and having used it as a logical example I drop it, without caring to anticipate the theologian's reply. I only desire to point out how impossible it is that we should have an idea in our minds which relates to anything but conceived sensible effects of things. Our idea of anything *is* our idea of its sensible effects; and if we fancy that we have any other we deceive ourselves, and mistake a mere sensation accompanying the thought for a part of the thought itself. It is absurd to say that thought has any meaning unrelated to its only function. It is foolish for Catholics and Protestants to fancy themselves in disagreement about the elements of the sacrament, if they agree in regard to all their sensible effects, here or hereafter.

It appears, then, that the rule for attaining the third grade of clearness of apprehension is as follows: Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object

A SYSTEM OF SCIENCE

PRESUPPOSITIONS OF SCIENCE: RELIGION AND COMMON SENSE

[The Prologue is from *MS* 1334, Lecture I to the Adirondack Summer School, 1905. The sections "Common Sense" and "Religion" are from *MS* 435, Lecture I, "On Detached Ideas in General, and on Vitally Important Topics as such," 1898. The subsection "Faith" is from *MS L* 463, Peirce to Welby, December 23, 1908. The subsection "Science Presupposes God" is from *MS* 436, Lecture I, 1898. None of these lectures were delivered.]

PROLOGUE

I HAVE A DIFFICULT TASK before me to render these four lectures profitable to you. It would be less so if you came without a single idea on the subject. But everybody, every butcher and baker, has ideas of logic and [has] even used the technical terminology of the subject. He says he deals in articles of "prime necessity." Perhaps he would be surprised to learn that the phrase "prime necessity" was invented by logicians to express a logical conception which has now become in common mouths very vague, it is true; but which still has a little of the original concept in a vague form clinging to it.

If I had a class in logic to conduct for a year, I should harp still, as I used to do at the Johns Hopkins, upon the maieutic character of my office,—which means that I should do all I could to make my hearers think for themselves, by which I earned the gratitude of men who are useful to mankind. I should insist that they must not suppose that my opinions were bound to be correct, but must work out their own ways of thinking. But now that there are but four lectures, and all falling in one week, the case is otherwise. I must beg you to remember that comprehension comes first and criticism later. It will be as much as you can possibly do in this week with diligent endeavors, to understand what I mean by logic and what the general outline of my system is. In order to do as much as that you must endeavor to take up a sympathetic attitude,—to try to catch what it is that I am driving at, and to store up in your minds an outline of my theory which you will subject to criticism in the months to come.

In order that you may understand me, that you may for this one week put yourselves, as far as you can, in my intellectual shoes,—leaving yourselves to decide only after you have worn them for awhile whether they really fit or not,—[. . .] I am going to begin by telling you something about my classification of the sciences; because it will aid you in the difficult task of imbibing my notion of the kind of science that I hold logic to be.

COMMON SENSE

Among the advantages which our humble cousins whom it pleases us to refer to as "the lower animals" enjoy over some of our own family is that they *never* reason about vitally important topics, and never have to lecture nor to listen to lectures about them. Docilely allowing themselves to be guided by their instincts into almost every detail of life, they live exactly as their Maker intended them to live. The result is, that they very rarely fall into error of any kind, and never into a vital one. What a contrast to our lives! Truly, that Reason upon which we so plume ourselves, though it may answer for little things, yet for great decisions is hardly surer than a toss-up.

The mental qualities we most admire in human Kind, the maiden's delicacy, the mother's devotion, manly courage, are merely instincts and inheritances from the biped who did not yet speak; while the characters that are most contemptible, such as, backbiting, treachery, hypocrisy, thieving, will be found if the students of the psychology of criminals are to be trusted, to be effects of reasoning. Undoubtedly we are compelled to reason a little, unless we can hire servants to do it for us. Accounts have to be kept either by ourselves or by our clerks. Logic is computation, said Hobbes; and those who have deepest delved in that dreary discipline testify that all reasoning whatever involves mathematics, and laugh over the fallacies of those who attempt to reason unmathematically. Now tell me, is mathematics an occupation for a gentleman and an athlete? Is not such drudgery fit only for the lower classes? One may well be struck with pity for the masses of population concentrated in New York and living under such unnatural conditions that they are forced to think mathematically. However, it is not as if they had the tender nurture of a cultured modern Harvard, that great eleemosynary institution that Massachusetts has established to the end that the *élite* of her youths

may be aided to earning comfortable incomes and living softly cultured lives. The brains of those New York plebeians are coarse, strong, laboring brains, who don't know what it is to be free from mathematics. Their conceptions are crude and vulgar enough, but their vigor of reasoning would surprise you. I have seen my [private] scholars there wrestle with problems that I would no more venture to allow the exquisitely polished intellects of a modern university to attack than I would venture to toss a cannonball into an eggshell cup.

I intend to call upon you for no reasoning in these lectures more complicated than one of Hegel's dilemmas. For all reasoning is mathematical and requires effort; and I mean to shun the guilt of overstraining anybody's powers. That is why I have selected a subject for my lectures which is not at all in my line, but which I hope may prove to be to your taste. I entitle the whole course *Detached Ideas on Topics of Vital Importance*. In this introductory lecture I shall submit to your judgment some reflections about *Detached Ideas* in general, and about *Vitally important Topics* in general.

On vitally important topics reasoning is out of place. The very theory of reasoning, were we resolutely to attack it without any dread of mathematics, would furnish us conclusive reasons for limiting the applicability of reasoning to unimportant matters; so that, unless a problem is insignificant in importance compared with the aggregate of analogous problems, reasoning itself pronounces that there is a fallacy in submitting the question to reason, at all. That must remain merely an assertion, mathematics being *taboo*. But possibly before the course is complete, you may [be] able to get a glimpse of the general drift of the demonstration of it. Let the assertion go at present for what it is worth.

In regard to the greatest affairs of life, the wise man follows his heart and does not trust his head. This should be the method of every man, no matter how powerful his intellect. More so still, perhaps, if mathematics is too difficult for him, that is to say, if he is unequal to any intricate reasoning whatsoever. Would not a man physically puny be a fool not to recognize it, and to allow an insane megalomania to induce him to enter a match game of football? But the slightest of physical frames might as well attempt to force back a locomotive engine, as for the mightiest of mental giants to try to regulate his life advantageously by a purely reasoned out theory.

Common sense, which is the resultant of the traditional experience of mankind, witnesses unequivocally that the heart is more than the head, and is in fact everything in our highest concerns, thus agreeing with my unproved logical theorem; and those persons who think that sentiment has no part in common sense forget that the dicta of common sense are objective facts, not the way some dyspeptic may feel, but what the healthy, natural, normal democracy thinks. And yet when you open the next new book on the philosophy of religion that comes out, the chances are that it will be written by an intellectualist who in his preface offers you his metaphysics as a guide for the soul, talking as if philosophy were one of our deepest concerns. How can the writer so deceive himself?

If, walking in a garden on a dark night, you were suddenly to hear the voice of your sister crying to you to rescue her from a villain, would you stop to reason out the metaphysical question of whether it were possible for one mind to cause material waves of sound and for another mind to perceive them? If you did, the problem might probably occupy the remainder of your days. In the same way, if a man undergoes any religious experience and hears the call of his Saviour, for him to halt till he has adjusted a philosophical difficulty would seem to be an analogous sort of thing, whether you call it stupid or whether you call it disgusting. If on the other hand, a man has had no religious experience, then any religion not an affectation is as yet impossible for him; and the only worthy course is to wait quietly till such experience comes. No amount of speculation can take the place of experience.

Pray pardon my hopping about from one branch of my discourse to another and back again with no more apparent purpose than a robin redbreast or a Charles Lamb. Because it would hardly be logically consistent for me to arrange my matter with scrupulously logical accuracy when the very thing I am driving at is that logic and reasoning are only of secondary importance. There are two psychological or anthropological observations about our reasoning powers which it is convenient to insert here.

One is that powers of reasoning in any but the most rudimentary way are a somewhat uncommon gift, about as uncommon as a talent for music. Indeed, a much smaller number of persons

actually attain to any proficiency in reasoning. But then the exercise of intricate ratiocination requires great energy and prolonged effort, while musical practice is nearly unmixed pleasure, I suppose, for those who do it well. Moreover, owing to several peculiar circumstances, good instruction in reasoning is exceedingly rare. As for what is taught in the colleges under the name of logic, oh dear, perhaps the less said the better. It is true that mathematics teaches one branch of reasoning. That is, indeed, its chief value in education. But how few teachers understand the logic of mathematics! And how few understand the psychology of the puzzled pupil! The pupil meets with a difficulty in Euclid. Two to one the reason is that there is a logical flaw. The boy, however, is conscious only of a mysterious hindrance. What his difficulty is he cannot tell the teacher; the teacher must teach him. Now the teacher probably never really saw the true logic of the passage. But he thinks he does because, owing to long familiarity, he has lost the sense of coming up against an invisible barrier that the boy feels. Had the teacher ever really conquered the logical difficulty himself, of course he would recognize just what it was, and thus would fulfill the first condition, at least, of being helpful. But not having conquered the difficulty, but only having worn out the sense of difficulty by familiarity, he simply cannot understand why the boy should feel any difficulty; and all he can do is to exclaim, "Oh, these stupid, stupid boys!" As if a physician should exclaim, "Oh, these horrid patients, they won't get well!" But suppose, by some extraordinary conjunction of the planets, a really good teacher of reasoning were to be appointed, what would be his first care? It would be to guard his scholars from that malady with which logic is usually infested, so that unless it runs off them like water from a duck, it is sure to make them the very worst of reasoners, namely, unfair reasoners, and what is worse unconsciously unfair, for the rest of their lives. The good teacher will therefore take the utmost pains to prevent the scholars getting puffed up with their logical acquirements. He will wish to impregnate them with the right way of looking at reasoning before they shall be aware that they have learned anything; and he will not mind giving considerable time to that, for it is worth a great deal. But now come the examiner and the pupil himself. They want *results*, tangible to them. The teacher is dismissed as a failure, or, if he is allowed another chance, he will take good care to reverse the method of his teaching and give them *results*,—especially, as that is the lazy way. These are some of the causes of there being so few strong reasoners in the world. But allowing for the influence of such causes as well as we can, the fact still remains that comparatively few persons are originally possessed of any but the feeblest modicum of this talent. What is the significance of that? Is it not a plain sign that the faculty of reasoning is not of the first importance to success in life? For were it so, its absence would cause the individual to postpone marriage and so affect his procreation; and thus natural selection would operate to breed the race for vigorous reasoning powers, and they would become common. And the study of characters confirms this conclusion. For though the men who are most extraordinarily successful evidently do reason deeply about the details of their business, yet no ordinary degrees of good success are influenced, otherwise than perhaps favorably,—by any lack of great reasoning power. We all know highly successful men, lawyers, editors, scientific men,—not to speak of artists—whose great deficiency in this regard is only revealed by some unforeseen accident.

The other observation I desired to make about the human reason is that we find people mostly modest enough about qualities which really go to making fine men and women,—the courageous man not usually vaunting his courage, nor the modest woman boasting of her modesty, nor the loyal vain of their good faith: the things they are vain about are some insignificant gifts of beauty, or skill of some kind. But beyond all, with the exception of those who, being trained in logic, follow its rules and thus do not trust their direct reasoning powers at all, everybody else ridiculously overrates his own logic, and if he really has superior powers of reason is usually so consumed by conceit, that it is far from rare to see a young man completely ruined by it; so that one is sometimes tempted to think, and perhaps truly, that it conduces not only to a man's success from a worldly point of view but to his attaining any real elevation of character to be all but a fool in this regard, provided only he be perfectly aware of his own deficiency.

But however unimportant logical vigor may be there are a few careers which a man who is deficient in mathematics would do well to avoid. He had better not cherish much ambition in the direction of philosophy. As *professor* of philosophy he might pass muster. Several very useful German books remind us of this. But he will not be of much service to philosophy itself. It is true

that as this subject has hitherto been treated, its reasonings have been of the very simplest. And though they may cease to be so simple after the logic of relatives shall have been digested and assimilated, yet that will not happen for a good many years. There are, however, two peculiarities of metaphysics which are of decisive importance in this connection.

Permit me here to interrupt what I am saying in order to explain to you, once for all, the senses which I attach to the words philosophy and metaphysics. I define *philosophy* as that branch of science which is founded in the main upon such experience as is familiar to every man, and which experience, owing to its extreme familiarity, no man ever did or ever will really doubt, so that the conclusions of philosophy *ought* to carry,—and *would*, I suppose, carry were it only investigated according [to] a really scientific method,—a degree of certitude, a sort of necessity, which can belong to none of the sciences which rest upon special, or recondite, experiences. I define philosophy in this way because the division of sciences according to the departments of experience with which they deal gives more natural groups than any other principle of division except that according to their abstractness, which is Comte's principle followed also by Spencer. But this latter principle is, taken by itself, insufficient and too vague; and besides the two substantially agree in their results. We must not indeed forbid to a science, especially not to philosophy, resort to any premises or methods whatsoever. Philosophy may adduce as data results of special sciences. But it is distinguished from other sciences in resting mainly upon familiar experiences. That gives it its character, its abstractness, its universality, and the sort of necessity which marks it. Above it in Comte's scale, as I would reform that scale, stands only pure abstract mathematics, which makes no inquiry at all into what is the fact, but studies only hypotheses. When all the possible hypotheses of mathematics shall be seen to form a continuum, or cosmos, as they are already beginning to do, then mathematics will stand out as the queen of the sciences, to which all the others even philosophy are but adjuvant. For it will contain the ideal essence of them all, but purified from brute existence and rounded out into the perfection they do not attain.

* * *

Conservatism, true conservatism, which is sentimental conservatism, and by those who have no powers of observation to see what sort of men conservatives are, is often called stupid conservatism, an epithet far more applicable to the false conservatism that looks to see on which side bread is buttered,—true conservatism, I say, means not trusting to reasonings about questions of vital importance but rather to hereditary instincts and traditional sentiments. Place before the conservative arguments to which he can find no adequate reply and which go, let us say, to demonstrate that wisdom and virtue call upon him to offer to marry his own sister, and though he be unable to answer the arguments, he will not act upon their conclusion, because he believes that tradition and the feelings that tradition and custom have developed in him are safer guides than his own feeble ratiocination. Thus, true conservatism is sentimentalism. Of course, sentiment lays no claim to infallibility, in the sense of *theoretical infallibility*, a phrase that logical analysis proves to be a mere jingle of words with a jungle of contradictory meanings. The conservative need not forget that he might have been born a Brahmin with a traditional sentiment in favor of *suttee*,—a reflection that tempts him to become a radical. But still, on the whole, he thinks his wisest plan is to reverence his deepest sentiments as his highest and ultimate authority, which is regarding them as *for him practically infallible*,—that is, to say infallible in the only sense of the word in which *infallible* has any consistent meaning.

The opinion prevalent among radicals that conservatives, and sentimentalists generally, are fools is only a cropping-out of the tendency of men to conceited exaggeration of their reasoning powers. Uncompromising radical though I be upon some questions, inhabiting all my life an atmosphere of science, and not reckoned as particularly credulous, I must confess that the conservative sentimentalism I have defined recommends itself to my mind as eminently sane and wholesome. Commendable as it undoubtedly is to reason out matters of detail, yet to allow mere reasonings and reason's self-conceit to overslaw¹ the normal and manly sentimentalism which ought to lie at the cornerstone of all our conduct seems to me to be foolish and despicable.

Philosophy after all is, at its highest valuation, nothing more than a branch of science, and as such is not a matter of vital importance; and those who represent it as being so are simply offering us

a stone when we ask for bread. Mind, I do not deny that a philosophical or other scientific error may be fraught with disastrous consequences for the whole people. It might conceivably bring about the extirpation of the human race. Importance in that sense it might have in any degree. Nevertheless, in no case is it of *vital* importance.

A great calamity the error may be, *qua* event, in the sense in which an earthquake, or the impact of a comet, or the extinction of the sun would be an important event, and consequently, if it happens to lie in the line of my duty or of yours to investigate any philosophical question and to publish the more or less erroneous results of our investigations, I hope we shall not fail to do so, if we can. Certainly, any task which lies before us to be done has its importance. But there our responsibility ends. Nor is it the philosophy itself, *qua* cognition, that is vital, so much as it is our playing the part that is allotted to us.

You will observe that I have not said a single word in disparagement of the philosophy of religion, in general, which seems to be a most interesting study, at any rate, and possibly likely to lead to some useful result. Nor have I attacked any sect of that philosophy. It is not the philosophy which I hold to be baleful, but the representing it to be of vital importance, as if any genuine religion could come from the head instead of from the heart.

Somewhat allied to the philosophy of religion is the science of ethics. It is equally useless. Now books of casuistry, indeed, using the word "casuistry" not in any technical sense, but merely to signify discussions of what ought to be done in various difficult situations, might be made at once extremely entertaining and positively useful. But casuistry is just what the ordinary treatises upon ethics do not touch, at least not seriously. They chiefly occupy themselves with reasoning out the basis of morality and other questions secondary to that. Now what's the *use* of prying into the philosophical basis of morality? We all know what morality is: it is behaving as you were brought up to behave, that is, to think you ought to be punished for not behaving. But to believe in thinking as you have been brought up to think defines *conservatism*. It needs no reasoning to perceive that morality is conservatism. But conservatism again means, as you will surely agree, not trusting to one's reasoning powers. To be a moral man is to obey the traditional maxims of your community without hesitation or discussion. Hence, ethics, which is reasoning out an explanation of morality is,—I will not say immoral, [for] that would be going too far,—composed of the very substance of immorality. If you ever happen to be thrown in with an unprofessional thief, the only very bad kind of thief so as to be able to study his psychological peculiarities, you will find that two things characterize him; first, an even more immense conceit in his own reasoning powers than is common, and second, a disposition to reason about the basis of morals.

Ethics, then, even if not a positively dangerous study, as it sometimes proves, is as useless a science as can be conceived. But it must be said, in favor of ethical writers, that they are commonly free from the nauseating custom of boasting of the utility of their science.

RELIGION

Among vitally important truths there is one which I verily verily believe,—and which men of infinitely deeper insight than mine have believed,—to be solely supremely important. It is that vitally important facts are of all truths the veriest trifles. For the only vitally important matter is *my* concern, business, and duty,—or yours. Now you and I,—what are, we? Mere cells of the social organism. Our deepest sentiment pronounces the verdict of our own insignificance. Psychological analysis shows that there is nothing which distinguishes my personal identity except my faults and my limitations,—or if, you please my blind will, which it is my highest endeavor to annihilate. Not in the contemplation of "topics of vital importance" but in those universal things with which philosophy deals, the factors of the universe, is man to find his highest occupation. To pursue "topics of vital importance" as the first and best can lead only to one or other of two terminations,—either on the one hand what is called I hope not justly, Americanism, the worship of business, the life in which the fertilizing stream of genial sentiment dries up or shrinks to a rill of comic tit-bits, or else on the other hand, to monasticism, sleepwalking in this world with no eye nor heart except for the other. Take for the lantern of your footsteps the cold light of reason and regard your business, your duty, as the highest thing, and you can only rest in one of those goals or the other. But suppose you embrace, on

the contrary, a conservative sentimentalism, modestly rate your own reasoning powers at the very mediocre price they would fetch if put up at auction, and *then* what do you come to? Why, *then*, the very first command that is laid upon you, your quite highest business and duty, becomes, as everybody knows, to recognize a higher business than your business, *not* merely an avocation after the daily task of your vocation is performed, but a generalized conception of duty which completes your personality by melting it into the neighboring parts of the universal cosmos. If this sounds unintelligible, just take for comparison the first good mother of a family that meets your eye, and ask whether she is not a sentimentalist, whether you would wish her to be otherwise, and lastly whether you can find a better formula in which to outline the universal features of her portrait than that I have just given. I dare say you can improve upon that; but you will find one element of it is correct,—especially if your understanding is aided by the logic of relatives,—and that is that the supreme commandment of the Buddhisto-Christian religion is, to generalize, to complete the whole system even until continuity results and the distinct individuals weld together. Thus, it is that while reasoning and the science of reasoning strenuously proclaim the subordination of reasoning to sentiment, the very supreme commandment of sentiment is that man should generalize, or what the logic of relatives shows to be the same thing[,] should become welded into the universal continuum, which is what true reasoning consists in. But this does not reinstate reasoning[,] for this generalization should come about, not merely in man's cognitions, which are but the superficial film of his being, but objectively, in the deepest emotional springs of his life. In fulfilling this command, man prepares himself for transmutation into a new form of life, the joyful Nirvana in which the discontinuities of his will shall have all but disappeared.

Do you know what it was that was at the root of the barbarism of the Plantagenet period and paralyzed awakening science from the days of Roger Bacon to those of Francis Bacon? We plainly trace it in the history, the writings, the monuments of that age. It was the exaggerated interest men took in matters of vital importance.

Do you know what it is in Christianity that when recognized makes our religion an agent of reform and progress? It is its marking duty at its proper finite figure. Not that it diminishes in any degree its vital importance, but that behind the outline of that huge mountain it enables us to descry a silvery peak rising into the calm air of eternity.

The generalization of sentiment can take place on different sides. Poetry is one sort of generalization of sentiment, and in so far is the regenerative metamorphosis of sentiment. But poetry remains on one side ungeneralized, and to that is due its emptiness. The complete generalization, the complete regeneration of sentiment is religion, which is poetry, but poetry completed.

That is about what I had to say to you about topics of vital importance. To sum it up, all sensible talk about vitally important topics must be commonplace, all reasoning about them unsound, and all study of them narrow and sordid.

FAITH

Dear Lady Welby, for the past week all my time and all my energy have been taken up with what we Yankees (i.e. the stock of those who came over to Massachusetts before 1645,—I forget the exact date,) call "chores." I believe that in standard English the word is lost. It means the menial offices of every day in a household, especially, a primitive household,—the hewing of wood and the drawing of water and the like.

I now return to the expression of my abhorrence of the doctrine that any proposition whatever is infallibly true. Unless truth be recognized as *public*,—as that of which *any* person would come to be convinced if he carried his inquiry, his sincere search for immovable belief, far enough,—then there will be nothing to prevent each one of us from adopting an utterly futile belief of his own which all the rest will disbelieve. Each one will set himself up as a little prophet; that is, a little "crank," a halfwitted victim of his own narrowness.

But if Truth be something public, it must mean that to the acceptance of which as a basis of conduct any person you please would ultimately come if he pursued his inquiries far enough;—yes, every rational being, however prejudiced he might be at the outset. For Truth has that compulsive nature which Pope well expressed:

The eternal years of God are her's.

But, you will say, I am setting up this very proposition as infallible truth. Not at all; it is a mere definition. I do not say that it is infallibly true that there is any belief to which a person would come if he were to carry his inquiries far enough. I only say that that alone is what I call Truth. I cannot infallibly know that there is any Truth.

You say there is a certain "Faith" the object of which is absolutely "certain." Will you have the goodness to tell me what you mean by "certain"? Does it mean anything more than that you personally are obstinately resolved upon sticking to the proposition, *ruat caelum*? It reminds me of an anecdote that was told me in 1859 by a southern ducky. "You know," says he, "that General Washington and General Jackson was great friends, dey was (the fact being that the latter was an irreconcilable opponent of the former, but did not become a figure in national politics until after Washington had retired from public life). Well, one day Gen'l. Washington, he said to Gen'l. Jackson, "Gen'l, how tall should you think that horse of mine was?" "I don't know, General," says General Jackson, "how tall is he, General Washington?" "Why," says General Washington, "he is sixteen feet high." "Feet, General Washington," say Gen'ral Jackson, "feet, General Washington? You means *hands*, Gen'ral!" "Did I say *feet*, General Jackson," said General Washington. "Do you mean to say that I said my horse was sixteen *feet* high?" "You certainly said so, General Washington." Very well, then, Gen'ral Jackson, if I *said* feet, if I *said* feet, then I sticks to it!" Is your "sublime faith" any more "sublime" than that? How?

Now I will tell you the meaning that I would, in my turn, attach to the word faith. The New Testament word is πιστις, which means, in its most proper sense, trust; i.e. belief in something not as having any knowledge or approach to knowledge about the matter of belief, but "implicit belief," as the catholics say, i.e. belief in it derived from one's belief that a witness who testifies to it would not so testify if it were not so. Hence, the latest writers of classical Greek, such as Plato and Isocrates, and the earliest writers of common Greek, such as Aristotle, use it for any mediate belief, any belief well founded on another belief. That is, these writers apply πιστις to an assured belief. They also apply it to an *assurance* of any belief. But the English word "faith" could not be used so without great violence to usage which would be entirely unwarranted by any need. I think that what the word is needed to express, and what it might be restricted to express without too great violence to usage is *that belief which the believer does not himself recognize*, or rather (since that cannot properly be called belief), that which he is prepared to conform his conduct to, without recognizing what it is to which he is conforming his conduct. For example, if I do not know what Liddell & Scott say is the meaning of πιστις but am convinced that whatever they may say is its meaning really is so, I have a *faith* that it is so. A person who says "Oh, I could not believe that this life is our only life; for if I did I should be so miserable that I should suicide forthwith," I say that he has a *Faith* that things are not intolerably bad for any individual or at any rate are not so for *him*. Every true man of science, i.e. every man belonging to a social group all the members of which sacrifice all the ordinary motives of life to their desire to make their beliefs concerning one subject conform to verified judgments of perception together with sound reasoning, and who therefore really believes the universe to be governed by reason, or in other words by God,—but who does not explicitly recognize that he believes in God,—has Faith in God, according to my use of the term Faith. For example, I knew a scientific man who devoted his last years to reading theology in hopes of coming to a belief in God, but who never could in the least degree come to a consciousness of having the least belief of the sort, yet passionately pursued that very mistaken means of attaining his heart's supreme desire. He, according to me, was a shining example of Faith in God. For to believe in reasoning about phenomena is to believe that they are governed by reason, that is, by God. That to my mind is a high and wholesome belief. One is often in a situation in which one is obliged to assume, i.e. to go upon, a proposition which one ought to recognize as extremely doubtful. But in order to conduct oneself with vigorous consistency one must dismiss doubts on the matter from consideration. There is a vast difference between *that* and any holding of the proposition for certain. To hold a proposition to be certain is to puff oneself up with the vanity of perfect knowledge. It leaves no room for Faith. It is not absolutely certain that twice two is four. It is humanly certain that no conception of God can be free from all error. I once made a careful study of Dr. Schaff's three solid volumes on *The Creeds of*

Christendom. I found not one that said one word about the principle of love, although that seems to be the leading element of christian faith. In order to find out, if I could, the reason for this passing strange omission, I made a study of the circumstances which determined the formulation of each Symbolum, and ascertained that, with the possible exception of what we erroneously call "The Apostle's Creed," concerning whose origin we have no definite information, but which is no exception as regards the information in question, and certainly does not breathe the spirit of such early documents as the *Διδαχη*,² every one sprang from the *odium theologicum* and the desire to have some certain person excommunicated, with the evident wish that he might be damned. Theology arises from discontent with religious Faith,—which implies a lack of such Faith, and with a desire to substitute for that a scientific anatomy and physiology of God, which, rightly considered, is blasphemous and antireligious. It is also in most striking disaccord with the spirit of the son of Mary.

Your pleading that I should not use such a phrase as "attractive fancy" and I suppose you might feel so about the phrase "strictly hypothetical God" seems to show that I quite failed to convey my own sense of the value of the Neglected Argument,³ in that it does not lead to any theology at all, but only to what *I* mean by a purely religious *Faith*, which will have already taken deep root before the subject of it thinks of it at all as a belief. Writing this is like having to explain a joke.

* * *

... By the way, when I was speaking of creeds, I might have mentioned ... that I say the creed in church with the rest. By doing so I only signify, as I presume the majority do,—I hope they do,—my willingness to put aside, most heartily, anything that tends to separate me from my fellow christians. For the very ground of my criticism of creeds is that every one of them was originally designed to produce such a separation, contrary to the notions of him who said "He that is not against me is for me." By the way, I have been reading, with much study, the book of W. B. Smith entitled *Der vorchristliche Jesus*, which I have little doubt is sound in the main; and I think probably christianity was a higher development out of Buddhism, modified by Jewish belief in a living god

SCIENCE PRESUPPOSES GOD

I would have liked to have made all this quite plain, so that you could have perceived its exact truth as evident. But it happens that no difficult reasoning can be made evident and exact without mathematics; and I regret that however victorious Harvard may be in contests of athletics, the vigor of mind requisite for diagrammatic reasoning is wanting here. I regret it, because what I say to you, put in the rough and apparently arbitrary and maimed way in which I am driven to hinting it, seems at once commonplace and enigmatic, the taste of which is like sugar and salt. But there is one great comfort for us all. It is that the historical development of man has now reached a stage at which all our intellectual feebleness will be made up, in two or three centuries[,] because the race which is wanting in vigor of thought is now sure to be supplanted by a race that can reason mathematically without being overcome by that tired feeling. Perhaps it will be the Japanese who are certainly superior to us in every respect except brute vigor, and to whom, therefore, we ought to be very willing to surrender our empire. At any rate, we must either quit or work, in whichever way the current of civilization finds the path of least resistance.

It was over the door of Plato's Academy that was put up the notice "No admission for the *αγεωμετητης*"⁴ Ah! Were it only from the Academy that he was debarred. He is utterly cut off from all contemplation of the rational. His reason is embryological. Between him and all the perfections which the Cosmos approaches or suggests, a dense fog obstructs all vision. He is bound down to his five senses and to the day's happenings, like a poor dog. And to think that emancipation from all this is possible by a sufficient effort, but that the man cannot screw his courage up to making that effort!

It is true that there is no treatise on the parts of mathematics which are valuable not as a utensil but as the crown of a freeman's education. I would not for the world say anything in disparagement of Schröder's *Logik*. Yet I cannot but think there is room for a brief presentation of the Logic of Relatives and of Exact Logic generally, subjective and objective, which shall be less mechanical and fatiguing and shall better display its living ideas and connections with philosophy and with life. I wrote such a book myself with the utmost care and no economy of pains. I was well pleased with it

myself. But the publishers told me it would not pay, especially as I was not a university professor; and so I put the MS to another use; that of lighting fires.

Thus, in every way I am driven to see that this country will have nothing intellectual that is beautiful and finished. It wants only sporadic ideas on vitally important topics; and that is why I am inflicting upon you this wretched desultory sermonizing for which I am no more fitted than I am for rowing stroke in the Varsity crew. I can only say that if anybody wishes to have his eyes opened to a cosmos of thought of such wonderful beauty that merely as a poem the delight of it would a thousand times repay the effort of finding it, and which in addition to that appears to be the very Key that unlocks the secret of the physical and psychical universe, if he will come to me prepared, not for brilliant *aperçus* but for thorough work, I can help him to it. When I have said that, well knowing that the news will be received with incredulity, I have gone as far as duty requires. How bleak a climate America with its vitally important topics is for vitally unimportant but cosmically vital ideas, I have often thought when I have vainly tried to get into print a just word of praise for the solid work of some American thinker.

NOTES

1. {See *The Century Dictionary*: "overslaugh"—to oppress or hinder}
2. {*The Didache*}
3. {See *Collected Papers*.}
4. {The Greek means "ignorant of mathematics."}

THE NATURE OF SCIENCE

[From MS 1334, Adirondack Summer School Lectures, 1905]

My classification of the sciences will give you a first inkling of my notion of the position that logic holds among the sciences.

This classification adopts the general idea of the classification called Comte's. When I speak of it as "the classification called Comte's," I must state that of my own knowledge, I know no reason for not simply calling it Comte's classification. But Dr. Robert Flint and other writers aver very solemnly, "If that classification possess any merits they must be ascribed to Dr. Burdin, who conceived it, and to Saint-Simon, who first received and published it; not to Comte, although he showed how much could be made of it." Notwithstanding the scoundrelly character of the clerical profession in times past, I cannot believe that Dr. Flint would use such language without conclusive proof of its truth, convincing to every mind. I am sorry that I cannot quite suppress a lingering suggestion of doubt in my mind owing to the unspeakable mendacity of the cloth in times too recent. I certainly cannot for an instant believe that Comte was a conscious plagiarist.

This scheme, as you know, arranges what are called by Comte the "abstract sciences" in a ladder, with the idea that each derives its principles from the discoveries of the more abstract science that occupies the rung above, while all are at the same time pressing upwards in the endeavor to become more "abstract." Since Comte first set forth that scheme, many others have been proposed; but among the core or more which have seemed to me to be at all deserving of study, including all that are widely known, I have not found one which was not manifestly founded upon that which goes by Comte's name; and if my own has no other distinction it shall have that of honestly owning a filiation to a system of philosophy to which I am profoundly opposed,—a filiation of which too many of its offspring seem to be basely ashamed to own.

This, however, is not the only peculiarity of my classification. In order to make it useful I wished it to be a natural classification, that is, I wished it to embody the chief facts of relationships between the sciences so far as they present themselves to scientific and observational study. Now to my apprehension, it is only natural experiential objects that lend themselves to such a natural classification. I do not think, for example, that we can make a natural classification of plane curves or of any other mere possibilities. We do classify them, or rather, divide them, according to their *orders* and *classes* or their so-called *deficiencies*. But this is a mere enumeration of the logically possible cases. It embodies no positive information. It cannot therefore serve the same purpose as a natural classification. My notion is that what we call "natural classification" is, from the nature of things limited to natural objects. Now the vast majority of classifications of the sciences are classifications of *possible* sciences, which are certainly not natural objects. What is a science as a natural object? It is the actual living occupation of an actual group of living men. It is in that sense only that I presume to attempt any classification of the sciences. A very considerable proportion of all the so-called classifications of the sciences are classifications of *scientia*, or *ἐπιστήμαι*, in the ancient sense of perfect knowledge. Others are classifications not of sciences but of the objects of systematized knowledge.

But what I mean by a "science," both for the purpose of this classification and in general, is the life devoted to the pursuit of truth according to the best known methods on the part of a group of men who understand one another's ideas and works as no outsider can. It is not what they have already found out which makes their business a science; it is that they are pursuing a branch of truth according, I will not say, to the best methods that are known at the time. I do not call the solitary studies of a single man a science. It is only when a group of men, more or less in intercommunication, are aiding and stimulating one another by their understanding of a particular group of studies as outsiders cannot understand them, that I call their life a science. It is not necessary that they should all be at work upon the same problem, or that all should be fully acquainted with all that it is needful for another of them to know; but their studies must be so closely allied that any one of them could take up the problem of any other after some months of special preparation and that each should understand pretty minutely what it is that each one's of the others work consists in; so that any two of them meeting together shall be thoroughly conversant with each other's ideas and the language he talks and should feel each other to be brethren. In particular, one thing which commonly unites them is their common skill, unpossessed by outsiders, in the use of certain instruments, and their common skill in performing certain kinds of work. The men of that group have dealings with the men of another group whose studies are more abstract, to whom they go for information about principles that the men of the second group understand better, but which the men of the first group need to apply. At the same time the men of this first group will probably have far more skill in their special applications of these principles than have the members of the second group who understand better the principles themselves. Thus the astronomer resorts to the student of optics, who understands the principles of optics better than he does. But he understands the applications of those principles to astronomical instruments and to work with them far better than the pure optical student does. One group may be in such wise dependent upon several other groups. Now I do not pretend that all the ramifications of dependence of one science upon

another can be fully represented by any scheme of arrangement of the names of those sciences, even if we limit the kind of dependence that we seek to represent to dependence for *principles*. But I do undertake to represent somewhat vaguely the dependence for *principles* only of each science and each group of sciences upon others after the manner of Comte, or Charles Burdin, or whoever it was that made that wonderful discovery.

All human lives separate themselves and segregate themselves into three grand groups whose members understand one another in a general way, but can[^t] for the life of them understand sympathetically the pursuits and aims of the others. The first group consists of the devotees of enjoyment who devote themselves to carving their bread and eating as fine bread as they can and who seek the higher enjoyments of themselves and their fellows. This is the largest and most necessary class. The second group despise such a life and cannot fully understand it. Their notion of life is to accomplish results. They build up great concerns, they go into politics, not as the heeler¹ does, for a living, but in order to wield the forces of state, they undertake reforms of one and another kind. This group makes civilization. The men of the third group who are comparatively few cannot conceive at all a life for enjoyment and look down upon a life of action. Their purpose is to worship God in the development of ideas and of truth. These are the men of science. They again segregate themselves into three great groups distinguished by their different conceptions of the purpose of science. There are those who look upon themselves as the tutors and superiors of the doers. Science to their minds tells how the world's work is to be done; and the sciences they cultivate are the Practical Sciences. But in order to develop any practical science, a man must have the equivalent of a digest of science[,] a systematized account of all human knowledge. Therefore there must be a second class of men whose purpose it is to produce such digests, one working upon one part of it and another upon another. For these men, science is what Coleridge defined it as being, organized knowledge. This very business I am engaged in, of classifying the sciences is a necessary part of this work of systematizing and digesting human knowledge. I have called such sciences the Sciences of Review, and also Tactics, or Taxospude, the endeavor to arrange science. The third great division of science I call heuristics or heurospude, the endeavor to discover. It is true that all scientific men are engaged upon nothing else than the endeavor to discover. This is true of *taxospudists* and the *prattospudists* as much as of the *heurospudists*. But the difference is that the *prattospudists* endeavor to discover for the ultimate purpose of doing, and the *taxospudists* endeavor to discover for the purpose of applying knowledge in any way, be it in action or more especially in cognition. But the *heurospudists* look upon discovery as making acquaintance with God and as the very purpose for which the human race was created. Indeed as the very purpose of God in creating the world at all. They think it a matter of no consequence whether the human race subsists and enjoys or whether it be exterminated, as [in] time it very happily will be, as soon as it has subserved its purpose of developing a new type of mind that can love and worship God better.

You must not think that I mean to say in any wooden sense that God's notion in creating the world was to have somebody to admire him. We cannot possibly put ourselves in God's shoes, even so far as to say in any definite, wooden sense that *God is*. I only mean that the purpose of creation as it must appear to us in our highest approaches to an understanding of it, is to make an answering mind. It is God's movement toward self-reproduction. And when I say that *God is*, I mean that the conception of a God is the highest flight toward an understanding of the original of the whole physico-psychical universe that we can make. It has the advantage over the agnostics and other views of offering to our apprehension an object to be loved. Now the *heurospudist* has an imperative need of finding in nature an object to love. His science cannot subsist without it. For science to him must be worship in order not to fall down before the feet of some idol of human workmanship. Remember that the human race is but an ephemeral thing. In a little while it will be altogether done with and cast aside. Even now it is merely dominant on one small planet of one insignificant star, while all that our sight embraces on a starry night is to the universe far less than a single cell of the brain is to the whole man.

NOTE

1. {Slang for "hack politician"; see *The Century Dictionary*.}

MATHEMATICS, THE FIRST SCIENCE

[The section "Mathematics" is from *MS* 459, The Lowell Lectures, 1903. The section "Diagrams" is from *MS* 293, ca. 1906. The section "Diagram Observation" is from *MS* 15, "On Quantity," ca. 1895. The section "Two Kinds of Deduction" is from *MS* L 224, Peirce to William James, December 25, 1909.]

MATHEMATICS

Mathematics is the science which draws necessary conclusions. Such was the definition first given by my father, Benjamin Peirce, in 1870. At that day the new mathematics was in its early infancy and the novelty of this definition was disconcerting even to the most advanced mathematicians; but today no competent man would adopt a definition decidedly opposed to that. The only fault I should find with it is that if we conceive a science, not as a body of ascertained truth, but, as the living business which a group of investigators are engaged upon, which I think is the only sense which gives a natural classification of sciences, then we must include under mathematics everything that is an indispensable part of the mathematician's business; and therefore we must include the *formulation* of his hypotheses as well as the tracing out of their consequences. Certainly, into that work of formulation the mathematicians put an immense deal of intellectual power and energy.

Moreover, the hypotheses of the mathematician are of a peculiar nature. The mathematician does not in the least concern himself about their truth. They are often designed to represent *approximately* some state of things which he has some reason to believe is realized; but he does not regard it as his business to find out whether this be true or not; and he generally knows very well that his hypothesis only approximates to a representation of that state of things. The substance of the mathematician's hypothesis is therefore a creature of his imagination. Yet nothing can be more unlike a poet's creation. The reason is that the poet is interested in his images solely on account of their own beauty or interest as images, while the mathematician is interested in his hypotheses solely on account of the ways in which necessary inferences can be drawn from them. He consequently makes them perfectly definite in all those respects which could affect the ways in which parts of them could or [could] not be taken together so as to lead to necessary consequences. If he leaves the hypotheses determinate in any other respects, they are hypotheses of *applied* mathematics. The pure mathematician generalizes his hypotheses so as to make them applicable to all conceivable states of things in which precisely analogous conclusions could be drawn. In view of this I would define Pure Mathematics as the science of pure hypotheses perfectly definite in respects which can create or destroy forms of necessary consequences from them and entirely indeterminate in other respects.

I am confident that this definition will be accepted by mathematicians as, at least, substantially accurate. As for the old definition that mathematics is the science of quantity, it first appears, I believe, in Boëthius, about A.D. 500 when mathematics was at its lowest ebb; and at that time three words that occur in it had entirely different meanings from those they now carry. Those three words are *Mathematics*, *Science*, and *Quantity*. First, under mathematics [were] then included only four sciences called Arithmetic, Astronomy, Geometry, and Music. But by arithmetic was not meant anything now called by that name; for our arithmetic was called *logistic* and was not included in mathematics. Secondly, by *science* was then meant *comprehension* through principles, which we now call *philosophy*, a thing which a modern mathematician would not touch with a nine foot pole. Thirdly, by *quantity* was meant simply things *measurable*. Therefore, the true meaning of that phrase Mathematics is the science of quantity was that four branches of learning, of which all but geometry are now utterly forgotten, constituted the philosophy of measurement. You see it is one of the many cases in which a phrase has quite survived its meaning. The relation of Quantity to Mathematics is, in fact this, that it is found that in one way or another the conception of quantity has an important bearing upon almost every branch of mathematics, as it has upon logic itself. But it is by no means the principal subject of all branches of mathematics. Thus the theory of Linear Perspective is a branch of Mathematics. Yet it is properly and primarily not concerned with quantity; and if it is made to appear so, it is badly taught.

Some very eminent and profound mathematicians go so far as to say that Mathematics is a branch of Logic. Dedekind is one of these, whose little book published by the Open Court Company under the title of *Essays on Number* I beg leave to recommend to your study. But Mathematics is not Logic for the reason that the mathematician deals exclusively with assumptions for whose truth he in no wise makes himself responsible, while logic deals with positive truth. The mathematician's interest in reasoning is to get at the conclusion in the speediest way consistent with certainty. The logician, on the contrary, does not care particularly what the conclusion is. His interest lies in picking the reasoning to pieces and discovering the principles upon which its leading to truth depends. As far as necessary inference is concerned, the mathematician and the logician meet upon a common highway. But they face in contrary directions.

Still, the mere fact that mathematicians of high rank consider mathematics as a branch of logic may serve as sufficient justification for my devoting a part of this course to the examination of mathematics. There is no science more infested with a vermin of ignorant pretenders than logic; and there is one simple

question by which they can commonly be detected. Ask your pretended logician whether there are any necessary reasonings of an essentially different character from mathematical reasonings. If he says no, you may hope he knows something about logic; but if he says "yes," he is contradicting a well-established truth universally admitted by sound logicians. If you ask for a sample, it will be found to be a very simple mathematical reasoning *blurred* by being confusedly apprehended. For a necessary reasoning is one which *would* follow under all circumstances, whether you are talking of the real world or the world of the *Arabian Nights* or what. And that precisely defines mathematical reasoning. It is true that a *distinctively* mathematical reasoning is one that is so intricate that we need some kind of a diagram to follow it out. But something of the nature of a diagram, be it only an imaginary skeleton proposition, or even a mere noun with the ideas of its application and signification is needed in all necessary reasoning. Indeed one may say that something of this kind is needed in all reasoning whatsoever, although in induction it is the real experiences that serves as diagram.

One of the most striking characters of pure mathematics,—of course you will understand that I speak only of mathematics in its present condition, and only occasionally and with much diffidence speculate as to what the mathematics of the future may be,—but one of [the] characters of latter day pure mathematics is that all its departments are so intimately related that one cannot treat of any one as it should be treated without considering all the others. We see the same thing in several other advanced sciences. But so far as it is possible to break mathematics into departments, we observe that in each department there is a certain set of alternatives to which every question relates. Thus, in projective geometry, which is the whole geometry that is allied to perspective *without measurement*, namely, the geometry of planes, their intersections and envelopes, and the intersections and envelopes of intersections and envelopes, the question always is whether a figure lies in another figure or not, whether a point one way described lies on a point another way described, whether a point lies on a line or not, whether three lines coincide or not. Here there are two alternatives. In other departments, the alternatives are all the integer numbers; in still others, the alternatives are all the analytical numbers, etc. The set of alternatives to which a branch of mathematics constantly refers may be considered as a system of values; and in that sense, mathematics seems always to deal with quantity. It would seem that if any lines of demarcation are to be drawn between different mathematical theories they must be according to the number of alternatives in the set of alternatives to which it refers; but I am bound to say that this is a notion personal to myself,—and that I have my doubts as to its worth as the basis of a complete classification of mathematics. We may, however, accept it in so far as it shows that the simplest possible kind of mathematics will be that all whose questions relate to which one of a single set of two alternatives is to be admitted. Now in Existential Graphs, all questions relate to whether a graph is true or false; and we may conceive that every proposition has one or other of two values, the infinite value of being true, and the zero value of being false. We have, therefore, in Existential Graphs an exposition of this simplest possible form of mathematics. It is Applied Mathematics, because we have given definite logical significations to the graphs. But if we were to define the graphs solely by means of the five fundamental rules of their transformation, allowing them to mean whatever they might mean while preserving those rules, we should then see in them the Pure Mathematics of two values, the simplest of all possible mathematics. Were we to follow out the same principle, we should divide all mathematics according to the number of alternatives in the set of alternatives to which it constantly refers and also to the number of different sets of alternatives to which it refers. Perhaps that would give as natural a classification of pure mathematical inquiries as any that could at this time be proposed. At any rate, we may so far safely trust to it, to conclude that the very first thing to be inquired into in order to comprehend the nature of mathematics, is the matter of *number*.

Certainly, of all mathematical ideas, next after the idea of two alternatives, the most ubiquitous is the idea of whole numbers. Dr. Georg Cantor is justly recognized as the author of two important doctrines, that of *Cardinal Numbers* and that of *Ordinal Numbers*. But I protest against his use of the term *Cardinal Number*. What he calls cardinal number is not number at all. A cardinal number is one of the vocables used primarily in the experiment called counting a collection, and used secondarily as an appellative of that collection. But what Cantor means by a cardinal number is the *zeroness, oneness, twoness, threeness*, etc.—in short the *multitude* of a collection. I shall always use the word *multitude* to mean the degree of *maniness* of a collection. By *ordinal numbers* Cantor means certain symbols invented by him to denote the place of an object in a series in which each object has another next after it. The character of being in a definite place in such a series may be called the *posteriority* of the object.

Since I have alluded to Cantor, for whose work I have a profound admiration, I had better say that what I have to tell you about Multitude is not in any degree borrowed from him. My studies of the subject began before his, and were nearly completed before I was aware of his work, and it is my independent development substantially agreeing in its results with his, of which I intend to give a rough sketch. And since I have recommended Dedekind's work, I will say that it amounts to a very able and original development of ideas which I had published six years previously. Schröder in the third volume of his logic shows how Dedekind's development might be made to conform more closely to my conceptions. That is interesting; but Dedekind's

development has its own independent value. I even incline to think that it follows a comparatively better way. For I am not so much in love with my own system as the late Professor Schröder was. I may add that quite recently Mr. Whitehead and the Hon. Bertrand Russell have treated of the subject; but they seem merely to have put truths already known into a uselessly technical and pedantic form.

DIAGRAMS

In order to expound my proposition that all necessary reasoning is diagrammatic, it is requisite that I explain exactly what I mean by a Diagram, a word which I employ in a wider sense than is usual. A Diagram, in my sense, is in the first place a Token, or singular Object used as a Sign; for it is essential that it should be capable of being perceived and observed. It is, however, what is called a General sign; that is, it denotes a general Object. It is, indeed, constructed with that intention, and thus represents the Object of that intention. Now the Object of an intention, purpose, or desire is always General. The Diagram represents a definite Form of Relation. This Relation is usually one which actually exists, as in a map, or is intended to exist, as in a Plan. But this is so far from being essential to the Diagram as such, that if details are added to represented existential or experiential peculiarities, such additions are distinctly of an undiagrammatic nature. The pure Diagram is designed to represent and to render intelligible, the Form of Relation merely. Consequently, Diagrams are restricted to the representation of a certain class of relations; namely, those that are intelligible. We may make a diagram of the Battle of Gettysburgh, because in a certain [sense], it may thus be rendered comprehensible. But we do not make a diagram simply to represent the relation of killer to killed, though it would not be impossible to represent this relation in a Graph-Instance; and the reason we do not is that there is little or nothing in that relation that is rationally comprehensible. It is known as a fact, and that is all. I believe I may venture to affirm that an intelligible relation, that is, a relation of thought, is created only by the act of representing it. I do not mean to say that if we should some day find out the metaphysical nature of the relation of killing, that intelligible relation would thereby be created. For if such be the nature of killing, such it always was, from the date of a certain "difficulty" and consurrection in a harvest field. No; for the intelligible relation has been signified, though not read by man, since the first killing was done, if not long before. The thought of God,—if the anthropomorphism is too distasteful to you, you can say the thought in the universe,—had represented it. At any rate, a Diagram is clearly in every case a sign of an ordered Collection or Plural,—or, more accurately, of the ordered Plurality or Multitude, or of an Order in Plurality. Now a Plural,—say, for example, Alexander, Hannibal, Caesar, and Napoleon,—seems unquestionably to be an *ens rationis*, that is to be created by the very representation of it; and Order appears to be of the same nature; that is, to be an Aspect, or result of taking account of things in a certain way. But these are subtle points; and I should like to give the question maturer consideration before risking much on the correctness of my solution. No such doubt bedims our perception that it is as an Icon that the Diagram represents the definite Form of intelligible relation which constitutes its Object, that is, that it represents that Form by a more or less vague resemblance thereto. There is not usually much vagueness, but I use that word because the Diagram does not itself define just how far the likeness extends, and in some characteristic cases such definition would be impossible, although the Form of Relation is in itself Definite, since it is General. It is, however, a very essential feature of the Diagram *per se* that while it is as a whole an Icon, it yet contains parts which are capable of being recognized and distinguished by the *affixion* to each of a distinct Semantic Index (or Indicatory Seme, if you prefer this phrase). Letters of the alphabet commonly fulfil this office. How characteristic these Indices are of the Diagram is shown by the fact that though in one form or another they are indispensable in using the diagram, yet they are seldom wanted for the general enunciation of the proposition which the Diagram is used for demonstrating. That which is most of all requisitionable from a definition of an artificial contrivance such as a Diagram is, is that it should state what the Definition does and what it is for; so that these points must now be touched upon even at the risk that this Definition of a Diagram might be threatened with danger to its absolute preeminence over all others, of what sort soever, that ever have been or ever shall be given, in respect to the chief grace of definitions, that of Brevity. That which every sign does is to determine its Interpretant. The responsive Interpretant, or Signification, of one kind of signs is a vague presentation, of another kind is an Action, while of a third it is involved in a Habit and is General in its nature. It is to this third class that a Diagram belongs. It has to be interpreted according to Conventions embodied in Habits. One contemplates the Diagram, and one at once prescind from the accidental characters that have no significance. They disappear altogether from one's understanding of the Diagram; and although they be of a sort which no visible thing be without (I am supposing the diagram to be of the visual kind), yet their [disappearance] is only an understood disappearance and does not prevent the features of the Diagram, now become a Schema, from being subjected to the scrutiny of observation. By what psychical apparatus this may get effected the logician does not inquire. It suffices for him, that one

can contemplate the Diagram and perceive that it has certain features which would always belong to it however its insignificant features might be changed. What is true of the geometrical diagram drawn on paper would be equally true of the same Diagram when put on the blackboard. The assurance is the same as that of any description of what we see before our eyes. But the action of the Diagram does not stop here. It has the same percussive action on the Interpreter that any other Experience has. It does not stimulate any immediate counter-action, nor does it, in its function as a Diagram, contribute particularly to any expectation. As Diagram, it excites curiosity as to the effect of a transformation of it

DIAGRAM OBSERVATION

. . . Modern exact logic shows that every operation of deductive reasoning consists of four steps as follows:
1st, a diagram, or visual image, whether composed of lines, like a geometrical figure, or an array of signs, like an algebraical formula, or of a mixed nature, like a graph, is constructed, so as to embody in iconic form, the state of things asserted in the premise (there will be but one premise, after all that is known and is pertinent is collected into one copulative proposition).
2nd, Upon scrutiny of this diagram, the mind is led to suspect that the sort of information sought may be discovered, by modifying the diagram in a certain way. This experiment is tried.
3rd. The results of the experiment are carefully observed. This is genuine experiential observation, even though the diagram exists only in the imagination; for after it has once been created, though the reasoner has power to change it, he has no power to make the creation already past and done different from what it is. It is, therefore, just as real an object as if drawn on paper. Included in this observation is the analysis of what is seen and the representation of it in general language. What is so observed is a new relation between the parts of the diagram not mentioned in the precept by which it was constructed.
4th, By repeating the experiment, or by the similarity of the experiment to many others which have often been repeated without varying the result, the reasoner infers inductively, with a degree of probability practically amounting to certainty, that every diagram constructed according to the same precept would present the same relation of parts which has been observed in the diagram experimented upon

TWO KINDS OF DEDUCTION

In my opinion, excepting Metaphysics there is no science that is more in need of the science of Logic than Psychology proper is. On the other hand, I found Logic largely on a study which I call Phaneroscopy, which is the keen observation of and generalization from the direct Perception of what we are immediately aware of. I find there are three kinds of possible warrant for a belief. Here is this distressing number 3 again, against which you seem to have sworn eternal enmity, but which *will* turn up again and again. I don't think you are willing to believe that space has three dimensions, are you? None of the 3 warrants is Positively Infallible although one of them is so in a Pickwickian sense. The first kind of warrant consists in the reasoner's being *disposed to believe* in his proposition. This goes toward warranting the belief, since the very undertaking to find out a truth one does not directly perceive assumes that things conform in a measure to what our reason thinks they should. In other words our Reason is akin to the Reason that governs the universe, we must assume that or despair of finding out anything. Now despair is always illogical; and we are warranted in thinking so, since otherwise all reasoning will be in vain. If it be so, a strong inward impulse to believe a given proposition tends to show that proposition to be true; and if it be not so, we never can discover what we don't directly perceive, do what we may.

Dec. 28. I have been suffering horribly for 2 days and am now like a drowned rat. Juliette was also ill all last night and it sometimes seems all but hopeless to keep her alive through the winter if it is going to keep on as it has begun with 50°F only attainable for a couple of hours. My ink will freeze in a few days I hear and then what shall I do, I wonder. The second warrant is in case one's inference is from some state of things capable of expression in a proposition (generally a copulative proposition of some complexity) and when every state of things not denied by this proposition is a state of things in which the conclusion is true. Such inference is Deduction, or Necessary Inference. There are two kinds of Deduction; and it is truly significant that it should have been left for me to discover this. I first found, and subsequently *proved* {See P 296}, that every Deduction involves the observation of a Diagram (whether Optical, Tactical, or Acoustic) and having drawn the diagram (for I myself always work with Optical Diagrams) one finds the conclusion to be represented by it. Of course, a diagram is required to comprehend any assertion. My two genera of Deductions are 1st those in which any

Diagram of a state of things in which the premisses are true represents the conclusion to be true and such reasoning I call *Corollarial* because all the corollaries that different editors have added to Euclid's *Elements* are of this nature. 2nd Kind. To the Diagram of the truth of the Premisses something else has to be added, which is usually a mere May-be and then the conclusion appears. I call this *Theorematic* reasoning because all the most important theorems are of this nature.

A very good example of this is the Ten Point Theorem whose diagram I have here drawn [Fig. 1]. If rays be drawn on a plane (or great circles on a hemisphere) so that three rays meet in one point, O , of the plane and on each of these rays two points, A and a on one, B and b , on another and C and c on the third; and if then from each of these six points two rays be drawn to 2 and the points on different rays through O ; so that the new rays may be lettered AB, AC, BC, ab, bc, ca ,

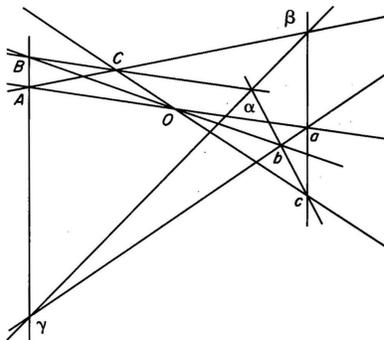


Figure 1. Ten Point Theorem

there will be for each of the 3 rays through O , two of the six rays last drawn that do not pass through lettered points on that rays, but these two rays will cut each other and their three intersections; that is the intersection of BC and bc , which I mark, α , and the intersection of CA and ca which I mark, β , and the intersection of AB and ab which I mark γ will lie on one ray! Now for more than two centuries, if not for three in all, the greatest mathematicians have tried to prove *that* by the diagram required to exhibit it *alone*, and have tried in vain. But it is readily proved in several ways by additions to the diagram; as for example by imagining the ray OBb to be the shadow on projection of a ray through O but not on the plane of $AOCac$. It then becomes evident, from the fact that two flats of dimensions M and N lying in a flat of dimensions P not greater than $M + N$ necessarily have a flat of dimensions $M + N - P$ in common. Thus 2 lanes in a flat of 3 dimensions have $2 + 2 - 3 = 1$ or a ray in common.

The 3rd kind of warrant is that which justifies the use of a method of inference provided it be carried out to the end consistently. There are 3 kinds of inference of this kind. They are all inferences from random samples. The strongest is that which is a sample (that is, a collection) of units. In that case, the theory of errors is applicable. The second kind is where there are no definite multitudes but where, as the sample is enlarged, the inference becomes stronger and stronger. The third kind which is the weakest of all forms of Induction is where the only defence is that if the conclusion is false, its falsity will sometime be detected if the method of inference be persisted in long enough. For example, if we infer from the fact that so closely as we have been able to measure, the sum of the angles of a triangle is 180° , therefore it is exactly so, the only warrant for this inference is that if we go on making our errors of measurement less and less, then if the sum be not exactly 180° , we shall ultimately find out that it is more or less if we persist in making the measurements. No inductive inference can be weaker than that and have any warrant at all.

CENOSCOPY (PHILOSOPHY)

[From *MS 1334*, Adirondack Summer School Lectures, 1905.]

We now come to what particularly concerns us, *Cenoscopy*, or *Philosophy*. You will observe that I make this a branch of science upon which all special science including psychology depends, while the empirical philosophers generally, Comte, followed by his imitators Spencer and Fiske (and all their violent opposition to him only make their dependency more), as well as Wundt and many others, make philosophy to depend upon the special sciences. I do not however so totally disagree with them as would appear at first glance. On the contrary, I quite acknowledge that there is such a science as they call positive philosophy or Synthetic Philosophy or Cosmic Philosophy [or] by some other such name. That science stands in my opinion at the head of the Sciences of Review. But all these philosophers make one of the most disastrous mistakes possible in confounding this science with *Cenoscopy*, which must not depend upon the special sciences inasmuch as they, on the contrary, need to depend upon it.

The reason that I hold this unification of widely separated sciences to be so disastrous is that it leads to the most important questions, especially logical questions, never receiving any serious consideration at any time. One branch of *cenoscopy* is logic, and one branch of logic is *methodeutic* which should investigate the general principles upon which scientific studies should be carried on. But under the plan of these philosophers, logic is to be founded upon the study of all the other sciences. That is to say you are first to make your researches and after that inquire how they ought to be made, locking the barn door after the horse is already stolen. To be sure, those philosophers maintain that two sciences can be reciprocally dependent upon each other. But the question of whether they can be so dependent or not, than which no question is of greater importance to the well-being of science, never receives at their hands any serious study. The question is asked in the vaguest terms, without any exact determination of what kind of dependence is referred to; and is answered on the basis of a loose analogy to cases in which when the number of observations exceeds the number required to draw a conclusion the conclusion is utilized to correct the observations. They do not analyze the conditions under which such a thing is possible. For the reason that under their method they first assume an answer to it without any serious examination; and then having acted upon that hasty answer throughout, it has naturally lost all practical importance, and so never does get any serious consideration. If they were to analyze the case which they fancy sustains their notion of reciprocal dependence, they would see that, far from sustaining that idea, it is quite opposed to it. A student of one subject[,] say[,] Dr. A[,] may go to a student of another subject, say[,] Dr. B, and ask him a question and make use of his answer; and subsequently Dr. B who gave the answer may ask a question of Dr. A, and if it be a wholly independent question there is no reason why he should not derive solid information from him. But the idea that Doctors A and B can each supply the other with the very same information or with information virtually the same is ridiculous. I maintain that no two sciences can depend each upon results of the other for principles without which it cannot exist as a science. Now all the special sciences,—in particular, dynamics[,] the most fundamental of the physical sciences[,] and the science of association[,] the most fundamental of the psychical sciences,—depend for their existence as sciences upon principles which only the metaphysician can properly discuss. To show how differently the ultra empiricists think, I will quote a sentence from the second edition of Wundt's *System der Philosophie*. He says: "Ich muss zugeben: wenn man es als ein Axiom betrachtet, metaphysische Systeme Müssen unabhängig von allen Einfüssen des Einzelwissens, sozusagen durch eine wissenschaftliche *generatio aequivoca*, entstehen, so lässt sich gegen jene Meinung nicht viel einwenden. In der That glaube ich dass es einen Unterschied macht, wo man anfangt, und wo man aufhört. Da ich von den Naturwissenschaften ausgegangen und dann durch die Beschäftigung mit empirische Psychologie zur Philosophie gekommen bin, so wurde es mir unmöglich erscheinen anders zu philosophiren als nach eine Methode, die dieser Folge der Probleme entspricht."¹ It is that slur about the *generatio aequivoca* that I wish to call attention which implies that a doctrine which is not based upon a result of one of the Einzelwissenschaften, or Special Sciences, has no basis at all. Now if such results depend upon logical principles without which no special science would have any credibility. It would therefore follow that logical principles are based on nothing at all, and that the special sciences which are based on those baseless principles have no solid basis, were it not that Wundt thinks that Logic and the Special Sciences, like two lying witnesses in court, sustain each other's credit. But according to me there are certain principles that no man doubts,—that you do not doubt in the least degree. Very vague, I confess, or rather insist, that they are; but still not entirely nonsensical; and that it is upon these principles of Common Sense that Logic and all *Cenoscopy* must rest; and since they are absolutely indubitable there can be no consistent dissatisfaction with them. These are not results of any special science, but on the contrary, antecede all scientific research and are taken for granted by all scientists. For scientific men are not sophists and wranglers over nothing, but are eminently men of Common Sense, that is of Human Instinct, beyond the gates of which it is impossible for men to push their criticism. I could not ask for more convincing support of this Common Sensism than is furnished by the ultra-

empiricist Ernst Mach in his book *{Die Mechanik in ihrer Entwicklung historisch-kritisch dargestellt}*.

NOTE

1. {I must admit: if one regards it as an axiom that metaphysical systems ought to arise independently of all influences of special sciences, so to speak by means of a scientific *generatio aequivoca* [equivocal or indeterminate generation], then there can be little objection to that opinion. In fact I believe that it makes a difference where one begins and one stops. Since I started out with the natural sciences, and then came to philosophy through my concern with empirical psychology, it seems impossible to me to philosophize other than according to a method which corresponds to this series of problems.}

PHANEROSCOPY

[This section from the following: *MS 1334*, Adirondack Summer School Lectures, 1905; *MS 293*, Prolegomena to an Apology for Pragmatism, ca. 1903; *MS 478*, syllabus of a Course of Lectures at the Lowell Institute beginning Nov. 23, 1903; and *The Century Dictionary Supplement*, pp. 217, 475, 981, 1189, and 1344.]

My views of Cenoscropy are, no doubt, immature. I have only been working on the problem some forty odd years and what can be expected from an infant: give me a hundred years more of vigor, be it in this body you see before you, or in that of some young man who will take up the work and find a successor, and we shall have something better than vague guessing. The division ought to be into three parts: *Phaneroscopy*, or *Protoscropy*, *Deuteroscopy*, and *Tritoscopy*.

Phaneroscopy is the description of the *phaneron*; and by the *phaneron* I mean the collective total of all that is in any way or in any sense present to the mind quite regardless of whether it corresponds to any real thing or not. If you ask present *when*, and to *whose* mind, I reply that I leave these questions unanswered, never having entertained a doubt that those features of the phaneron that I have found in my own mind are present at all times and to all minds. So far as I have developed this science of phaneroscopy it is occupied with the formal elements of the phaneron. I know that there is another series of elements imperfectly represented by Hegel's categories. But I have been unable to give any satisfactory account of them.

* * *

The System of Existential Graphs the development of which has only been begun by a solitary student, furnishes already the best diagram of the contents of the logical Quasi-mind that has ever yet been found and promises much future perfectionment. Let us call the collective whole of all that could ever be present to the mind in any way or in any sense, the Phaneron. Then the substance of every Thought (and of much beside Thought proper) will be a Constituent of the Phaneron. The Phaneron being itself far too elusive for direct observation, there can be no better method of studying it than through the Diagram of it which the System of Existential Graphs puts at our disposition. We have already tasted the first-fruits of this method, we shall soon gather more, and I, for my part, am in confident hope that by-and-by (not in my brief time) a rich harvest may be garnered by this means.

What, in a general way, does the Diagram of Existential Graphs represent the mode of structure of the Phaneron to be like? The question calls for a comparison, and in answering it a little flight of fancy will be in order. It represents the structure of the Phaneron to be quite like that of a chemical compound. In the imagined representation of the Phaneron (for we shall not, as yet, undertake actually to construct such a Graph), in place of the ordinary spots, which are Graphs not *represented* as compound, we shall have Instances of the absolutely Indecomposable Elements of the Phaneron (supposing it has any ultimate constituents, which, of course, remains to be seen, until we come to the question of their Matter; and as long as we are, as at present, discoursing only of their possible Forms, their being may be presumed), which [are] close enough analogues of the Atoms in the Chemical Graph of "Rational Formula." Each Elementary Graph, like each chemical element, has its definite Valency,—the number of Pegs {i.e. loose ends, compare free ions in chemistry} on the periphery of its Instance, and the Lines of Identity (which never branch [later Peirce allowed these lines to branch]) will be quite analogous to the chemical bonds. This is resemblance enough. It is true that in Existential Graphs we have the Cuts, to which nothing in the chemical Graph corresponds. Not yet, at any rate. We are now just beginning to rend away the veil that has hitherto enshrouded the constitution of the proteid bodies; but whatever I may conjecture as to those vast super-molecules, some containing fifteen thousand molecules, whether it seems probable on chemical grounds, or not, that they contain groups of opposite polarity from the residues outside those groups, and whether or not similar polar submolecules appear within the complex inorganic acids, it is certainly too early to take those into account in helping the exposition of the constitution of the phaneron. Were such ideas as solid as they are, in fact, vaporous, they ought to be laid aside until we have first thoroughly learned all the lessons of that analogy between the constitution of the phaneron and that of chemical bodies which consists in both the one and the other being composed of elements of definite valency.

In all natural classifications, without exception, distinctions of form, once recognized, take precedence

over differences of matter. Who would now throw Iron, with its valency, perhaps, of eight, as used to be done, into the same class with Manganese, of valency seven, Chromium, with its valency of six (though these three all belong to the even fourth series), and Aluminum with valency three and in the odd series three, rather than with Nickel and Cobalt, and even along with Ruthenium, Rhodium, and Palladium of the sixth series, and with the tenth-series Osmium, Iridium, and Platinum? Or who would for one instant liken ordinary alcohol to methyl ether (which has the same material composition) instead of with the alcoholates? The same precedence of Form over Matter is seen in the classification of psychical products. Some of Rafael's greatest pictures,—the Christ bearing the cross, for example,—are suffused with a brick red tinge, intended, I doubt not, to correct for the violet blueness of the deep shade of the chapels in which they were meant to be hung. But who would classify Rafael's paintings according to their predominant tinges instead of according to the nature of the composition, or the stages of Rafael's development? There is no need of insisting upon a matter so obvious. Besides there is a rational explanation of the precedence of Form over Matter in natural classifications. For such classifications are intended to render the composition of the entire classified collection rationally intelligible,—no matter what else they may be intended to show; and Form is something that the mind can "take in," assimilate, and comprehend; while Matter is always foreign to it, and though recognizable, is incomprehensible. The reason of this, again, is plain enough: Matter is that by virtue of which an object gains Existence, a fact known only by an Index, which is connected with the object only by brute force; while Form, being that by which the object is such as it is, is comprehensible. It follows that, assuming that there are any indecomposable constituents of the Phaneron, since each of these has a definite Valency, or number of Pegs to its Graph-Instance, this is the only Form, or, at any rate, the only intelligible Form, the Element of the Phaneron can have, the Classification of Elements of the Phaneron must, in the first place, be classified according to their Valency, just as are the chemical elements.

We call a Spot a Medad, Monad, Dyad, Triad, Tetrad, or by some other such name, according as its Valency, or the number of its Pegs, is 0, 1, 2, 3, 4, etc. It is to be remarked that a Graph not only has attachments to other Graphs through its Pegs and through Lines of Identity, but is also attached to the Area on which it is scribed, this Area being a Sign of a logical Universe. But it is not the same kind of attachment, since the Entire Graph of the Area is after a fashion *predicated* of that Universe, while the Lines of Identity represent Individual Subjects of which the two connected Spots are predicated either being regarded as determining the other. There would therefore be a confusion of thought in adding one to the number of Pegs and calling the sum the Valency. It would rather be the sum of two different categories of Valency. But in the case of the Medad, where there is no Peg, the possibility of scribing the Graph upon an Area is the only Valency the Spot has,—the only circumstance that brings it and other thoughts together. For this reason, we can, without other than a Verbal inconsistency, due to the incompleteness of our Terminology, speak of a Medad as a Monad. For some purposes, it is indispensable so to regard it.###

* * *

In classification generally, it may fairly be said to be established, if it ever was doubted, that Form, in the sense of structure is of far higher significance than Material. Valency is the basis of all external structure; and where indecomposability precludes internal structure,—as in the classification of elementary concepts,—valency ought to be made the first consideration. I term [this] the doctrine of *cenopythagoreanism*.

* * *

Now, before we go on to further conventions, let us [see to] what the three already admitted lead. The different figures are all supposed to be scribed on the *recto* {page}, and we will agree that the universe of discourse shall consist of all human persons now living on the earth.

Fig. 1.

The dot of Fig. 1 denotes then some person now living on the globe to whom the description witch applies; so that the whole asserts that a witch now lives on earth.

Figure 2.

The dot of Fig. 2, which denotes some person now living who is described as a witch and as rich; so that the

whole asserts that some rich witch exists, or some witch is rich.



Figure 3.

The line of Fig. 3 is a continuum of contiguous dots, and contiguity signifies identity; so that the heavy line asserts the identity of the individuals denoted by its extremities; and the whole is equivalent to Fig. 2, asserting that some rich person is a witch. Any sign scribed on this system (which by the way is called the *System of Existential Graphs*, but must on no account be confounded with the System of Entitative Graphs expressed in Vol. VII of *the Monist*), and which expresses an assertion is called [a] *graph*, or, more accurately, an *existential graph*, whether it is disconnected or joined to other graphs. The term *graph* is taken in the sense of a type; and that which is actually on the paper is a *graph-instance*. But the word "scribe" is taken in such a sense that to put a *graph-instance* on any area is accurately described as "scribing the *graph*" of which it is an instance on the same area.



Figure 4.

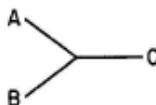


Figure 5.

Fig. 4 introduces a point of branching of a line of identity, which is an instance of the graph of ter-identity, so that Fig. 5 means A is identical at once with B and with C. Fig. 4 asserts that some philanthropist is at once a witch and a charlatan, or there is a person who reunites the three characters of witch, charlatan, and philanthropist.



Figure 6.

Fig. 6 asserts that some man loves a woman [.]



Figure 7.

Fig. 7 asserts that some mother loves somebody of whom she is the mother.



Figure 8.

Fig. 8 asserts that somebody steals something from a person and gives it back. (Here the universe embraces

things as well as persons.)

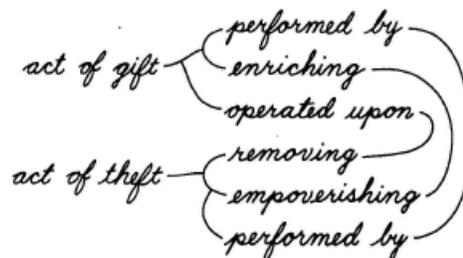


Figure 9.

Fig. 9 asserts the same thing, but in such a way that the only triadic graph instances are those of teridentity, by introducing acts into the universe. It is, however, easy to see that there is here no genuine reduction of the triadic relations of giving and stealing into dyadic relations with the relation of teridentity. I will leave the precise formulation of the reason why it is not so, as a highly instructive exercise to be performed by you, dear reader. I shall thus be doing something in return for your amiability in wading through this screed slough. Above all, do not imagine that I am insincere in these expressions.

The conventions so far adopted enable us to translate and analyze but a very limited range of signs; and it would [be] rash in the extreme to adopt any generalization simply because it was sustained by these few instances. Yet by examining how certain points stand now, and holding our results over to be modified when the system is further developed, we shall be able to divide our difficulties and so conquer them with greater facility. In the first place, it is none too early to say a word or two in explanation of the purpose of this diagrammatization of the course of logical thinking. This system follows pretty closely in the footsteps of the logical algebras, and especially in that of the "Universal Algebra of Logic" {e.g., *P* 167}, to which it might serve as an illuminative introduction, although it fulfills the principal common purpose of them and of it better, on the whole, than either of them do. It must not be supposed that the principal purpose even of the algebras is to furnish a method for passing from premisses to necessary conclusions. When a person first makes the acquaintance of Boolean algebra, never having heard of such a thing before, the fact that it works out the conclusions of complicated premisses semi-automatically strikes him as all but magical. This is natural; especially, as the person is likely to be pretty young; and thus he naturally gets the idea that the system is mainly, if not wholly, a calculus in the most wooden sense. But in truth there is nothing that ought to be surprising in the matter, and the same power will necessarily be possessed by any mode of exact and analytical expression of propositions: for any such mode there must be a code of permissible transformations that can be applied to produce any necessary conclusions from the first assumptions and will never give rise to anything but such a conclusion. Still less was any system of mine designed to be employed as a pasigraphy, although I dare say a superior pasigraphy could be developed upon the basis of existential graphs. The chief purpose which governed the construction of the algebras and still more exclusively that of existential graphs has been the facilitation of logical analysis, and the resolution of problems in logic.

For example, one of the puzzling problems of logic is how concepts can be combined. If two concepts, A and B, are to be compounded, there must, it would seem, be needed a combining concept C,—a sort of cement joined at once to A and to B. But then the question recurs, How is C to be compounded with A, and how with B? But the System of Existential Graphs at once solves the enigma. If the two bonds of Fig. 6 were broken, its meaning would be "Something is a man; something is a woman; something loves something." When the bonds are joined these indefinite somethings explain each other. The compound states that the something that loves something is the something that is a man, while the something that that something loves is the something that is a woman. The two explicit indefinites mutually define each other. The expression "explicit indefinite" calls for a word of explanation. Any idea that can be diagrammatized by our first three conventions is indefinite in countless ways. That is, countless questions might be asked as to what they refer to, and would remain unanswered in the idea itself. But the thought is not directed to them all. On the other hand the concept of "some-thing" not only leaves a possible question as to what it refers to unanswered, but itself thinks of that question. That is what I call an "explicit indefinite." It is expressed by the loose end of a line of identity. If we convert any ordinary point of a line of identity on the recto into a point of teridentity by starting there a new branch of the line, then if the end of the new branch be left loose, we shall thus diagrammatize the operation of thought by which an implicit indefiniteness is made explicit.

After the bonds of Fig. 6 are both broken, the three resulting graphs are still united by virtue of all

being attached to the same recto; so that the copulate judgment is diagrammatized, "There is a man, and something loves something, and there is a woman." But the mode of this composition does not differ in principle from the way by which, in the unseparated Fig. 6, the ideas of man and woman are joined. They are joined by their explicit indefinite being defined by the two explicit indefinites of "Something loves something." But this is precisely the thought expressed by a blank space of the recto which extends up to two loose ends of lines of identity, except that in the interpretations of the latter graph, "loves" is to be replaced by "is coexistent with." In this way we see that Fig. 6 with broken bonds expresses the thought "Some man is coexistent with something that loves something coexistent with a woman." That this analysis is correct will become evident if you reflect that the recto denotes the universe and that the placing of a dot upon the recto asserts that the something that dot denotes exists in the universe. Hence, if two separate dots are scribed on the recto, the whole expresses that the individuals those dots denote both exist in the same universe, that is, that they coexist. Indeed, we may once for all lay down the principle that any supposed analysis that can be represented in existential graphs as being an analysis must be a true analysis, provided the representation in existential graphs involves no iteration. The reason for this exception is that iteration is a device whereby two graphs may be combined without their combination being diagrammatized as such. This is the key of the problem about giving, as the reader has perhaps discovered. It appears, then, that, so far as we have as yet gone, all combination of concepts takes place by the mutual definition of indefinites; and it will be interesting to note whether or not this formula will require modification for cases not yet considered.

We have thus made a hopeful beginning in the task of constructing a system for diagrammatizing intellectual cognition. Before penetrating further we desiderate some synopsis, some forecast, of what lies before us. The domain of ideas (I purposely employ a vague term) and the domain of signs seem to coincide. Since, therefore, signs are considerably more tangible and overt to examination than ideas otherwise are, I will sketch out such a classification of signs as I can make in advance. Of course, having only studied signs during one brief life-time, I cannot know very much about them. I know, however, enough to see that the sketch of classification that I am about to give stands in some need of being more detailed, and to see how it could be carried into more detail. But I am restrained from doing this by the reflexion that if distinctions are made too fine and too numerous the mind cannot steadily retain a firm grasp of them. I proceed upon a principle adopted in advance of any particular examination of the different kinds of signs, and which is of such a nature as to be capable of giving a more or less detailed classification within almost any limits. But let it not be forgotten that I am only attempting such a classification as can be made almost entirely in advance of any acquaintance with signs.

I consider the essential structure of a sign. It has an Object and an Interpretant; or rather, more closely viewed, it has two Objects and three Interpretants. So then, three divisions of signs will be according to the mode of being of the sign, according to the nature of the Immediate Object, and according to the nature of [the] Immediate Interpretant. The Dynamical Object and the Dynamical Interpretant exist independently of the Sign; and therefore each affords two divisions of Signs, the one according to the mode of being of the Dynamical Correlate, the other according to the manner in which the Dynamical Object determines the Sign or the manner in which the Dynamical Interpretant is determined by the Sign. As for the Final Interpretant, that seems to necessitate three divisions of Signs, because besides its own various possible natures, and its dynamical relation to the sign, the Final Interpretant has a purposive relation to the Sign. Thus, in all, I make ten different divisions of signs.

I make each of these divisions a trichotomy, and my reason for doing so, though the exposition of it is somewhat long, seems to me to be at every step as plain and commonsensible as anything could be. Yet some of those who have heard me develop it have, by some perverse ingenuity (as it appears to me) persuaded themselves that it is most abstruse, if not mystical, or even utterly unintelligible. My own candid opinion is that these men, whose intellectual insight I otherwise most warmly respect, have in this been thrown into a panic or other mental spasm on detecting in my plain pointings out of truth that anybody ought to see, some threatened danger to their darling theory of the universe. In my opinion, however, it is logic that ought to determine metaphysics, and not metaphysics logic. I should be glad to learn what my present readers think of my reasons.

I invite you, Reader, to turn your attention to a subject which, at first sight, seems to have as little to do with signs as anything could. It is what I call the *Phaneron*, meaning the totality of all that is before or in your mind, or mine, or any man's, in any sense in which that expression is ever used. There can be no psychological difficulty in determining whether anything belongs to the *Phaneron*, or not; for whatever seems to be before the mind *ipso facto* is so, in my sense of the phrase. I invite you to consider, not everything in the *Phaneron*, but only its indecomposable elements, that is, those that are logically indecomposable, or indecomposable to direct inspection. I wish to make out a classification, or division, of these indecomposable elements; that is, I want to sort them into their different kinds according to their real characters. I have some acquaintance with two different such classifications, both quite true; and there may be others. Of these two I know of, one is a division according to the Form or Structure of the elements, the other according to their

Matter. The two most passionately laborious years of my life were exclusively devoted to trying to ascertain something for certain about the latter; but I abandoned the attempt, as beyond my powers, or, at any rate, unsuited to my genius. I had not neglected to examine what others had done but could not persuade myself that they had been more successful than I. Fortunately, however, all taxonomists of every department have found classifications according to structure to be the most important.

A reader may very intelligently ask, How is it possible for an indecomposable element to have any differences of structure? Of internal logical structure it would be clearly impossible. But of external structure, that is to say, structure of its possible compounds, limited differences of structure are possible; witness the chemical elements, of which the "groups," or vertical columns of Mendeleef's table, are universally and justly recognized as ever so much more important than the "series," or horizontal ranks in the same table. These columns are characterized by their several valencies, thus:

He, Ne, Ar, Kr, are medads ($\mu\eta\alpha$ none + the patronymic {-} ιαης);
 H, Li, Na, K, Cu, Rb, Ag, Cs, -, -, Au, are monads;
 G, Mg, Ca, Zn, Sr, Cd, Ba, —, —, Hg, Rn, are dyads;
 B, Al, Sc, Ga, Y, In, La, —, Yb, Tl, Ac, are triads;
 C, Si, Ti, Ge, Zr, Sn, Ce, -, -, Pb, Th, are tetrads;
 N, P, V, As, Sb, Pr, -, Ta, Bi, Po, are properly pentads (as PCl_5 , though owing to the junction of two pegs they often appear as triads[;] their pentad character is particularly required to explain certain phenomena of albumins);
 O, S, Se, Cr, Mo, Te, Nd, —, W, -, U, are properly hexads (though by junction of bonds they usually appear as dyads);
 F, Cl, Mn, Br, -, I, are properly heptads (usually appearing as monads); Fe, Co, Ni, Ru, Rh, Pd, -, -, -, Os, Ir, Pt, are octads;
 (Sm, Eu, Gd, Er, Tb, Bz, Cl, are not yet placed in the table.)

So, then, since elements may have structure through valency, I invite the reader to join me in a direct inspection of the valency of elements of the Phaneron. Why do I seem to see my reader draw back? Does he fear to be compromised by my bias, due to preconceived views? Oh, very well; yes, I do bring some convictions to the inquiry. But let us begin by subjecting these to criticism, postponing actual observation until all preconceptions are disposed of, one way or the other.

First, then, let us ask whether or not valency is the sole formal respect in which elements of the Phaneron can possibly vary. But seeing that the possibility of such a ground of division is dependent upon the possibility of multivalence, while the possibility of a division according to valency can in no wise be regarded as a result of relations between bonds, it follows that any division by variations of such relations must be taken as secondary to the division according to valency, if such divisions there be. Now (my logic here may be puzzling, but it is correct), since my ten trichotomies of signs, should they prove to be independent of one another (which is, to be sure, logically improbable), would suffice to furnish us classes of signs to the number of

$$\begin{aligned}
 3^{10} &= (3^2)^5 = (10 - 1)^5 = && 10^5 - 5 \cdot 10^4 \\
 &&& + 10 \cdot 10^3 - 10 \cdot 10^2 \\
 &&& + 5 \cdot 10 - 1 \\
 &= 50000 \\
 &+ 9000 \\
 &+ 49 \\
 &= 59049
 \end{aligned}$$

(*Viola*, a lesson in vulgar arithmetic thrown in to boot!) which calculation rather threatens a multitude of classes too great to be conveniently carried in one's head, rather than a group inconveniently small, we shall, I think, do well to postpone preparations for further divisions until there be some prospect of such a thing being wanted.

If, then, there be any formal division of elements of the Phaneron, there must be a division according to valency; and we may expect medads, monads, dyads, triads, tetrads, etc. Some of these, however, can be antecedently excluded, as impossible; although it is important to remember that these divisions are not exactly like the corresponding divisions of Existential Graphs, which have relation only to explicit indefinites. In the present application, a medad must mean an indecomposable idea altogether severed logically from every other; a monad will mean an element which, except that it is thought as applying to some subject, has no other characters than these which are complete in it without any reference to anything else; a dyad will be an elementary idea of something that would possess such characters as it does possess relatively to something else but regardless of any third object of any category[;] a triad would be an elementary idea of something which should be such as it were relatively to two others in different ways, but regardless of any fourth, and so on.

Some of these, I repeat, are plainly impossible. A medad would be a flash of mental "heat-lightning" absolutely instantaneous, Thunderless, unremembered, and altogether without effect.

It can further be said in advance, not, indeed, purely *a priori* but with the degree of apriority that is proper to {signs} logic, namely, as a necessary deduction from the fact that there are signs, that there must be an elementary triad. For were every element of the Phaneron a monad or a dyad, without the relative of teridentity (which is, of course, a triad) it is evident that no triad could ever be built up. Now the relation of every sign to its Object and Interpretant is plainly a triad. A triad might be built up of pentads or of any higher perissid elements in many ways. But it can be proved,—and really with extreme simplicity, though the statement of the general proof is confusing,—that no [indecomposable] element can have a higher valency than three.¹

* * *

Phenomenology is that branch of science which is treated in Hegel's *Phenomenologie des Geistes* (a work far too inaccurate to be recommended to any but mature scholars, though perhaps the most profound ever written) in which the author seeks to make out what are the elements or, if you please, the kinds of elements, that are invariably present in whatever is, in any sense, in mind. According to the present writer, these universal categories are three. Since all three are invariably present, a pure idea of any one, absolutely distinct from the others, is impossible; indeed, anything like a satisfactorily clear discrimination of them is a work of long and active meditation. They may be termed Firstness, Secondness, and Thirdness.

Firstness is that which is such as it is positively and regardless of anything else.

Secondness is that which is as it is in a *second* something's being as it is, regardless of any third.

Thirdness is that whose being consists in its bringing about a secondness.

There is no Fourthness that does not merely consist in Thirdnesses.

Of these three, Secondness is the easiest to comprehend, being the element that the rough-and-tumble of this world renders most prominent. We talk of *hard* facts. That hardness, that compulsiveness of experience, is Secondness. A door is slightly ajar. You try to open it. Something prevents. You put your shoulder against it, and experience a sense of effort and a sense of resistance. These are not two forms of consciousness; they are two aspects of one two-sided consciousness. It is inconceivable that there should be any effort without resistance, or any resistance without a contrary effort. This double-sided consciousness is Secondness. All consciousness, all being awake, consists in a sense of reaction between *ego* and *non-ego*, although the sense of effort be absent. It is a peculiarity of Secondness that in whatever field it presents itself there are two forms in which it may present itself; and these two forms differ in the Secondness being more thoroughly genuine in the one than in the other. Thus, reaction with a sense of striving, which we regard as brought on by ourselves, is volition. The Secondness there is strong. But in perception there is a sense of reaction without striving, which we think of as belonging to the outward thing. It is, as we may say, a *degenerate*² form of Secondness. The idea of Secondness seems here to be unnecessarily imported into the phenomenon, which might have been regarded as a mere dream, or rather as the quality of our being, without being materially different, except in the absence of the element of Secondness. Secondness cannot be thus eliminated from the phenomenon of volition. So both volition and perception can be exercised upon our own consciousness, giving rise to the conception [of] an Internal world,—which is nothing but consciousness with a Secondness imported into it,—and an External world. We not only thus experience Secondness, but we attribute it to outward things; which we regard as so many individual objects, or *quasi selves*, reacting on one another. Secondness only is while it actually is. The same thing can never happen twice. As Heraclitus said, one cannot cross the same river twice.³ ποταμῶν οὐκ ἐστὶν ἑμῖθινα ταυτ

For an example of Firstness, look at anything red. That redness is positively what it is. Contrast may heighten our consciousness of it; but the redness is not relative to anything; it is absolute, or positive. If one imagines or remembers red, his imagination will be either vivid or dim, but that will not, in the least, affect the quality of the redness, which may be brilliant or dull, in either case. The vividness is the degree of our consciousness of it, its reaction on us. The quality in itself has no vividness or dimness. In itself, then, it cannot be consciousness. It is, indeed, itself, a mere possibility. Now consciousness is either awake (more or less) or it has no being at all. Possibility, the mode of being of Firstness, is the embryo of being. It is not nothing. It is not existence. We not only have an immediate acquaintance with Firstness in the qualities of feelings and sensations, but we attribute it to outward things. We think that a piece of iron has a quality in it that a piece of brass has not, which *consists* in the steadily continuing *possibility* of its being attracted by a magnet. In fact, it seems undeniable that there really are such possibilities, and that though they are not existences, they are not *nothing*. They are possibilities, and nothing more. But whether this be admitted or not, it is undeniable that such elements are in the objects as we commonly conceive them; and that is all that concerns phenomenology. Firstness is too simple to have any degenerate form.

Thirdness is found wherever one thing brings about a Secondness between two things. In all such cases, it will be found that Thought plays a part. By thought is meant something like the meaning of a word, which may be "embodied," that is, may govern, this or that, but it is not confined to any existent. Thought is

often supposed to be something in consciousness; but on the contrary, it is impossible ever actually to be directly conscious of thought. It is something to which consciousness will conform, as a writing may conform to it. Thought is rather of the nature of a habit, which determines the suchness of that which may come into existence, when it does come into existence. Of such a habit one may be conscious of a symptom; but to speak of being directly conscious of a habit, as such, is nonsense. In a still fuller sense, Thirdness consists in the formation of a habit. In any succession of events that have occurred there must be some kind of regularity. Nay, there must be regularities strictly exceeding all multitude. But as soon as time adds another event to the series, a great part of those regularities will be broken, and so on indefinitely. If, however, there be a regularity that never will be and never would be broken, that has a mode of being consisting in this destiny or determination of the nature of things that the endless future shall conform to it. That is what we call a *law*. Whether any such law be discoverable or not, it is certain we have the idea of such a thing, and should there be such a *law*, it would evidently have a *reality*, *consisting in* the fact that predictions based on it would be borne out by actual events. Nobody can doubt that we know laws upon which we can base predictions to which actual events still in the womb of the future will conform to a marked extent, if not perfectly. To deny reality to such laws is to quibble about words. Many philosophers say they are "mere symbols." Take away the word *mere*, and this is true. They are symbols; and symbols being the only things in the universe that have any importance, the word "mere" is a great impertinence. In short, wherever there is thought there is Thirdness. It is genuine Thirdness that gives thought its characteristic, although Thirdness consists in nothing but one thing's bringing two into Secondness. In whatever field we find Thirdness, we find it occurring in three forms, whereof two are related to one another somewhat as the degenerate and genuine forms of Secondness, while the third has a living character that the others want.

In order to understand logic, it is necessary to get as clear notions as possible of these three categories and to gain the ability to recognize them in the different conceptions with which logic deals.

* * *

Cenopythagorean (sen"ō-pi-thag-ō-rē'an), a. (Gr. Καίθνος, recent, new, + E. *Pythagorean*.) Of or pertaining to a modern doctrine which resembles Pythagoreanism in accepting universal categories that are related to and are named after numbers.

Cenopythagorean phenomenology, universal phenomenology as it is understood by those who recognize the categories of *firstness*, *secondness*, and *thirdness*
 firstness, n. 2.

In the phenomenology of C. S. Peirce, the mode of being of that which is whatever it is regardless of anything else. This is true only of qualities of feeling, such as red or scarlet, and of such qualities of a similar nature as we suppose things to possess. Thus, although hardness consists in resistance to being scratched by a second thing, yet our ordinary common-sense conception is that a hard body possesses in itself a quality which it retains although it never comes into contact with another, and that this quality, which it possesses regardless of anything else and would possess though all of the universe never existed, is the cause of the difficulty of scratching it. The mode of being of such an internal quality is *firstness*. That which has firstness can have no parts, because the being of an object which has parts consists in the being of the parts, which are none of them the whole. Any analysis of the constituents of a quality is a description of something found to be true of whatever possesses that quality. But a quality of feeling, as it is in its mode of being as a quality, has no parts.

Secondness . . . n. 2. (a) The mode of being of an object which is such as it is by virtue of being connected with or related to another object or objects, regardless of any triadic relation. (b) The mode of connection or relation of such an object with such another. (c) In a looser sense, the secundal, or relative, character which

Thirdness . . . n. 2. The mode of being of that which is such as it is by virtue of a triadic relation which is incapable of being defined in terms of dyadic relations.

NOTES

1. {In a very important manuscript of 1897 (as yet unpublished), entitled "On Logical Graphs" (MS 482), Peirce gave a mathematical account of what might be called Valency Analysis (VA). In late manuscripts (the preceding one, for example) and letters, he often referred to this or its results, even in the last year of his life describing it as his "most lucid and interesting paper" (MS L 477). Working from within mathematical topology and early graph theory, in this MS Peirce gave a very general definition of a logical graph, then used those ideas to develop two graphical logic systems, the Entitative and the Existential. The latter system soon showed itself to be the most generally useful. However, while Peirce's graphical logic has been well discussed, the underlying ideas associated with VA have not. Moreover, VA is important for understanding his later work in general. So here is a quick summary of the results of Peirce's Valency Analysis.

The quickest access to it is by way of relations. Here is a dyadic relation: The fire caused an explosion. If we think of this relation independently of the things it relates, we might express it as ____ caused ____." We thereby

generalize the subjects of the causal relation. Peirce went one step further (in *MS 482* and elsewhere) by also generalizing the relation proper. One can think of his move here as a "black box" step. Thus, our example becomes



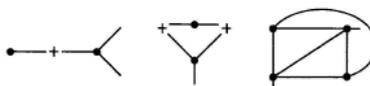
Where the dark dot is the relation, the content of which is no longer specifically known. Its two arms, or "loose ends," are the items (unspecified) that are related by the black box. Such a diagram allows one to see only the "external form" of the original relation. Here are drawings of a monad, a triad, a tetrad, and a pentad treated in that same fashion.



The valency of any combination of the above kind of graphs is determined simply by counting the number of loose ends. For instance, the valency of the above entire line of graphs is 13. The outer tips of loose ends represent places where connections with tips of other loose ends may occur. To connect two loose ends is to bond or compose. Composition in this system ALWAYS occurs using TWO AND ONLY TWO loose ends (compare Peirce's discussion, above, of "explicit indefiniteness"). Now, in any graph that has at least one bond, the overall valency will be given by this rule:

Valency of the overall graph is equal to the sum of the valencies of the component graphs imagined without bonds minus two times the number of bonds.

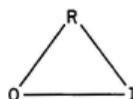
Here are two examples, drawn with "+" (to aid in visualizing) with "+" at the places where two loose ends have been bonded; the third example is drawn without an aid.



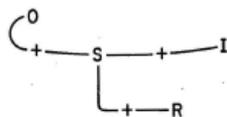
It follows as a corollary of this rule that no oddly valent graph can be composed exclusively of evenly valent graphs. Since the above rule is true of all graphs in VA, if we assumed that an oddly valent graph was made entirely of evenly valent graphs, we would get the absurd consequence that an oddly valent graph has a valency equal to the sum of only even numbers minus an even number (two times any number gives an even number). So the corollary holds that no odd graph can be made only from even graphs. This means that within this system, triads cannot be composed of dyads only. Notice also that, by definition, monads are indecomposable into more elementary things. If a monad bonds with another monad, a graph of zero valency (a medad) results. If a dyad bonds with a monad, a monad is produced. If a dyad bonds with another dyad, another dyad results; or from one dyad a medad may be produced. A triad may produce a monad if two of its loose ends are bonded. Two triads and two bonds will produce a dyad. Three triads and three bonds will produce a triad. But more important, two triads and one bond will produce a tetrad. And in general, tetrads and higher relations may be composed from $N - 2$ triads. Thus, a pentad may be composed of $5 - 2$, or 3, triads and 2 bonds; an octad may be composed of $8 - 2$, or 6, triads and 5 bonds.

These results, if applied to relations in general, suggest the general formal properties of Peirce's categories: (a) Firsts (monads), Seconds (dyads), and Thirds (triads) are unique (not derived from something more elementary within the system of VA); (b) Thirds are not reducible to Seconds (a slightly more general form of the corollary of the valency rule); Firsts, Seconds, and Thirds are complete, in the sense that with them the external form of all relations can in principle be derived (compare the rule that allows tetrads and higher relations to be made from combinations of a more elementary form, the triad); (c) Firsts and Seconds are contained within Thirds (in that triads may be bonded in ways to produce monads or dyads or triads).

The system of VA was widely applied by Peirce in his later work, much as a mathematical physicist might apply any mathematical hypothesis considered possibly relevant to some particular problem under study. Failure to take note of VA can produce some serious misunderstandings of Peirce. For instance, semioticians often display Peirce's notion of a sign relation with a triangle (where O, R, and I are the Object, Representamen, and Interpretant, respectively):



Peirce would have rejected this, for it displays a sign relation (the overall diagram) as composed entirely of dyads (as if it were reducible to an appropriate collection of efficient causal relations). One of the most important doctrines of his semeiotic is that signs are irreducible triadic relations. A more appropriate diagram for the sign relation "R represents O to I" would be (where S is the sign relation triad proper):



It seems to me that once one gives Peirce the applied system of VA, his position is logically reasonably tight. Probably the place his approach is most vulnerable to attack is the point at which his mathematical hypothesis is first applied to philosophical subject matter. Of course, Peirce was a man who regarded philosophy as a science in which such hypotheses were tested, and ultimately confirmed or disconfirmed.}

2. This term is borrowed from the geometers who speak of a pair of coplanar rays as a "degenerate conic." That is, the idea of their being a conic is unnecessarily imported.
3. These cannot be the very words of Heraclitus. But I have taken one of the more epigrammatic of half a dozen versions. The one most likely to be the correct quotation is too tame.

NORMATIVE SCIENCES

NORMATIVE SCIENCE

[From *MS 1334*, Adirondack Summer School Lectures, 1905.]

There arose in the Lyceum after the death of Aristotle [a question] as to whether Logic was a Speculative or Practical Science, an Art, or an Organon. It is not worth while to explain the meanings of these terms. The dispute, like many others, continued long after its meaning had been forgotten; and to this day Normative Sciences are frequently confounded with Practical Sciences. They are, however, properly speaking pure sciences, although practical studies are joined to them, so that in part they are truly Practical Sciences. But the normative science proper is not a practical science but is a study in the pure interest of theory. The conception of a family of sciences of their description is, I believe, due to Herbart, together with the word *normative*.

If we are to admit only two normative sciences, the first of these, which for convenience we call *ethics* relating to *control of the existent*, or say to actualization, and the second to *thought*, then that first ethics must have two sections, the one on the ultimate aim, or *summum bonum*, which will be the same as esthetics, if esthetics is not to be confined to sensuous beauty, but is to relate to the admirable and adorable generally, while the other, which may be called *critical ethics* treats of the conditions of conformity to the ideal.

If a new word must be made to designate that first section, I will suggest that *axiagastics* be the name of the science of the worthy of adoration. For I hold that the science must consist in the analysis of that which is admirable without any ulterior reason for being admirable, or in other words the analysis of what it is that excites that feeling akin to worship that fills one's whole life in the contemplation of an idea that excites this feeling. We must suppose that primitive or barbarous people hardly have this idea, since hardly any word in any language (as far as I know) expresses it. The French *beau* approximates it but is poor and cold. The primitive man found too much reason to think of the divine *not* as something to be passionately loved, but as something to be feared. Only the Greek *αγαμαι* is an exception[,] a glorious verb expressing how the common people in primitive times looked up to their leaders with passionate admiration and devotion[.] [It] comes the nearest to expressing the idea. Repeating the root, although the linguists do not say they are the same, I make the word *axiagastics*, for the science of that which is worthy to be admired and adored. But I am not thoroughly persuaded that Baumgarten's word *esthetics* will be too unwarrantably wrenched in being given this meaning.

Critical ethics will be the science of the general conditions of control; and it is easy to see that it comes chiefly to the doctrine of *self-control*.

Logic takes its start in that. It is but an application of ethics to thought. For *reasoning* differs from the formation of a new belief by the action of the association of ideas only by being a deliberate, controlled, piece of conduct.¹

However, the one sole way to success in logic is to regard it as a science of signs; and I defined it in 1867 as the theory of the relation of symbols to their objects. Further experience has convinced me that the best plan is to consider logic as embracing more than that, and [as] the general theory of signs of all kinds, not merely in their relation to their objects but in every way.

This way of looking upon logic is the one salvation for the science. You will object. You will say, "What[,] have not these signs got to be understood by some mind?" I reply, yes, undoubtedly. But when you speak vaguely of some mind's understanding them, you mingle confusedly many circumstances, some of them

essential, but furnishing no science until they are separated and each is definitely recognized in its precise functions and the merely accidental circumstances cleared away. What is thinking? It can only take place in signs. What is it to understand a sign? It is merely that the sign is interpreted in a sign in your minds. The whole function of the mind is to make a sign interpret itself in another sign and ultimately perhaps in an action or in an emotion. But the emotion is an idle thing unless it leads to an action. The action is an idle thing unless it produces a result which agrees with a sign through a sign. The whole problem is of signs; and if a mind has to be taken into account, it should be considered in its relation to signs.

There will be no preparation for understanding these lectures, which, judging by great psychologists, are not easy to understand, and I may say I am sure they are quite impossible to understand from the psychological standpoint since they turn principally upon elements of experience that the psychologist takes pains to shut out from view,—I say there is no better preparation than that of spending an hour more or less, remembering for how very short a time attention can be on the stretch without relaxation, in spending then the remnants of an hour most of it given to rest and to bringing attention back, in thinking how thought is a discourse of the self that has been to the critical self that is coming. "I says to myself," say the wise unlearned. Thought is nothing but a tissue of signs. The objects concerning which thought is occupied are signs. To try to strip off the signs and get down to the very meaning itself is like trying to peel an onion and get down to the very onion itself. "You may get down, however, to actions," say some of the pragmatists. I beg their pardon. You may get down to resolutions to act. But they are not actions but signs of actions. Get down to the very actions themselves and you can no longer find in them the meanings of the signs. Let us talk about yonder chair. "Chair" is a word. It is a sign. The *Vorstellung* chair is a sign. What will you have[?] Get down to the very impressions of sense, and there is no chair there. The life we lead is a life of signs. Sign under sign endlessly. In one of my early papers, in the second volume of the *Journal of Speculative Philosophy* {P 26}, I compared the case to the dipping of an ivory object {a triangle arranged thus 

Some men, like our dear James and like Thomas Davidson, the founder of this school, think that this [is] absurd. They think there must be a first line. That is, against the testimony of the sense or imagination they invoke logic. Well, we say to them, put the argument, if there be one into any syllogistic form. They are unable to do so. Very well, we say, if it cannot be put into any of the recognized forms of syllogism, tell us under what new form of reasoning you can put the argument that makes the testimony of fact absurd,—that makes it absurd that Achilles shall overtake the tortoise,—for that is the same thing. They are unable to do that. Then, we say do you mean to say that the real Achilles will not overtake the real tortoise is a fact? No, they admit that he will. So then, we say, we and all mathematicians, who are the only exact reasoners see no absurdity at all in this. But you have an inscrutable logic which cannot be reduced to any principle, which requires you from true premisses to insist upon what you yourselves admit to be a false conclusion. What is logic *for*, if not to prevent the passage from true premisses to false conclusions? To this, they have nothing to say, but they go their way still insisting that it is absurd that Achilles should overtake the tortoise. "Absurd," we call after them in a last appeal, [""] should mean contrary to reason, and you are unable to formulate this reason. Why not give up this logic and adopt that of all mathematicians?[""] More ineradicable with them than reason itself is that tendency of theirs to consider the general, the law, as an existent thing. I do not see what remains to us, to whom the whole matter is perfectly clear, but to say that they are minds congenitally incapable of a necessary form of thought. Certainly a logic which leads one from true premisses to admittedly false conclusions appears to us to be a poor form of logic; and when that logic is unable to formulate itself we are tempted to call it mental incapacity. Yet they base their whole philosophy [upon] this unhesitatingly. I for my part prefer to cast my lot with the mathematicians, whose logic does not kick up such capers, and is able to give an account of itself. "Well," says James, "I hate logic." I reply that I am sorry, but a philosophy ought not to be based upon that sentiment.

But though these gentlemen are unable to formulate their own logic, we have no difficulty at all in formulating it for them. They sometimes think that it is continuity only that they object to. They are mistaken. Continuity is not necessarily involved in what they pronounce absurd. What they find absurd is the endless. The very idea of the future, as endless, is to them absurd, though they may not at once see that it is. In short, though they think in signs like the rest of us, they do not really think in general signs, but only in such imperfect interpretations of them as can be made into images and slight inhibited efforts.

* * *

Having thus given you a preliminary idea of my point of view in the study of logic, I am going to impart to you a little of my doctrine . . . For what I have been talking to you is not cenoscopy at all. It is taxospuide.

NOTE

1. {From a variant page at *MS* 1334:42} Ethics is the Science of self-control. It has only two parts, according to me; for I turn the whole question of the *summum bonum* over to *axiagastics*, called *Esthetics*, thus making ethics to depend upon esthetics as many others have done. That leaves two things for ethics itself to do. The first is to describe the operation of self-control, not psychologically, that is, not as a student of the law of thinking ought to describe it, but as it presents itself as a problem to the psychologist to explain it. The other part of ethics, I call critical ethics. It is not far from what is called casuistry, except that unlike that it does not consist in dealing with cases. It tells to what conditions conduct must conform in order to be right. Logic is an application of ethics, just as ethics is an application of *axiagastics*[.] For the difference between reasoning and the creation of a new belief by the association of ideas is that reasoning is *self-controlled thought*, or thought *tamed and trained*.

ESTHETICS (AS PURPOSE OR IDEAL)

[Form *MS* 449, Lowell Lectures, "Second Draught," 1903.]

What does right reasoning consist in? It consists in such reasoning as shall be conducive to our ultimate aim. What, then, is our ultimate aim? Perhaps it is not necessary that the logician should answer this question. Perhaps it might be possible to deduce the correct rules of reasoning from the mere assumption that we have some ultimate aim. But I cannot see how this could be done. If we had, for example, no other aim than the pleasure of the moment, we should fall back into the same absence of any logic that the fallacious argument would lead to. We should have no ideal of reasoning, and consequently no norm. It seems to me that the logician ought to recognize what our ultimate aim is. It would seem to be the business of the moralist to find this out, and that the logician has to accept the teaching of ethics in this regard. But the moralist, as far as I can make it out, merely tells us that we have a power of self-control, that no narrow or selfish aim can ever prove satisfactory, that the only satisfactory aim is the broadest, highest, and most general possible aim; and for any more definite information, as I conceive the matter, he has to refer us to the esthetician, whose business it is to say what is the state of things which is most admirable in itself regardless of any ulterior reason. So, then, we appeal to the esthete to tell us what it is that is admirable without any reason for being admirable beyond its inherent character. Why, that, he replies is the beautiful. Yes, we urge, such is the name that you give to it but what is it? What is this character? If he replies that it consists in a certain quality of feeling, a certain *bliss*, I for one decline altogether to accept the answer as sufficient. I should say to him, My dear Sir, if you can prove to me that this quality of feeling that you speak of does, as a fact, attach to what you call the beautiful, or that which would be admirable without any reason for being so, I am willing enough to believe you; but I cannot without strenuous proof admit that any particular quality of feeling is admirable without a reason. For it is too revolting to be believed unless one is forced to believe it. A fundamental question like this, however practical the issues of it may be, differs entirely from any ordinary practical question, in that whatever is accepted as good in itself must be accepted without compromise. In deciding any special question of conduct it is often quite right to allow weight to different conflicting considerations and calculate their resultant. But it is quite different in regard to that which is to be [the] aim of all endeavor. The object admirable that is admirable *per se* must, no doubt, be general. Every ideal is more or less general. It may be a complicated state of things. But it must be a *single* ideal; it must have *unity*, because it is an idea and unity is essential to every idea and every ideal. Objects of utterly disparate kinds may, no doubt, be admirable, because some special reason may make each one of them so. But when it comes to the ideal of the admirable, in itself, its very nature of its being is to be a precise idea; and if somebody tells me it is either this, or that, or that other, I say to him, It is clear you have no *idea* of what precisely it is. But an ideal must be capable of being embraced in a unitary idea, or it is no ideal at all. Therefore, there can be no compromises between different considerations here. The admirable ideal cannot be too extremely admirable. The more thoroughly it has whatever character is essential to it, the more admirable it must be. Now what would the doctrine that that which is admirable in itself is a quality of feeling, come to if taken in all its purity and carried to its furthest extreme,—which should be the extreme of admirableness? It would amount to saying that the one ultimately admirable object is the unrestrained gratification of a desire, regardless of what the nature of that desire may be. Now that is too shocking. It would be the doctrine that all the higher modes of consciousness with which we are acquainted in ourselves, such as love and reason, are good only so far as they subserve the lowest of all modes of consciousness. It would be the doctrine that this vast universe of Nature which we contemplate with such awe is good only to produce a certain quality of feeling. Certainly, I must be excused for not admitting that doctrine unless it be proved with the utmost evidence. So, then, what proof is there that it is true? The only reason for it that I have been able to learn is that *gratification, pleasure*, is the only conceivable result that is satisfied with itself; and therefore since we are seeking for that which is *fine* and *admirable* without any reason

beyond itself, *pleasure, bliss*, is the only object which can satisfy the conditions. This is a respectable argument. It deserves consideration. Its premiss, that pleasure is the only conceivable result that is perfectly self-satisfied, must be granted. Only, in these days of evolutionary ideas which are traceable to the French Revolution as their instigator, and still further back to Galileo's experiment at [the] leaning tower of Pisa, and still further back to all the stands that have been made by Luther and even by Robert of Lincoln against attempts to bind down human Reason to any prescriptions fixed in advance,—in these days, I say, when these ideas of progress and growth have themselves grown up so as [to] occupy our minds as they now do, how can we be expected [to] allow the assumption to pass that the admirable in itself is any stationary result? The explanation of the circumstance that the only result that is satisfied with itself is a quality of feeling is that reason always looks forward to an endless future and expects endlessly to improve its results. Consider, for a moment, what Reason, as well as we can today conceive it, really is. I do not mean man's faculty which is so called from its embodying in some measure Reason, or *Nouç*, as something manifesting itself in the mind, in the history of mind's development, and in nature. What is this reason? In the first place, it is something that never can have been completely embodied. The most insignificant of general ideas always involves conditional predictions or requires for its fulfillment that events should come to pass, and all that ever can have come to pass must fall short of completely fulfilling its requirements. A little example will serve to illustrate what I am saying. Take any general term whatever. I say of a stone that it is *hard*. That means that so long as the stone remains hard, every essay to scratch it by the moderate pressure of a knife will surely fail. To call the stone *hard* is to predict that no matter how often you try the experiment, it will fail every time. That innumerable series of conditional predictions is involved in the meaning of this lowly adjective. Whatever may have been done will not begin to exhaust its meaning. At the same time, the very being, of the General, of Reason, is of such a mode that this being *consists* in the Reason's actually governing events. Suppose a piece of carborundum has been made and has subsequently been dissolved in aqua regia without anybody at any time, so far as I know, ever having tried to scratch it with a knife. Undoubtedly, I may have good reason, nevertheless, to call it hard; because some actual fact has occurred such that Reason compels me to call it so, and a general idea of all the facts of the case can only be formed if I do call it so. In this case, my calling it hard is an actual event which is governed by that law of hardness of the piece of carborundum. But if there were no actual fact whatsoever which was meant by saying that the piece of carborundum was hard, there would be not the slightest meaning in the word hard as applied to it. The very being of the general, of reason, *consists* in its governing individual events. So, then, the essence of Reason is such that its being never can have been completely perfected. It always must be in a state of incipency, of growth. It is like the character of a man which consists in the ideas that he will conceive and in the efforts that he will make, and which only develops as the occasions actually arise. Yet in all his life long no son of Adam has ever fully manifested what there was in him. So, then, the development of Reason requires as a part of it the occurrence of more individual events than ever can occur. It requires too all the coloring of all qualities of feeling, including pleasure in its proper place among the rest. This development of Reason consists, you will observe in embodiment, that is, in manifestation. The creation of the universe, which did not take place during a certain busy week, in the year 4004 B.C. but is going on today and never will be done, is this very development of Reason. I do not see how one can have a more satisfying ideal of the admirable than the development of reason so understood. The one thing whose admirableness is not due to an ulterior Reason is Reason itself comprehended in all its fullness, so far as we can comprehend it. Under this conception, the ideal of conduct will be to execute our little function in the operation of the creation by giving a hand toward rendering the world more reasonable whenever, as the slang is, it is "up to us," to do so. In logic, it will be observed that knowledge is reasonableness; and the ideal of reasoning will be to follow such methods as must develop knowledge the most speedily. . . .

ETHICS (AS SELF-CONTROL)

[From "The Ethics of Terminology," *Syllabus of Certain Topics of Logic* (P 1035). (Boston: Mudge, 1903).]

In order that my use of terms, notations, etc., may be understood, I explain that my conscience imposes upon me the following rules. Were I to make the smallest pretension to dictate the conduct of others in this matter, I should be reprov'd by [the] first of these rules. Yet if I were to develop the reasons the force of which I feel myself, I presume they would have weight with others.

Those reasons would embrace, in the first place, the consideration that the woof and warp of all thought and all research is symbols, and the life of thought and science is the life inherent in symbols; so that it is wrong to say that a good language is *important* to good thought, merely; for it is of the essence of it. Next would come the consideration of the increasing value of precision of thought as it advances. Thirdly, the progress of science cannot go far except by collaboration; or, to speak 'more accurately, no mind can take one step without the aid of other minds. Fourthly, the health of the scientific communion requires the most absolute mental freedom.

Yet the scientific and philosophical worlds are infested with pedants and pedagogues who are continually endeavoring to set up a sort of magistrature over thoughts and other symbols. It thus becomes one of the first duties of one who sees what the situation is, energetically to resist everything like arbitrary dictation in scientific affairs, and above all, as to the use of terms and notations. At the same time, a general agreement concerning the use of terms and of notations,—not too rigid, yet prevailing, with most of the co-workers in regard to most of the symbols, to such a degree that there shall be some small number of different systems of expression that have to be mastered,—is indispensable. Consequently, since this is not to be brought about by arbitrary dictation, it must be brought about by the power of rational principles over the conduct of men.

Now what rational principle is there which will be perfectly determinative as to what terms and notations shall be used, and in what senses, and which at the same time possesses the requisite power to influence all right-feeling and thoughtful men?

In order to find the answer to that question, it is necessary to consider, first, what would be the character of an ideal philosophical terminology and system of logical symbols; and secondly, to inquire what the experience of those branches of science has been that have encountered and conquered great difficulties of nomenclature, etc., in regard to the principles which have proved efficacious, and in regard to unsuccessful methods of attempting to produce uniformity.

As to the ideal to be aimed at, it is, in the first place, desirable for any branch of science that it should have a vocabulary furnishing a family of cognate words for each *scientific* meaning, unless its different meanings apply to objects of different categories that can never be mistaken for one another. To be sure, this requisite might be understood in a sense which would make it utterly impossible. For every symbol is a living thing, in a very strict sense that is no mere figure of speech. The body of the symbol changes slowly, but its meaning inevitably grows, incorporates new elements and throws off old ones. But the effort of all should be to keep the *essence* of every scientific term unchanged and exact; although absolute exactitude is not so much as conceivable. Every symbol is, in its origin, either an image of the idea signified, or a reminiscence of some individual occurrence, person or thing, connected with its meaning, or is a metaphor. Terms of the first and third origins will inevitably be applied to different conceptions; but if the conceptions are strictly analogous in their principal suggestions, this is rather helpful than otherwise, provided always that the different meanings are remote from one another, both in themselves and in the occasions of their occurrence. Science is continually gaining new conceptions; and every new *scientific* conception should receive a new word, or better, a new family of cognate words. The duty of supplying this word naturally falls upon the person who introduces the new conception; but it is a duty not to be undertaken without a thorough knowledge of the principles and a large acquaintance with the details and history of the special terminology in which it is to take a place, nor without a sufficient comprehension of the principles of word-formation of the national language, nor without a proper study of the laws of symbols, in general. That there should be two different terms of identical scientific value may or may not be an inconvenience, according to circumstances. Different systems of expression are often of the greatest advantage.

The ideal terminology will differ somewhat for different sciences. The case of philosophy is very peculiar in that it has positive need of popular words in popular sense,—not as its own language (as it has too usually used those words), but as objects of its study. It thus has a peculiar need of a language distinct and detached from common speech, such a language as Aristotle, the scholastics, and Kant endeavored to supply, while Hegel endeavored to destroy it. It is good economy for philosophy to provide itself with a vocabulary so outlandish that loose thinkers shall not be tempted to borrow its words. Kant's adjectives "objective" and "subjective" proved not to be barbarous enough, by half, long to retain their usefulness in philosophy, even if there had been no other objection to them. The first rule of good taste in writing is to use words whose meanings will not be misunderstood; and if a reader does not know the meaning of the words, it is infinitely better that he should know he does not know it. This is particularly true in logic, which wholly consists, one might almost say, in exactitude of thought.

The sciences which have had to face the most difficult problems of terminology have unquestionably been the classificatory sciences of physics, chemistry and biology. The nomenclature of chemistry is, on the whole, good. In their dire need, the chemists assembled in congress, and adopted certain rules for forming names of substances. Those names are well-known, but they are hardly used. Why not? Because the chemists were not psychologists, and did not know that a congress is one of the most impotent of things, even less influential by far than a dictionary. The problem of the biological taxonomists has, however, been incomparably more difficult; and they have solved it (barring small exceptions) with brilliant success. How did they accomplish this? Not by appealing to the power of congresses, but by appealing to the power of the idea of right and wrong. For only make a man *really see* that a certain line of conduct is wrong, and he *will* make a strong endeavor to do the right thing,—be he thief, gambler, or even a logician or moral philosopher. The biologists simply talked to one another, and made one another see that when a man has introduced a conception into science, it naturally becomes both his privilege and his duty to assign to that conception suitable scientific expressions; and that

when a name has been conferred upon a conception by him to whose labors science is indebted for that conception, it becomes the duty of all,—a duty to the discoverer, and a duty to science,—to accept his name, unless it should be of such a nature that the adoption of it would be unwholesome for science; that should the discoverer fail in his duty, either by giving no name or an utterly unsuitable one, then, after a reasonable interval, whoever first has occasion to employ a name for that conception must invent a suitable one; and others ought to follow him; but that whoever deliberately uses a word or other symbol in any other sense than that which was conferred upon it by its sole rightful creator commits a shameful offence against the inventor of the symbol and against science, and it becomes the duty of the others to treat the act with contempt and indignation.

As fast as the students of any branch of philosophy educate themselves to a genuine scientific love of truth to the degree to which the scholastic doctors were moved by it, suggestions similar to those above will suggest themselves; and they will consequently form a technical terminology. In logic, a terminology more than passably good has been inherited by us from the scholastics. This scholastic terminology has passed into English speech more than into any other modern tongue, rendering it the most logically exact of any. This has been accompanied by the inconvenience that a considerable number of words and phrases of scientific logic have come to be used with a laxity quite astounding. Who, for example, among the dealers in Quincy Hall who talks of "articles of *prime necessity*," would be able to say what that phrase "prime necessity" strictly means? He could not have sought out a more technical phrase. There are dozens of other loose expressions of the same provenance.

Having thus given some idea of the nature of the reasons which weigh with me, I proceed to state the rules which I find to be binding upon me in this field.

1st, To take pains to avoid following any recommendation of an arbitrary nature as to the use of philosophical terminology.

2nd, To avoid using words and phrases of vernacular origin as technical terms of philosophy.

3rd, To use the scholastic terms in their anglicised forms for philosophical conceptions, so far as they are strictly applicable; and never to use them in other than their proper senses.

4th, For ancient philosophical conceptions overlooked by the scholastics, to imitate, as well as I can, the ancient expression.

5th, For precise philosophical conceptions introduced into philosophy since the middle ages, to use the anglicised form of the original expression, if not positively unsuitable, but only in its precise original sense.

6th, For philosophical conceptions which vary by a hair's breadth from those for which suitable terms exist, to invent terms with a due regard for the usages of philosophical terminology and those of the English language but yet with a distinctly technical appearance. Before proposing a term, notation, or other symbol, to consider maturely whether it perfectly suits the conception and will lend itself to every occasion, whether it interferes with any existing term, and whether it may not create an inconvenience by interfering with the expression of some conception that may hereafter be introduced into philosophy. Having once introduced a symbol, to consider myself almost as much bound by it as if it had been introduced by somebody else; and after others have accepted it, to consider myself more bound to it than anybody else.

7th, To regard it as needful to introduce new systems of expression when new connections of importance between conceptions come to be made out, or when such systems can, in anyway, positively subserve the purposes of philosophical study.

LOGIC AS SEMEIOTIC (THE THEORY OF SEMEIOSIS OR SIGN ACTION)

STECHEOTIC (BASIC DEFINITIONS)

[From *MS 478*, "Speculative Grammar," 1903.]

A *Sign*, or *Representamen*, is a First, which stands in such a genuine triadic relation to a Second, called its *Object*, as to be capable of determining a Third, called its *Interpretant*, to assume the same triadic relation to its Object in which it stands itself to the same Object. The triadic relation is *genuine*, that is, its three members are bound together by it in a way that does not consist in any complexus of dyadic relations. That is the reason the Interpretant, or Third, cannot stand in a mere dyadic relation to the Object, but must stand in such a relation to it as the Representamen itself does. Nor can the triadic relation in which the Third stands be merely similar to that in which the First stands, for this would make the relation of the Third to the First a degenerate Secondness merely. The Third must indeed stand in such a relation, and thus must be capable of determining a Third of its own; but besides that, it must have a second triadic relation in which the Representamen, or rather the relation thereof to its Object, shall be its own (the Third's) Object, and must be capable of determining a Third to this relation. All this must equally be true of the Third's Thirds and so on endlessly; and this, and more, is involved in the familiar idea of a Sign; and as the term Representamen is here used, nothing more is implied. A *Sign* is a Representamen with a mental Interpretant. Possibly there may be Representamens that are not Signs. Thus, if a sunflower, in turning towards the sun, becomes by that very act fully capable, without further condition, of reproducing a sunflower which turns in precisely corresponding ways toward the sun, and of doing so with the same reproductive power, the sunflower would become a Representamen of the sun. But *thought* is the chief, if not the only, mode of representation.

Representamens are divided by two trichotomies. The first and most fundamental is that any Representamen is either an *Icon*, an *Index*, or a *Symbol*. Namely, while no Representamen actually functions as such until it actually determines an Interpretant, yet it becomes a Representamen as soon as it is fully capable of doing this; and its Representative Quality is not necessarily dependent upon its ever actually determining an Interpretant, nor even upon its actually having an Object.

An *Icon* is a Representamen whose Representative Quality is a Firstness of it as a First. That is, a quality that it has *qua* thing renders it fit to be a representamen. Thus, anything is fit to be a *Substitute* for anything that it is like. (The conception of "substitute" involves that of a purpose, and thus of genuine thirdness.) Whether there are other kinds of substitutes or not we shall see. A Representamen by Firstness alone can only have a similar Object. Thus, a Sign by Contrast, denotes its object only by virtue of a contrast, or Secondness, between two qualities. A Sign by Firstness is an image of its object and, more strictly speaking, can only be an *idea*. For it must produce an Interpretant idea; and an external object excites an idea by a reaction upon the brain. But most strictly speaking, even an idea, except in the sense of a possibility, or Firstness, cannot be an Icon. A possibility alone is an Icon purely by virtue of its quality; and its object can only be a Firstness. But a Sign may be *iconic*, that is, may represent its object mainly by its similarity, no matter what its mode of being. If a substantive be wanted, an iconic representamen may be termed a *hypoicon*. Any material image, as a painting, is largely conventional in its mode of representation; but in itself, without legend or label it may be called a *hypoicon*. Hypoicons may [be] roughly divided according to the mode of Firstness of which they partake. Those which partake the simple qualities, or First Firstnesses, are *images*; those which represent the relations, mainly dyadic, or so regarded, of the parts of one thing by analogous relations in their own parts, are *diagrams*; those which represent the representative character of a representamen by representing a parallelism in something else, are *metaphors*.

An *Index* is a Representamen whose Representative Firstness consists in a genuine Secondness, or existential relation to its Object. Thus the shout of a driver, "Hi, there!" (the very event, when it takes place) considered as simply calling attention to him is an Index. So, the veering of a weather-cock is an Index of the veering of the wind which produces it. It follows from the definition that an Index and its Object must alike be existent individual Seconds or Secondnesses, things or facts. The object directly indicated must actually be there and then. A *Subindex*, or *hyposeme* is a sign which denotes its object principally because it is actually connected with it, without necessarily being strictly an individual Index. Thus, a proper name, a personal, demonstrative, or relative pronoun is not an individual or existing thing, but it represents its object by virtue, chiefly, of being actually connected with it. An Index may have a Hypoicon as a constituent part of it. Thus, a weather-cock shows the direction of the wind iconically; but it shows that it is the wind's direction, and that as a matter of present fact, as an *index*, almost free from any conventional admixture.

A *Symbol* is a Representamen whose Representative character consists precisely in its being a rule that will determine its Interpretant. All words, sentences, books, and other conventional signs are Symbols. We

speak of writing or pronouncing the word "man"; but it is only a *replica*, or embodiment of the word, that is pronounced or written. The word itself has no existence although it has a real being, *consisting in* the fact that existents *will* conform to it. It is a general mode of succession of three sounds or representamens of sounds, which becomes a sign only in the fact that a habit, or acquired law, will cause replicas of it to be interpreted as meaning a law or men. The word and its meaning are both general rules; but the word alone of the two prescribes the qualities of its replicas in themselves. Otherwise the "word" and its "meaning" do not differ, unless some special sense be attached to "meaning."

A Symbol is a law, or regularity of the indefinite future. Its Interpretant must be of the same description; and so must be also its complete immediate Object, or meaning.¹ But a law necessarily governs, or "is embodied in" individuals, and prescribes some of their qualities. Consequently, a constituent of a Symbol may be an Index, and a constituent may be an Icon. A man walking with a child points his arm up into the air and says, "There is a balloon." The pointing arm is an essential part of the symbol without which the latter would convey no information. But if the child asks, ["]What is a ballon,["] and the man replies, "It is something like a great big soap bubble," he makes the image a part of the symbol. Thus, while the complete object of a symbol, that is to say, its meaning, is of the nature of a law, it must *denote* an individual, and must *signify* a character. A *genuine* symbol is a Symbol that has a general meaning. There are two kinds of degenerate symbols, the *Singular Symbol* whose Object is an existent individual, and which signifies only such characters as that individual may realize; and the *Abstract Symbol*, whose only Object is a character. Although the immediate Interpretant of an Index must be an Index, yet since its Object may be the Object of a Singular Symbol, the Index may have such a Symbol for its indirect Interpretant. Even a genuine Symbol may be an imperfect Interpretant of it. So an *icon* may have a degenerate Index, or an Abstract Symbol for an indirect Interpretant, and a genuine Index of Symbol for an imperfect Interpretant.

The second trichotomy of representamens is into 1st, simple signs, substitutive signs or *sumisigns*; 2nd, double signs, informational signs, quasi-propositions, or *dicisigns*; 3rd, triple signs, rationally persuasive signs, *arguments*, or *suadisigns*. Of these three classes, the one whose nature is, by all odds, the easiest to comprehend, is the second, that of quasi-propositions, despite the fact that the question of the essential nature of the "judgment" is today quite the most vexed of all questions of logic. The truth is that *all* these classes are of very intricate natures; but the problem of the day is needlessly complicated by the attention of most logicians, instead of extending to propositions in general, being confined to "judgments," or acts of mental acceptance of propositions, which not only involve characters, additional to those of propositions in general,—characters required to differentiate them as propositions of a particular kind,—but which further involve, beside the mental proposition itself, the peculiar act of assent. The problem is difficult enough, when we merely seek to analyze the essential nature of the *Dicisign*, in general, that is, the kind of sign that *conveys* information, in contradistinction to a sign from which information may be derived.²

The readiest characteristic test showing whether a sign is a *Dicisign* or not, is that a *Dicisign* is either true or false, but does not directly furnish reasons for its being so. This shows that a *Dicisign* must profess to refer or relate to something as having a real being independently of the representation of it as such, and further that this reference or relation must not be shown as rational, but must appear as a blind Secondness. But the only kind of sign whose object is necessarily existent is the genuine Index. This Index might, indeed, be a part of a Symbol; but in that case the relation would appear as rational. Consequently a *Dicisign* necessarily represents itself to be a genuine Index, and to be nothing more. At this point let us discard all other considerations, and see what sort of sign a sign must be that in any way represents itself to be a genuine Index of its Object, and nothing more. Substituting for "represents __ to be" a clearer interpretation, the statement is that the *Dicisign's* Interpretant represents an identity of the *Dicisign* with a genuine Index of the *Dicisign's* real Object. That is, the Interpretant represents a real existential relation, or genuine Secondness, as subsisting between the *Dicisign* and its real Object. But the Interpretant of a Sign can represent no other Object than that of the Sign itself. Hence this same existential relation must be an Object of the *Dicisign*, if the latter have any real Object. This represented existential relation, in being an Object of the *Dicisign*, makes that real Object, which is correlate of this relation also an Object of the *Dicisign*.

This latter Object may be distinguished as the *Primary Object*, the other being termed the *Secondary Object*. The *Dicisign*, in so far as it is the relate of the existential relation which is the Secondary Object of the *Dicisign*, can evidently not be the entire *Dicisign*. It is at once a part of the Object and a part of the Interpretant of the *Dicisign*. Since the *Dicisign* is represented in its Interpretant to be an Index of a complexus as such, it must be represented in that same Interpretant to be composed of two parts, corresponding respectively to its Object and to itself. That is to say, in order to understand the *Dicisign*, it must be regarded as composed of two such parts whether it be in itself so composed or not. It is difficult to see how this can be, unless it really have two such parts; but perhaps this may be possible. Let us consider these two represented parts separately. The part which is represented to represent the Primary Object, since the *Dicisign* is represented to be an Index of its Object, must be represented as an Index, or some representamen of an Index, of the Primary Object. The part

which is represented to represent a part of the Dicsign is represented as at once part of the Interpretant and part of the Object. It must, therefore, be represented as such a sort of Representamen (or to represent such a sort), as can have its Object and its Interpretant the same. Now, a Symbol cannot even have itself as its Object; for it is a law governing its Object. For example, if I say "This proposition conveys information about itself," or "Let the term 'sphynx' be a general term to denote anything of the nature of a symbol that is applicable to every 'sphynx' and to nothing else," I shall talk unadulterated nonsense. But a Representamen mediates between its Interpretant and its Object, and that which cannot be the Object of the Representamen cannot be the Object of the Interpretant. Hence, *a fortiori*, it is impossible that a Symbol should have its Object as its Interpretant. An Index can very well represent itself. Thus, every number has a double; and thus the entire collection of even numbers is an Index of the entire collection of numbers, and so this collection of even numbers contains an Index of itself. But it is impossible for an Index to be its own Interpretant, since an Index is nothing but an individual existence in a Secondness with something; and it only becomes an Index by being capable of being represented by some Representamen as being in that relation. Could this Interpretant be itself there would be no difference between an Index and a Second. An Icon, however, is strictly a possibility, involving a possibility, and thus the possibility of its being represented as a possibility is the possibility of the involved possibility. In this kind of Representamen alone, then, the Interpretant may be the Object. Consequently, that constituent of the Dicsign, which is represented in the Interpretant as being a part of the Object, must be represented by an Icon or by a Representamen of an Icon. The Dicsign, as it must be understood in order to be understood at all, must contain those two parts. But the Dicsign is represented to be an Index of the Object, in that the latter involves something corresponding to these parts; and it is this Secondness that the Dicsign is represented to be the Index of. Hence the Dicsign must exhibit a connection between these parts of itself, and must represent this connection to correspond to a connection in the object between the Secunda Primary Object and the Firstness indicated by the part corresponding to the Dicsign.

We conclude, then, that, if we have succeeded in threading our way through the maze of these abstractions, a Dicsign, defined as a Representamen whose Interpretant represents it as an Index of its Object, must have the following characters:

1st, It must, in order to be understood, be considered as containing two parts. Of these, the one, which may be called the *Subject*, is or represents an Index of a Second existing independently of its being represented, while the other, which may be called the *Predicate*, is or represents an Icon of a firstness.

2nd, These two parts must be represented as connected; and that in such a way that if the Dicsign has any Object, it must be an Index of a Secondness subsisting between the Real Object represented in one represented part of the Dicsign to be indicated and a Firstness represented in the other represented part of the Dicsign to be Iconized....

Deduction is that kind of argument which arbitrarily assumes a hypothesis, and whether it be realized or not has no bearing on the reasoning; but the hypothesis must be of a general nature (for it will amount to the same thing if it refers to familiar ideas of a general nature); and it then not only *asserts* but *shows*, i.e. puts the Interpreter into a condition to assent to, concerning that purely hypothetical universe (as for the purposes of Deduction it always is) a proposition termed the *Conclusion*, which is really the Interpretant of the Symbol.

Abduction is that kind of argument, which sets out from a *surprising* experience, that is an experience contrary to an active or passive belief. This comes in the form of a perceptual judgment, or some proposition referring to such a judgment, and a new formula becomes necessary in order to generalize experience. But now the interpretant of the Abduction represents it to be *like*, that is to say, an Icon of, a replica of a Symbol. In common language, it seems to see a possible explanation of the surprising fact, and thereby accepts this Symbol, in the form of a proposition, as *Likely*. This does not mean *Probable* in the technical sense. That is to say, it is not such a probability as might safely be the basis for underwriters, if they had a sufficiently large number of cases to go upon. It merely means that the truth being like that proposition, the proposition is accepted in the Interrogative Mood,—a mood existing in Universal Grammar, whether it exists in any language or not. It is concluded to be a good question to ask. This is what is called *making an explanatory hypothesis*. The majority of logicians do not include it among arguments, but only as an adjuvant to arguments. But this is an error of classification. Every such adjuvant of an argument is *ipso facto* an argument. It tends toward a conclusion. Those same writers very likely recognize Abduction in another part of their book as *generalization*. But the two are merely varieties of one class of symbols.

Abduction is the first step in the whole process of reasoning. Its conclusion becomes a premiss for Deduction which, colligating this with pre-accepted propositions, produces quasi predictions as to the course of future experience,—that is, what would be predictions in the usual sense, if the conclusion of the abduction were fully believed. They may properly be termed *Predictions*, although not assertory predictions. In fact, no prediction can quite amount, in sound logic, to a Prophecy, regarding itself as infallible. The action of Induction is not carried on in pure thought. It consists in taking one's instruments and making experiments, and in concluding from the results of these to what extent it will be safe to rely upon the hypothesis. This mode of thought regards

the conclusion of the Abduction as a pure dream. For one can reason deductively just the same concerning the so-called imaginaries, that is, the unfounded dreams of mathematicians as concerning existences. Yet it must be something very different from a dream, in that, either in the hypothesis itself, or in the pre-known truths brought to bear upon it, there must be a *Universal* proposition, or Rule. Take the "immediate inference," which is as truly a deduction, as any other, from "There is a woman whom any Spaniard there may be adores," to "Any Spaniard there may be stands to some woman or other in the relation of adoring her." This inference may be drawn by a "rule of thumb"; that is, a habit may act to cause a feeling of confidence in the conclusion, without any deliberation or control. This, however, may happen even if the inference is not of the kind termed "immediate" (that is, a deduction from a relatively simple premiss, not a copulative proposition). But such inference, not being self-controlled, is not *Reasoning*. Yet even in that case, the habit is a universal rule in itself, although its operation may be hindered sometimes. But if the inference is drawn deliberately, the reasoner will consider that if the woman can be specified in advance of knowing what Spaniard is to be adduced, it can only make it easier to find such a woman if the Spaniard is fixed upon first; or in some other way, the case will be brought under a known or evident universal truth. Thus, the argument sets out from a law represented to be known actually to hold throughout the universe of the hypothesis, and in the conclusion interprets the effect of this law. As Prof. Mitchell³ profoundly said, the whole operation virtually consists in *erasure*.

Deduction has two markedly different kinds; *necessary inference* and *inference of a probability*. What is called "probable inference" is not necessarily *probable deduction*, but includes all inference not necessary. Probable deduction is necessary inference concerning probability, in the strict statistical sense. What makes it very distinct from necessary inference proper is that while the latter has no concern with the realization of its hypothesis, and reasons about its premisses as expressing a conceivable state of things, regardless of actual existence, probability, on the other hand, is essentially limited to the *course of experience*. In the realm of Firstness, Probability has no meaning. True there is a doctrine of "geometrical probability," but it is only a particular way of viewing problems in geometrical integration. The conception of probability, which is lugged into it, has no particular relevancy to it, further than that it may be suggestive in regard to this problem, as it may in regard to many others. But while probability *supposes* a course of actual experiences, this supposition is itself entirely arbitrary, so far as concerns the reasoning.

Deduction produces from the conclusion of Abduction predictions as to what would be found true in experience in case that conclusion were realized. Now comes the work of Induction, which is not to be done while lolling in an easy chair, since it consists in actually going to work and making the experiments, hence going on to settle a general conclusion as to how far the hypothesis holds good.

If, from a replica of a proposition, something be erased, such that, if the blank, or blanks, so left were filled, each with a proper name, then the general symbol of which this blank form would be a replica is termed by the present writer a *rheme* (the word is taken from the use of $\rho\eta\mu\alpha$ in Plato, Aristotle, Dionysius the Thracian, and many others to denote a verb. . . . This shows just how far the present writer has warped the original meaning.) A rheme is either a *medad* (a patronymic formed by the writer from $\mu\eta\delta\epsilon\nu$), a *monad*, a *dyad*, a *triad*, a *polyad*, etc. according as the number of blanks is 0, 1, 2, 3, or more than two. Any symbol which may be a direct constituent of a proposition is called a *term* (*terminus*, *Boëthius*). The logicians usually say that a categorical proposition has "two terms," its *subject* and its *predicate*, wherein, by a carelessness of expression, or by copying Aristotle,⁴ they stumble upon the truth. Their usual *doctrine* is (though often not directly stated in one sentence), that such a proposition has three terms, the subject, the predicate, and *copula* (Abelard). The correct designation of the subject and predicate, in accord with their doctrine, is the *extremes*, which is translated from the same Greek word as *term* ($\sigma\upsilon\gamma\gamma\epsilon\mu\epsilon\sigma\iota$). The ordinary doctrine makes the copula the only verb, and all other terms to be either proper names or general class-names; because this gives the simplest and most satisfactory account of the proposition. It happens to be true that in the overwhelming majority of languages there are no general class names and adjectives that are not conceived as parts of some verb (even when there really is no such verb) and consequently nothing like a copula is required in forming sentences in such languages. The author (though with no pretension to being a linguist), has fumbled the grammars of many languages in the search for a language constructed at all in the way in which the logicians go out of their way to teach that all men think (for even if they do so, that has really nothing to do with logic). The only such tongue that he has succeeded in finding is the Basque, which seems to have but two or three verbs, all the other principal words being conceived as nouns. Every language must have proper names; and there is no verb wrapped up in a proper name. Therefore, there would seem to be a direct suggestion there of a true common noun or adjective. But, notwithstanding that suggestion, almost every family of man thinks of general words as parts of verbs. This seems to refute the logicians' psychology.

A proper name, when one meets with it for the first time, is existentially connected with some percept or other equivalent individual knowledge of the individual it names. It is then, and then only, a genuine Index. The next time one meets with it, one regards it as an Icon of that Index. The habitual acquaintance with it having been acquired, it becomes a Symbol whose Interpretant represents it as an Icon of an Index of the Individual

named.

If you look into a textbook of chemistry for a definition of lithium, you may be told that it is that element whose atomic weight is 7 very nearly. But if the author has a more logical mind he will tell you that if you search among minerals that are vitreous, translucent, grey or white, very hard, brittle, and insoluble, for one which imparts a crimson tinge to an unglowing flame, this mineral being triturated with lime or witherite ratsbane, and then fused, can be partly dissolved in muriatic acid; and if this solution be evaporated, and the residue be extracted with sulphuric acid, and duly purified, it can be converted by ordinary methods into a chloride, which being obtained in the solid state, fused, and electrolyzed with half a dozen powerful cells, will yield a globule of a pinkish silvery metal that will float on gasoline; and the material of that is a specimen of lithium. The peculiarity of this definition,—or rather this precept that is more serviceable than a definition,—is that it tells you that what the word lithium denotes by prescribing what you are to do in order to gain a perceptual acquaintance with the object of the word. Every subject of a proposition, unless it is either an Index (like the environment of the interlocutors, or something attracting attention in that environment, as the pointing finger of the speaker) or a Subindex (like a proper name, personal pronoun or demonstrative) must be a *Precept*, or Symbol, not only describing to the Interpreter what is to be done, by him or others or both, in order to obtain an Index of an individual (whether a unit or a single set of units) of which the proposition is represented as meant to be true, but also assigning a designation to that individual, or, if it is a set, to each single unit of the set. Until a better designation is found, such a term may be called a Precept. Thus, the Subject of the proposition, 'Whatever Spaniard there may be adores some woman' may best be regarded as, "Take any individual, A, in the universe, and then there will be some individual, B, in the universe, such that A and B in this order form a dyad of which what follows is true," the Predicate being "—is either not a Spaniard or else adores a woman that is—."

Any term fit to be the subject of a proposition may be termed an *Onome*. A *Categorematic Term* (Duns Scotus, but probably earlier) is any term fit to be the subject or predicate of a proposition. A *Syncategorematic Term* or *Syntheticreuma* (*Summulae*) is a Symbol going to make up a *Categorematic Term*. The copula seems to fall between two stools, being neither categorematic nor syncategorematic. Arguments can only be Symbols, not Indices nor Icons. An argument is either a *Deduction*, an *Induction*, or an *Abduction*.

As to these words, *deducere*, in Latin, means rather to lead away or aside than to lead down; and if the word is applied to argumentation, which is not very common, it is rather the premisses that are *deduced* to their conclusion than the conclusion that is deduced from premisses. The term *deductio* was used by Boethius; but only for a quite special, and obscurely explained mode of reasoning which Aristotle calls *απαγωγή*. It was very little used in logic until we find Hamilton in 1837 (*Lectures on Metaph*, xxxvii) and Whewell in the same year (*Hist of Inductive Science*) speaking of *deduction* and *deductive reasoning* as a great branch of reasoning opposed to induction, and speaking as if this were a familiar use of words. In the few logical books that the present writer has been able to consult, he has not found the term *deduction* thus used at an earlier date. It is certain, that it is a peculiarly English term; and the use of it can only be traced to the peculiar sense given in English to the word *deduce*. In Latin, *deducere* means to lead away or aside rather than to lead down, and if it is applied to reasoning at all (which does not very often happen) it is the premisses which are deduced to the conclusion, not the conclusion from the premisses. In Old French *deduvie* is not very far removed in meaning from *seduvie*; and later it has been applied to any kind of serial sequence, especially a chronological sequence. But in English, from pre-Elizabethan times, *deduce* has been used to denote the recognition of the effect of a rule in particular cases. Both Hamilton and Whewell were strongly influenced by Kant; and Kant regards all necessary reasoning as the application of a general rule to a particular case. That must have made both those writers more ready to take up a floating usage of speech which contrasted Deduction with Induction. It happens that this English sense of deduction has some affinity with the use of the word by Boethius, as remarked by Adamson; but that may be reckoned to be fortuitous.

The term *Induction* (L *inductio*) was introduced into logic, in the same sense it bears today, by Cicero. The word is constructed after the model of the equivalent Greek *επαγωγή* which was used by Socrates, though not in the whole breadth of its Aristotelian meaning.

NOTES

1. There are two ways in which a Symbol may have a real Existential Thing as its real Object. First, the thing may conform to it, whether accidentally or by virtue of the Symbol having the virtue of a growing habit; and secondly, by the Symbol having an Index as a part of itself. But the immediate object of a symbol can only be a symbol and if it has in its own nature another kind of object, this must be by an *endless series*.

2. To explain the judgment in terms of the "proposition" is to explain it by that which is essentially intelligible. To explain the proposition in terms of the "judgment" is to explain the self-intelligible in terms of a psychical act, which is the most obscure of phenomena or facts.

3. Because Mitchell happened to be a student under a master at the time he produced his paper "On a New Algebra of Logic," that work has been spoken of in a tone unfit to be used toward so masterly a performance. Barring the *Analytics* of Aristotle and Boole's *Laws of Thought*, I never read anything else on necessary inference so rich in instructive suggestions. What I have gained from the study of it is inestimable. {See Mitchell in *P* 268.}

4."Ὅρον δὲ χαλῶ εἰς ῥν διαλεταί ἢ πρότασις, οἷον τὸ τε κατηγοροῦμενον καὶ τὸ χαθ' οὐ κατηγορεῖται says Aristotle 24b.16. {I call that a term into which the premise is resolved, that is, both the predicate and that of which it is being predicated, 'being' being added and 'not being' being removed, or vice versa.}

CRITIC (THEORY OF ARGUMENTATION)

[From *MS 293*, "Prolegomena to an Apology for Pragmatism," 1906.]

All necessary reasoning is diagrammatic; and the assurance furnished by all other reasoning must be based upon necessary reasoning. In this sense, all reasoning depends directly or indirectly upon diagrams. Only it is necessary to distinguish reasoning, properly so called, where the acceptance [of the] conclusion in the sense in which it is drawn, is seen *evidently* to be justified, from cases in which a rule of inference is followed because it has been found to work well, which I call following a rule of thumb, and accepting a conclusion without seeing why further than that the impulse to do so seems irresistible. In both those cases, there might be a sound argument to defend the acceptance of the conclusion; but to accept the conclusion without any criticism or supporting argument is not what I call reasoning. For example, a person having been accustomed to considering finite collections only might contract a habit of using the syllogism of transposed quantity, of which the following is an instance.

Every Hottentot kills a Hottentot
No Hottentot is killed by more than one Hottentot
Therefore every Hottentot is killed by a Hottentot.

Later forgetting why this necessarily follows for finite collections (if he ever did understand it), this person might by mere force of habit apply the same kind of reasoning to endless generations or other infinite [classes]; or he might apply it to a finite class, but with so little understanding that only luck would prevent his applying it to infinite collections. Such a case is an application of a rule of thumb and is not reasoning. Many persons are deceived by the catch about Achilles and the Tortoise; and I knew one extremely bright man who could not, for the life of him, perceive any fault in this reasoning:

It either rains or it doesn't rain:
It rains;
Therefore, it doesn't rain.

Such people appear to mistake the rule of thumb for reasoning.

Descartes, in one of his letters, is quite explicit that his *je pense, done je suis* is not a syllogism with a suppressed premiss. I infer, then, that he thought it not impossible that an imaginary being should think (i.e. be conscious) albeit he had no real existence. Of course, there would be a fallacy here, but not one that Descartes might not easily fall into. In the same fallacious manner, I suppose he said, It would be quite possible antecedently that I had never existed. But when he tried to suppose, not of a being in general, who might be imaginary, but of himself, that *he* was conscious without existing, he found *that* quite impossible; while yet he had no reason or principle that could serve as major premiss in the argument. This confused inability to suppose his being false, as long as he *thought*, was not, in my terminology, Reasoning, because Reasoning renders the truth of its conclusion plain and comprehensible, and does not, like the plagiaristic formula of Descartes, stumble in the dark against an invisible wall of inability to conceive something.

In order to expound fully my proposition that all necessary reasoning is diagrammatic, I ought to explain exactly what I mean by a Diagram. But at present it would be extremely difficult to do quite that. At a later place in this paper I will endeavour to do so; but just now, I think it will better meet the reader's needs to give an exposition that shall cover the main points, and to leave the others, whose needfulness is only perceived after deep study, to follow when the need of them comes out.

To begin with, then, a Diagram is an Icon of a set of rationally related objects. By *rationally* related, I mean that there is between them, not merely one of those relations which we know by experience, but know not how to comprehend, but one of those relations which anybody who reasons at all must have an inward acquaintance with. This is not a sufficient definition, but just now I will go no further, except that I will say that the Diagram not only represents the related correlates, but also, and much more definitely represents the relations between them, as so many objects of the Icon. Now necessary reasoning makes its conclusion *evident*. What is this "Evidence"? It consists in the fact that the truth of the conclusion is *perceived*, in all its generality, and in the generality the how and why of the truth is perceived. What sort of a Sign can communicate this Evidence? No index, surely, can it be; since it is by brute force that the Index thrusts its Object into the Field of Interpretation, the consciousness, as if disdaining gentle "evidence." No Symbol can do more than apply a "rule of thumb" resting as it does entirely on Habit (including under this term natural disposition); and a Habit is no evidence. I suppose it would be the general opinion of logicians, as it certainly was long mine, that the Syllogism is a Symbol, because of its Generality. But there is an inaccurate analysis and confusion of thought at the bottom of that view; for so understood it would fail to furnish Evidence. It is true that ordinary Icons,—the only class of Signs that remains for necessary inference,—merely suggest the possibility of that which they represent, being percepts *minus* the insistency and percussivity of percepts. In themselves, they are mere Semes,

predicating of nothing, not even so much as interrogatively. It is, therefore, a very extraordinary feature of Diagrams that they *show*,—as literally *show* as a Percept shows the Perceptual Judgment to be true,—that a consequence does follow, and more marvellous yet, that it *would* follow under all varieties of circumstances accompanying the premisses. It is not, however, the statical Diagram-icon that directly shows this; but the Diagram-icon having been constructed with an Intention, involving a Symbol of which it is the Interpretant (as Euclid, for example, first enounces in general terms the proposition he intends to prove, and then proceeds to draw a diagram, usually a figure, to exhibit the antecedent condition thereof) which Intention, like every other, is General as to its Object, in the light of this Intention determines an Initial Symbolic Interpretant. Meantime, the Diagram remains in the field of perception of imagination; and so the Iconic Diagram and its Initial Symbolic Interpretant taken together constitute what we shall not too much wrench Kant's term in calling a *Schema*, which is on the one side an object capable of being observed while on the other side it is General. (Of course, I always use 'general' in the usual sense of general as to its object. If I wish to say that a sign is general as to its matter, I call it a Type, or Typical.) Now let us see how the Diagram entrains its consequence. The Diagram sufficiently partakes of the percussivity of a Percept to determine, as its Dynamic, or Middle, Interpretant, a state [of] activity in the Interpreter, mingled with curiosity. As usual, this mixture leads to Experimentation. It is the normal Logical effect; that is to say, it not only happens in the cortex of the human brain, but must plainly happen in every Quasi-mind in which Signs of all kinds have a vitality of their own. Now, sometimes in one way, sometimes in another, we need not pause to enumerate the ways, certain modes of transformation of Diagrams of the system of diagrammatization used have become recognized as permissible. Very likely the recognition descends from some former Induction, remarkably strong owing to the cheapness of mere mental experimentation. Some circumstance connected with the purpose which first prompted the construction of the diagram contributes to the determination of the permissible transformation that actually gets performed. The Schema *sees*, as we may say, that the transformate Diagram is substantially contained in the transformand Diagram, and in the significant features to it, regardless of the accidents,—as, for example, the Existential Graph that remains after a deletion from the Phemic Sheet is contained in the Graph originally there, and would do so whatever colored ink were employed. The transformate Diagram is the Eventual, or Rational, Interpretant of the transformand Diagram, at the same time being a new Diagram of which the Initial Interpretant, or signification, is the Symbolic statement, or statement in general terms, of the Conclusion. By this labyrinthine path, and by no other, is it possible to attain to Evidence; and Evidence belongs to every Necessary Conclusion.

There are at least two other entirely different lines of argumentation each very nearly, and perhaps quite, as conclusive as the above, though less instructive, to prove that all necessary reasoning is by diagrams. One of these shows that every step of such an argumentation can be represented, but usually much more analytically, by Existential Graphs. Now to say that the graphical procedure is more analytical than another is to say that it demonstrates what the other virtually assumes without proof. Hence, the Graphical method, which is diagrammatic is the sounder form of the same argumentation. The other proof consists in taking up, one by one, each form of necessary reasoning, and showing that the diagrammatic exhibition of it does it perfect justice.

Let us now consider non-necessary reasoning. This divides itself, according to the different ways in which it may be valid, into three classes: probable deduction; experimental reasoning, which I now call Induction; and processes of thought capable of producing no conclusion more definite than a conjecture, which I now call Abduction. I examined this subject in an essay in the volume of 'Studies in Logic by Members of the Johns Hopkins University,' published in 1883; and have since made three independent and laborious investigations of the question of validity, and others connected with it. As my latest work has been written out for the press and may some time be printed, I will limit what I say here as much as possible. The general principle of the validity of Induction is correctly stated in the Johns Hopkins Essay, but is too narrowly defined. All the forms of reasoning there principally considered come under the class of Inductions, as I now define it. Much could now be added to the Essay. The validity of Induction consists in the fact that it proceeds according to a method which though it may give provisional results that are incorrect will yet, if steadily pursued, eventually correct any such error. The two propositions that all Induction possesses this kind of validity, and that no Induction possesses any other kind that is more than a further determination of this kind, are both susceptible of demonstration by necessary reasoning. The demonstrations are given in my Johns Hopkins paper; and although the description of the mode of validity there is too narrow, yet it covers the strongest inductions and most of the reasonings generally recognized as Inductions. It is characteristic of the present state of logic that no attempt has been made to refute the demonstrations, but the old talk conclusively refuted by me goes on just the same. To say that the validity of Induction rests on Necessary Reasoning is as much as to say that Induction separated from the deduction of its validity does not make it evident that its conclusion has the kind of justification to which it lays claim. This being the case, it is not surprising that Induction, separated from the deduction of its validity, makes no essential use of diagrams. But instead of experimenting on Diagrams it experiments upon the very Objects concerning which it reasons. That is to say, it does so in an easily extended sense of the term "experiment", the sense in which I commonly employ the word in the critical part of logic.

The third mode of non-necessary reasoning, if we are to count the deduction of probabilities as a class, though it ought not to be reckoned such, is Abduction. Abduction is no more nor less than guessing, a faculty attributed to Yankees.¹

NOTE

1. In point of fact, the three most remarkable, because most apparently unfounded, guesses I know of were made by Englishmen. They were Bacon's guess that heat was a mode of motion, Dalton's of chemical atoms, and Young's (or was it Wallaston's) that violet, *green* (and not yellow, as the painters said) and red were the fundamental colors. Such validity as this has consists in the generalization that no new truth is ever otherwise reached while some new truths are thus reached. This is a result of Induction; and therefore in a remote way Abduction rests upon diagrammatic reasoning.

METHODEUTIC (METHODOLOGY)

[From "Illustrations of the Logic of Science: First Paper--The Fixation of Belief," *Popular Science Monthly*, vol. 12, 1878, pp. 7f]

If the settlement of opinion is the sole object of inquiry; and if belief is of the nature of a habit, why should we not attain the desired end, by taking any answer to a question which we may fancy, and constantly reiterating it to ourselves, dwelling on all which may conduce to that belief, and learning to turn with contempt and hatred from anything which might disturb it? This simple and direct method is really pursued by many men. I remember once being entreated not to read a certain newspaper lest it might change my opinion upon free-trade. "Lest I might be entrapped by its fallacies and misstatements," was the form of expression. "You are not," my friend said, "a special student of political economy. You might, therefore, easily be deceived by fallacious arguments upon the subject. You might, then, if you read this paper, be led to believe in protection. But you admit that free-trade is the true doctrine; and you do not wish to believe what is not true." I have often known this system to be deliberately adopted. Still oftener, the instinctive dislike of an undecided state of mind, exaggerated into a vague dread of doubt, makes men cling spasmodically to the views they already take. The man feels that, if he only holds to his belief without wavering, it will be entirely satisfactory. Nor can it be denied that a steady and immovable faith yields great peace of mind. It may, indeed, give rise to inconveniences, as if a man should resolutely continue to believe that fire would not burn him, or that he would be eternally damned if he received his *ingesta* otherwise than through a stomach-pump. But then the man who adopts this method will not allow that its inconveniences are greater than its advantages. He will say, "I hold steadfastly to the truth, and the truth is always wholesome." And in many cases it may very well be that the pleasure he derives from his calm faith over-balances any inconveniences resulting from its deceptive character. Thus, if it be true that death is annihilation, then the man who believes that he will certainly go straight to heaven when he dies, provided he have fulfilled certain simple observances in this life, has a cheap pleasure which will not be followed by the least disappointment. A similar consideration seems to have weight with many persons in religious topics, for we frequently hear it said, "Oh, I could not believe so-and-so, because I should be wretched if I did." When an ostrich buries its head in the sand as danger approaches, it very likely takes the happiest course. It hides the danger, and then calmly says there is no danger; and, if it feels perfectly sure there is none, why should it raise its head to see? A man may go through life, systematically keeping out of view all that might cause a change in his opinions, and if he only succeeds—basing his method, as he does, on two fundamental psychological laws—I do not see what can be said against his doing so. It would be an egotistical impertinence to object that his procedure is irrational, for that only amounts to saying that his method of settling belief is not ours. He does not propose to himself to be rational, and, indeed, will often talk with scorn of man's weak and illusive reason. So let him think as he pleases.

But this method of fixing belief, which may be called the method of tenacity, will be unable to hold its ground in practice. The social impulse is against it. The man who adopts it will find that other men think differently from him, and it will be apt to occur to him, in some saner moment, that their opinions are quite as good as his own, and this will shake his confidence in his belief. This conception, that another man's thought or sentiment may be equivalent to one's own, is a distinctly new step, and a highly important one. It arises from an impulse too strong in man to be suppressed, without danger of destroying the human species. Unless we make ourselves hermits, we shall necessarily influence each other's opinions; so that the problem becomes how to fix belief, not in the individual merely, but in the community.

Let the will of the state act, then, instead of that of the individual. Let an institution be created which shall have for its object to keep correct doctrines before the attention of the people, to reiterate them perpetually, and to teach them to the young; having at the same time power to prevent contrary doctrines from being taught, advocated, or expressed. Let all possible causes of a change of mind be removed from men's apprehensions. Let

them be kept ignorant, lest they should learn of some reason to think otherwise than they do. Let their passions be enlisted, so that they may regard private and unusual opinions with hatred and horror. Then, let all men who reject the established belief be terrified into silence. Let the people turn out and tar-and-feather such men, or let inquisitions be made into the manner of thinking of suspected persons, and, when they are found guilty of forbidden beliefs, let them be subjected to some signal punishment. When complete agreement could not otherwise be reached, a general massacre of all who have not thought in a certain way has proved a very effective means of settling opinion in a country. If the power to do this be wanting, let a list of opinions be drawn up, to which no man of the least independence of thought can assent, and let the faithful be required to accept all these propositions, in order to segregate them as radically as possible from the influence of the rest of the world.

This method has, from the earliest times, been one of the chief means of upholding correct theological and political doctrines, and of preserving their universal or catholic character. In Rome, especially, it has been practised from the days of Numa Pompilius to those of Pius Nonus. This is the most perfect example in history; but wherever there is a priesthood-and no religion has been without one—this method has been more or less made use of. Wherever there is an aristocracy, or a guild, or any association of a class of men whose interests depend or are supposed to depend on certain propositions, there will be inevitably found some traces of this natural product of social feeling. Cruelties always accompany this system; and when it is consistently carried out, they become atrocities of the most horrible kind in the eyes of any rational man. Nor should this occasion surprise, for the officer of a society does not feel justified in surrendering the interests of that society for the sake of mercy, as he might his own private interests. It is natural, therefore, that sympathy and fellowship should thus produce a most ruthless power.

In judging this method of fixing belief, which may be called the method of authority, we must, in the first place, allow its immeasurable mental and moral superiority to the method of tenacity. Its success is proportionately greater; and, in fact, it has over and over again worked the most majestic results. The mere structures of stone which it has caused to be put together—in Siam, for example, in Egypt, and in Europe—have many of them a sublimity hardly more than rivaled by the greatest works of Nature. And, except the geological epochs, there are no periods of time so vast as those which are measured by some of these organized faiths. If we scrutinize the matter closely, we shall find that there has not been one of their creeds which has remained always the same; yet the change is so slow as to be imperceptible during one person's life, so that individual belief remains sensibly fixed. For the mass of mankind, then, there is perhaps no better method than this. If it is their highest impulse to be intellectual slaves, then slaves they ought to remain.

But no institution can undertake to regulate opinions upon every subject. Only the most important ones can be attended to, and on the rest men's minds must be left to the action of natural causes. This imperfection will be no source of weakness so long as men are in such a state of culture that one opinion does not influence another—that is, so long as they cannot put two and two together. But in the most priestridden states some individuals will be found who are raised above that condition. These men possess a wider sort of social feeling; they see that men in other countries and in other ages have held to very different doctrines from those which they themselves have been brought up to believe; and they cannot help seeing that it is the mere accident of their having been taught as they have, and of their having been surrounded with the manners and associations they have, that has caused them to believe as they do and not far differently. And their candor cannot resist the reflection that there is no reason to rate their own views at a higher value than those of other nations and other centuries; and this gives rise to doubts in their minds.

They will further perceive that such doubts as these must exist in their minds with reference to every belief which seems to be determined by the caprice either of themselves or of those who originated the popular opinions. The willful adherence to a belief, and the arbitrary forcing of it upon others, must, therefore, both be given up, and a new method of settling opinions must be adopted, which shall not only produce an impulse to believe, but shall also decide what proposition it is which is to be believed. Let the action of natural preferences be unimpeded, then, and under their influence let men, conversing together and regarding matters in different lights, gradually develop beliefs in harmony with natural causes. This method resembles that by which conceptions of art have been brought to maturity. The most perfect example of it is to be found in the history of metaphysical philosophy. Systems of this sort have not usually rested upon any observed facts, at least not in any great degree. They have been chiefly adopted because their fundamental propositions seemed "agreeable to reason." This is an apt expression; it does not mean that which agrees with experience, but that which we find ourselves inclined to believe. Plato, for example, finds it agreeable to reason that the distances of the celestial spheres from one another should be proportional to the different lengths of strings which produce harmonious chords. Many philosophers have been led to their main conclusions by considerations like this; but this is the lowest and least developed form which the method takes, for it is clear that another man might find Kepler's theory, that the celestial spheres are proportional to the inscribed and circumscribed spheres of the different regular solids, more agreeable to *his* reason. But the shock of opinions will soon lead men to rest on preferences of a far more universal nature. Take, for example, the doctrine that man only acts selfishly—that is, from the

consideration that acting in one way will afford him more pleasure than acting in another. This rests on no fact in the world, but it has had a wide acceptance as being the only reasonable theory.

This method is far more intellectual and respectable from the point of view of reason than either of the others which we have noticed. But its failure has been the most manifest. It makes of inquiry something similar to the development of taste; but taste, unfortunately, is always more or less a matter of fashion, and accordingly metaphysicians have never come to any fixed agreement, but the pendulum has swung backward and forward between a more material and a more spiritual philosophy, from the earliest times to the latest. And so from this, which has been called the *a priori* method, we are driven, in Lord Bacon's phrase, to a true induction. We have examined into this *a priori* method as something which promised to deliver our opinions from their accidental and capricious element. But development, while it is a process which eliminates the effect of some casual circumstances, only magnifies that of others. This method, therefore, does not differ in a very essential way from that of authority. The government may not have lifted its finger to influence my convictions; I may have been left outwardly quite free to choose, we will say, between monogamy and polygamy, and, appealing to my conscience only, I may have concluded that the latter practice is in itself licentious. But when I come to see that the chief obstacle to the spread of Christianity among a people of as high culture as the Hindoos has been a conviction of the immorality of our way of treating women, I cannot help seeing that, though governments do not interfere, sentiments in their development will be very greatly determined by accidental causes. Now, there are some people, among whom I must suppose that my reader is to be found, who, when they see that any belief of theirs is determined by any circumstance extraneous to the facts, will from that moment not merely admit in words that that belief is doubtful, but will experience a real doubt of it, so that it ceases to be a belief.

To satisfy our doubts, therefore, it is necessary that a method should be found by which our beliefs may be caused by nothing human, but by some external permanency—by something upon which our thinking has no effect. Some mystics imagine that they have such a method in a private inspiration from on high. But that is only a form of the method of tenacity, in which the conception of truth as something public is not yet developed. Our external permanency would not be external, in our sense, if it was restricted in its influence to one individual. It must be something which affects, or might affect, every man. And, though these affections are necessarily as various as are individual conditions, yet the method must be such that the ultimate conclusion of every man shall be the same. Such is the method of science. Its fundamental hypothesis, restated in more familiar language, is this: There are real things, whose characters are entirely independent of our opinions about them; those realities affect our senses according to regular laws, and, though our sensations are as different as our relations to the objects, yet, by taking advantage of the laws of perception, we can ascertain by reasoning how things really are, and any man, if he have sufficient experience and reason enough about it, will be led to the one true conclusion. The new conception here involved is that of reality. It may be asked how I know that there are any realities. If this hypothesis is the sole support of my method of inquiry, my method of inquiry must not be used to support my hypothesis. The reply is this: 1. If investigation cannot be regarded as proving that there are real things, it at least does not lead to a contrary conclusion; but the method and the conception on which it is based remain ever in harmony. No doubts of the method, therefore, necessarily arise from its practice, as is the case with all the others. 2. The feeling which gives rise to any method of fixing belief is a dissatisfaction at two repugnant propositions. But here already is a vague concession that there is some *one* thing to which a proposition should conform. Nobody, therefore, can really doubt that there are realities, or, if he did, doubt would not be a source of dissatisfaction. The hypothesis, therefore, is one which every mind admits. So that the social impulse does not cause me to doubt it. 3. Everybody uses the scientific method about a great many things, and only ceases to use it when he does not know how to apply it. 4. Experience of the method has not led me to doubt it, but, on the contrary, scientific investigation has had the most wonderful triumphs in the way of settling opinion. These afford the explanation of my not doubting the method or the hypothesis which it supposes; and not having any doubt, nor believing that anybody else whom I could influence has, it would be the merest babble for me to say more about it. If there be anybody with a living doubt upon the subject, let him consider it.

To describe the method of scientific investigation is the object of this series of papers. At present I have only room to notice some points of contrast between it and other methods of fixing belief.

This is the only one of the four methods which presents any distinction of a right and a wrong way. If I adopt the method of tenacity and shut myself out from all influences, whatever I think necessary to doing this is necessary according to that method. So with the method of authority: the state may try to put down heresy by means which, from a scientific point of view, seem very ill-calculated to accomplish its purposes; but the only test *on that method* is what the state thinks, so that it cannot pursue the method wrongly. So with the *apriori* method. The very essence of it is to think as one is inclined to think. All metaphysicians will be sure to do that, however they may be inclined to judge each other to be perversely wrong . . .

METAPHYSICS

[The section "Metaphysics" is from *MS* 940, "The Logic of Events," 1898. The section "Answers to Questions Concerning My Belief in God" is from *MS* 845 of that title, 1905.]

We have seen that logic requires that the more abstract sciences should be developed earlier than the more concrete ones. For the more concrete sciences require as fundamental principles the results of the more abstract sciences, while the latter only make use of the results of the former as data; and if one fact is wanting, some other will generally serve to support the same generalization.

But notwithstanding this, there is one highly abstract science which is in a deplorably backward condition. I mean Metaphysics. There is and can be no doubt that this immature condition of Metaphysics has very greatly hampered the progress of one of the two great branches of special science, I mean the Moral or Psychical Sciences. Most immediately has it checked the development of psychology; while the backward state of psychology has been a great disadvantage to all the other psychical sciences, such as linguistics, anthropology, social science, etc. To my mind it is equally clear that defective and bad metaphysics has been almost as injurious to the physical sciences, and is the real reason why all that depends upon the science of the constitution of matter, even physiology, is more or less rolling in the trough of the sea in rudderless fashion. The common opinion has been that Metaphysics is backward because it is intrinsically beyond the reach of human cognition. But that, I think I can clearly discern, is a complete mistake. Why should metaphysics be so difficult? Because it is abstract? But the abstracter a science is, the easier it is, both as a general rule of experience and as a corollary from logical principles. Mathematics, which is far more abstract than metaphysics, is certainly far more developed than any special science; and the same is true, though less tremendously so, of logic. But it will be said that metaphysics is inscrutable because its objects are not open to observation. This is doubtless true of some systems of metaphysics, though not to the extent that it is supposed to be true. The things that any science discovers are beyond the reach of direct observation. We cannot see energy, nor the attraction of gravitation, nor the flying molecules of gases, nor the luminiferous ether, nor the forests of the carbonaceous era, nor the explosions in nerve-cells. It is only the premisses of science, not its conclusions, which are directly observed. But metaphysics, even bad metaphysics, really rests on observations, whether consciously or not; and the only reason that this is not universally recognized is that it rests upon kinds of phenomena with which every man's experience is so saturated that he usually pays no particular attention to them. The data of metaphysics are not less open to observation, but immeasurably more so, than the data, say, of the very highly developed science of astronomy, to make any important addition to whose observations requires an expenditure of many tens of thousands of dollars. No, I think we must abandon the idea that metaphysics is backward owing to any intrinsic difficulty of it.

In my opinion the chief cause of its backward condition is that its leading professors have been theologians. Were they simply Christian ministers the effect of intrusting very important scientific business to their hands would be quite as bad as if the same number of Wall Street promoters and Broad Street brokers were appointed to perform the task. The unfitness in the one case, as in the other, would consist in those persons having no idea of any broader interests than the personal interests of some person or collection of persons. Both classes are practical men. Now it is quite impossible for a practical man to comprehend what science is about unless he becomes as a little child and is born again. Scientific men are made out of youths who during the plastic period of life are set to study science for a number of years. Most of these develop into mere teachers; only a minority imbibe the spirit of science. The practical man has a definite job which he sets himself to accomplish. For that purpose he has to adopt some consistent plan which must be based upon a theory, and to that theory he must be wedded before the work begins. Even if his practical problem is no more serious than playing a game of whist, when there are only three rounds of a hand to be played, he must go upon the supposition that the cards lie so that he can win the odd trick. If he is a judge presiding over the hearing of a cause, that cause must be decided somehow, no matter how defective the evidence may be; and consequently he is constrained to lay down a rule for the burden of proof. But the idea of science is to pile the ground before the foot of the outworks of truth with the carcasses of this generation, and perhaps of others to come after it, until some future generation, by treading on them, can storm the citadel. The difference comes to this, that the practical man stakes everything he cares for upon the hazard of a die, and must believe with all the force of his manhood that the object for which he strives is good and that the theory of his plan is correct; while the scientific man is above all things desirous of learning the truth and, in order to do so, ardently desires to have his present provisional beliefs, and all his beliefs are merely provisional, swept away, and will work hard to accomplish that object. This is the reason that a good practical man cannot do the best scientific work. The temperaments requisite for the two kinds of business are altogether contrary to one another. This is above all true of the practical teacher [who] has no calling for his work unless he thoroughly believes that he is already in possession of all-important truth, with which he seeks by every physiological means to imbue other minds, so that they

shall be unable to give it up. But a scientific man who has any such immovable beliefs to which he regards himself as religiously bound to be loyal, cannot at the same time desire to have his beliefs altered. In other words he cannot wish to learn the truth. Hence, I say that had the business of metaphysics been in trusted to ordinary parish priests it would have been performed unscientifically enough. But what has in fact been its fate has been far more tragic, in that it has been given over not to parish priests but to the caste of theologians. How much theologians may have contributed to the cause of Christianity, how far their writings and performances may have [been] the instruments of bringing home to men's hearts the truth of the Gospel of Love, or how far, on the other hand, they may have subserved the agencies that work to make Christians forget that truth, it is not in my province to inquire. I once bought and read through Dr. Schaff's three volumes upon the *Creeds of Christendom* for the purpose of ascertaining whether the theologians, who composed them, had ever once, from the first to the last, inserted a single clause in one of them by way of recognition of the principle of love; and I found that such a thing had never been done. But then we must remember that, that principle being fully admitted by all Christians, its insertion would not have served to damn anybody. Now the principal business of theologians is to make men feel the enormity of the slightest departure from the metaphysics they assume to be connected with the standard faith. Upon their religious side, however, I will not pretend to any opinion about the influence of theologians. But since theology pretends to be a science, they must also be judged as scientific men. And in that regard I must say that another so deplorably corrupt an influence as theirs upon the morals of science I do not believe has ever been operative. Theology, I am persuaded, derives its initial impulse from a religious wavering; for there is quite as much, or more, that is mysterious and calculated to awaken scientific curiosity, in the intercourse of men with one another as in their intercourse with God, and it [is] a problem quite analogous to that of theology. Yet we do not find that theologians have cared much for those problems. They have taken human conversation as a matter of course, with rather a remarkable absence of all curiosity about it. But, as far as I can penetrate into the motive of theology, it begins in an effort of men who have joined the Christian army and sworn fidelity to it to silence the suggestions of their hearts that they renounce their allegiance. How far it is successful in that purpose I will not inquire. But nothing can be more unscientific than the attitude of minds who are trying to confirm themselves in early beliefs. The struggle of the scientific man is to try to see the errors of his beliefs,—if he can be said to have any beliefs. The logic which observational science uses, is not like the logic that the books teach, quite independent of the motive and spirit of the reasoner. There is an ethics indissolubly bound up with it,—an ethics of fairness and impartiality—and a writer, who teaches, by his example, to find arguments for a conclusion which he wishes to believe saps the very foundations of science by trifling with its morals. To sum up, the case is this:

We should expect to find metaphysics, judging from its position in the scheme of the sciences, to be somewhat more difficult than logic, but still on the whole one of the simplest of sciences, as it is one whose main principles must be settled before very much progress can be gained either in psychics or in physics. Historically we are astonished to find that it has been a mere arena of ceaseless and trivial disputation. But we also find that it has been pursued in a spirit the very contrary of that of wishing to learn the truth, which is the most essential requirement of the logic of science; and it is worth trying whether by proceeding modestly recognizing in metaphysics an observational science, and applying to it the universal methods of such science, without caring one straw what kind of conclusions we reach or what their tendencies may be, but just honestly applying induction and hypothesis we cannot gain some ground for hoping that the disputes and obscurities of the subject may at last disappear.

ANSWERS TO QUESTIONS CONCERNING MY BELIEF IN GOD

The questions can be answered without very long explanations. "Do you believe in the existence of a Supreme Being?" Hume, in his "Dialogues Concerning Natural Religion," justly points out that the phrase "supreme being" is not an equivalent of "God," since it neither implies infinity nor any of the other attributes of God, excepting only Being and Supremacy. This is important; and another distinction between the two designations is still more so. Namely, "God" is a vernacular word, and like all such words, but more than almost any, is *vague*. No words are so well-understood as vernacular words, in one way; yet they are invariably vague; and of many of them it is true that, let the logician do his best to substitute precise equivalents in their places, still the vernacular words alone, for all their vagueness, answer the principal purposes. This is emphatically the case with the very vague word "God," which is not made less vague by saying that it imports "infinity," etc., since those attributes are at least as vague. I shall, therefore, if you please, substitute "God," for "Supreme Being" in the question.

I will also take the liberty of substituting "reality" for "existence." This is perhaps overscrupulosity; but I myself always use *exist* in its strict philosophical sense of "react with the other like things in the

environment." Of course, in that sense, it would be fetishism to say that God "exists." The word "reality," on the contrary, is used in ordinary parlance in its correct philosophical sense. It is curious that its legal meaning, in which we speak of "real estate," is the earliest, occurring early in the XIIth century. Albertus Magnus, who as a high ecclesiastic, must have had to do with such matters, imported it into philosophy. But it did not become at all common until Duns Scotus, in the latter part of the XIIIth century began to use it freely. I define the *real* as that which holds its characters on such a tenure that it makes not the slightest difference what any man or men may have thought them to be, or ever will have *thought* them to be, here using *thought* to include, imagining, opining, and willing (as long as forcible *means* are not used); but the real thing's characters will remain absolutely untouched. Of any kind of figment, this is not true. So, then, the question being whether I believe in the reality of God, I answer, Yes. I further opine that pretty nearly everybody more or less believes this, including many of the scientific men of my generation who are accustomed to think the belief is entirely unfounded. The reason they fall into this extraordinary error about their own belief is that they precise (or render precise) the conception, and in doing so, inevitably change it; and such precise conception is easily shown not to be warranted, even if it cannot be quite refuted. Every concept that is vague is liable to be self-contradictory in those respects in which it is vague. *No* concept, not even those of mathematics, is absolutely precise; and some of the most important for everyday use are extremely vague. Nevertheless, our instinctive beliefs involving such concepts are far more trustworthy than the best established results of science, if these be precisely understood. For instance, we all think that there is an element of order in the universe. Could any laboratory experiments render that proposition more certain than instinct or common sense leaves it? It is ridiculous to broach such a question. But when anybody undertakes to say *precisely* what that order consists in, he will quickly find he outruns all logical warrant. Men who are given to defining too much, inevitably run themselves into confusion in dealing with the vague concepts of common sense.

They generally make the matter worse by erroneous, not to say absurd, notions of the function of reasoning. Every race of animals is provided with instincts well-adapted to its needs, and especially to strengthening the stock. It is wonderful how unerring these instincts are. Man is no exception in this respect; but man is so continually getting himself into novel situations that he needs, and is supplied with, a subsidiary faculty of *reasoning* for bringing instinct to bear upon situations to which it does not directly apply. This faculty is a very imperfect one in respect to fallibility; but then it is only needed to bridge short gaps. Every step has to be reviewed and criticized; and indeed this is so essential that it is best to call an uncriticized step of inference by another name. If one does not at all know how one's belief comes about, it cannot be called even by the name of inference. If, with St. Augustine, we draw the inference "I think; therefore, I am," but when asked how we justify this inference, can only say that we are *compelled to think* that, since we think, we are. This uncriticized inference ought not to be called reasoning, which at the very least conceives its inference to be one of a general class of possible inferences on the same model, and all equally valid. But one must go back and criticize the premisses and the *principles* that guide the drawing of the conclusions. If it could be made out that all the ultimate (or first) premisses, were percepts; and that all the ultimate logical principles were as clear as the principle of contradiction, then one might say that one's conclusion was *perfectly* rational. Strictly speaking, it would not be quite so, because it is quite possible for perception itself to deceive us, and it is much more possible for us to be mistaken about the indubitableness of logical principles. But as a matter of fact, as far as logicians have hitherto been able to push their analyses, we have *in no single case*, concerning a matter of *fact*, as distinguished from a matter of mathematical conditional possibility, been able to reach this point. We are in every case either forced by such inexorable critic, sooner or later to declare, "such and such a proposition or mode of inference I *cannot doubt*"; it seems perfectly clear that it is so, but I can't say *why*," or else the critic himself tires before this criticism has been pushed to its very end.

If you absolutely cannot doubt a proposition,—cannot bring yourself, upon deliberation, to entertain the least suspicion of the truth of it, it is plain that there is no room to desire anything more. Many and many a philosopher seems to think that taking a piece of paper and writing down "I doubt that" is doubting it, or that it is a thing he can do in a minute as soon as he decides what he wants to doubt. Descartes convinced himself that the safest way was to "begin" by doubting everything, and accordingly he tells us he straightway did so, except only his *je pense*, which he borrowed from St. Augustine. Well I guess not; for genuine doubt does not talk of *beginning* with doubting. The pragmatist knows that doubt is an art which has to be acquired with difficulty; and his genuine doubts will go much further than those of any Cartesian. What he does not doubt, about ordinary matters of everybody's life, he is apt to find that no well-matured man doubts. They are part of our instincts. Instincts are now known not to be nearly so unchangeable as used to be supposed; and the present "mutation"-theory, which I have *always* insisted must be the way in which species have arisen, is, I am confident, the first beginning of the correct theory, and shows that it is no disproof of the instinctive character of a belief that it relates to concepts which the primitive man cannot be supposed to have had. Now, this is no confirmation of what one does not doubt. For what one does not doubt cannot be rendered more satisfactory than it already is. Yet while I may entertain, as far as I can search my mind, no perceptible doubt whatever of any one of a hundred

propositions, I may suspect that, among so many, some one that is not true may have slipped in; and if so, the marvellous inerrancy of instinct may perhaps add a little to my *general* confidence in the whole lot. However, I am far from insisting upon the point. I think the consideration is better adapted to helping us to detect the counterfeit paper doubts, of which so many are in circulation.

All the instinctive beliefs, I notice, are vague. The moment they are precided, the pragmatist will begin to doubt them.

The fourth part of the first book of Hume's *Treatise of Human Nature* affords a strong argument for the correctness of my view that reason is a mere succedaneum to be used where instinct is wanting, by exhibiting the intensely ridiculous way in which a man winds himself up in silly paper doubts if he undertakes to throw common sense, i.e. instinct, overboard and be perfectly rational. Bradley's *Appearance and Reality* is another example of the same thing, although Bradley is at the opposite pole from Hume in what he *does* admit. But Bradley is in no way as good a case as Hume. Hume endeavours to modify his conclusion by not stating it in the extreme length to which it ought to carry him. But a careful reader will see that if he proves anything at all by all his reasoning it is that reasoning, as such, is *ipso facto* and essentially illogical, "illegitimate," and unreasonable. And the reason it is so, is that either it is bad reasoning, or rests on doubtful premisses, or else that those premisses have not been thoroughly criticized. Of course not. The moment you come to a proposition which is perfectly satisfactory, so that you can entertain not the smallest suspicion of it, this fact debars you from making any genuine criticism of it. So that what Hume's argument would lead him to is that reasoning is "illegitimate" because its premisses are perfectly satisfactory. He candidly confesses that they are satisfactory to himself. But he seems to be dissatisfied with himself for being satisfied. It is easy to see, however, that he pats himself on the back, and is very well satisfied. Bradley's position is equally ridiculous. Another circumstance which goes toward confirming my view that instinct is the great internal source of all wisdom and of all knowledge is that all the "triumphs of science," of which that poor old XIXth century used to be so vain, have been confined to two directions. They either consist in physical,—that is; ultimately, dynamical,—explanations of phenomena, or else in explaining things on the basis of our common sense knowledge of human nature. Now dynamics is nothing but an elaboration of common sense; its experiments are mere imaginary experiments. So it all comes down to common-sense in these two branches, of which the one is founded on those instincts about physical forces that are required for the feeding-impulse, and the other on those instincts about our fellows that are requisite to the satisfaction of the reproductive impulse. Thus, then, all science is nothing but an outgrowth from those two instincts.

You will see that all I have been saying is not preparatory to any argument for the reality of God. It is intended as an apology for resting the belief upon instinct as the very bed-rock on which all reasoning must be built.

I have often occasion to walk, at night, for about a mile over an entirely untravelled road, much of it between open fields without a house in sight. The circumstances are not favorable to severe study, but are so calm meditation. If the sky is clear, I look at the stars in the silence, thinking how each successive increase in the aperture of a telescope makes many more of them visible than all that had been visible before. The fact that the heavens do not show a sheet of light proves that there are vastly more dark bodies, say planets, than there are suns. They must be inhabited, and most likely millions of them with beings much more intelligent than we are. For on the whole, the solar system seems one of the simplest; and presumably under more complicated phenomena greater intellectual power will be developed. What must be the social phenomena of such a world! How extraordinary are the minds even of the lower animals. We cannot appreciate our own powers any more than a writer can appreciate his own style, or a thinker the peculiar quality of his own thought. I don't mean that a Dante did not know that he expressed himself with fewer words than other men do, but he could not admire himself as we admire him; nor can we wonder at human intelligence as we do at that of wasps. Let a man drink in such thoughts as come to him in contemplating the physico-psychical universe of mind which coincides with the universe of matter. The idea of there being a God over it all of course will be often suggested; and the more he considers it, the more he will be enwrapt with Love of this idea. He will ask himself whether or not there really is a God. If he allows instinct to speak, and searches his own heart, he will at length find that he cannot help believing it. I cannot tell how every man will think. I know the majority of men, especially educated men, are so full of pedantries,—especially the male sex,—that they cannot think straight about these things. But I can tell how a man must think if he is a pragmatist. Now the shower of communications that I have been getting during the last two months causes me to share the expectation that I find so many good judges are entertaining, that pragmatism is going to be the dominant philosophical opinion of the XXth century.

Pragmatism, as it was originally defined by me, is the doctrine that the *entire* intellectual purport of a concept consists in the sum of all the conceivable conditional resolutions as to conduct to which it would give rise under the different conceivable circumstances and under the different conceivable motives. But so many of those who have been attracted by the doctrine wish to include, as part of the meaning, sensations, while still calling themselves pragmatists, and some of them wish to limit it to what *will* happen, that I now recommend

that the word be understood in the general sense of those who think they belong to the same school of thought as those who are now commonly called pragmatists. I continue to hold my original opinion which I now call *pragmaticism*. It is perfectly understood, the world over, that I am the father of the whole movement. I am confident that when the matter is thoroughly sifted it will be found that sensation has nothing to do with the intellectual purport, and that it is absolutely necessary to admit the conceivable general conditional resolutions.

I must point out some of the doctrines that are involved in pragmaticism. The entire intellect of the middle ages from about the end of the second crusade when Aristotle's Analytics became known in Western Europe, say A.D. 1149,—though perhaps I ought to go back to the days when those two great beings Gerbert (i.e. Herbert) and Theophane, the daughter, played their parts upon the stage of Europe,—down to the fall of Constantinople in A.D. 1453, when the Humanists began to be influential, was concentrated upon the question of the reality of generals, and the questions connected with that. At first, Nominalism had the upper hand, and Abelard was its *fin fleur*. Then, deeper studies brought a limited and carefully defined Realism,—the doctrine that *some* generals are real. In the hands of Duns Scotus, and his contemporaries toward the end of the XIIIth century, this doctrine became so extraordinarily elaborated, that Ockham, moved, partly by political and ecclesiastical motives, undertook to revive nominalism. Hobbes and Leibniz were students of Ockham (though in the later philosophy of Leibniz there is much that is profoundly inconsistent with nominalism, especially his principle of Continuity). Berkeley may have dipped into Ockham. At any rate, he was influenced by Hobbes. Hume's philosophy resulted from the study of Berkeley. Upon them came Gay and Hartley, who however paid no particular attention to the nominalistic philosophy. Upon them James Mill built his philosophy. John Stuart Mill, Bain, Grote, and others were direct pupils of James Mill, who also influenced his intensely nominalistic friend Bentham. Thus, all that English philosophy (really Scotch, but what we call Scotch Philosophy is opposed to it) was the school of Ockham. But in the Middle Ages, when the study of philosophy was carried on in oral disputations, conducted under a strict system of rules, called the Obligations, so that disputants were kept strictly to the point, and were obliged squarely to meet *all* their opponents arguments, in a way now, alas, utterly obsolete, under that system the Ockhamists were beaten out of their boots, so that when the Humanists came, they found the Scotists,—the Dunses, as they were called,—in control of the universities. Now these Dunses had a complete disdain for elegance. They looked upon study as a study of the truth, according to scientific methods. They thought elegance was merely turning the minds of young men to trifles. In short, the Dunses were obscurantists. It is interesting to see that in these days the word "dunce,"-i.e. Duns, did not at all convey the notion of stupidity or want of intellect. Quite the contrary, a dunce was a person who was so deep and subtle in his thought that no ordinary person could cope with him; but he was a person who knew no Greek, who read and wrote the most unreadable books, and who held elegant literature in contempt. The humanists were, some of them, bright minds; but they never deeply studied philosophy, being wholly engaged in literature. They hated the Dunses, and very naturally embraced the simpler doctrine of Ockham, while declining to dispute or argue about it. Through the reformation and also because scholasticism had exhausted all its important problems and had come to be occupied with nonsense, the humanists gained a complete victory, and got control of the universities. Thus, it resulted that all modern philosophy is nominalistic. Even Hegel is to my mind a nominalist; Kant is decidedly and prominently so. Yet the only real discussion of the question had gone the other way.

Writing to my brother, I can permit myself to say that my strongest philosophical works were a paper of May 14, 1867, *On a New List of Categories* and a paper which appeared some time in 1868 called *Some Consequences of Four Incapacities*, in which I declared for scholastic realism. I argued it at more length in the *North American Review* for October 1871, in a review of Frazer's edition of Berkeley. Next after these, in strength, were my two connected papers of November 1877, *The Fixation of Belief*, and Jan 1878 (first written in French on a voyage from Hoboken to Plymouth in September 1877) *How to Make our Ideas Clear*, in which I enunciated the principle of pragmaticism. I have done a great deal of better work; but none of it has been printed. There is a pretty good article of Jan 1901 on *Pearson's Grammar of Science* which attacks nominalism. In the *Monist* articles I am now writing I am greatly hampered for want of space and by the necessity of making myself understood by a somewhat large public. F. E. Abbot made a very clear defence of Realism in the introduction to his book *Scientific Theism*, 1885. There are lots of philosophers who call themselves scholastic realists, but who are hardly so, such as Royce. As Abbot well says, every scientific man who believes the laws of nature represent any truth of nature and are not mere *arbitrary*, arrangements of facts is, in so far, a Realist. It is plain that pragmaticism involves scholastic realism, since it makes all intellectual purport, and therefore, the meaning of reality itself, to consist in what *would be*, under conceivable conditions most of which can never be actualized. It thus involves making real being to include more than *existence*. Now that is precisely the point in dispute between Realists and Nominalists. "A real possibility," says the nominalist "is nonsense. For that is *possible* which we do not know is not true." The realist says that there is, besides, a real possibility and real necessity (not mere compulsion, but rational necessity, as in the laws of nature). I *can* open my window, if I find the air stuffy in my study. I really *can*. That is a positive objective possibility. I discussed Necessitarianism in the *Monist* of April 1892 and July 1893. It is a pity my best articles cannot be reprinted in one volume. It is

perfectly heart-breaking to hear people tell me to my face, as they do, that they are perfectly unintelligible. If they were collected in a volume, philosophers would in some future generation get the benefit of them. If ever I get the chance to publish them, I have half a mind to write a mystifying preface to the effect that I have been a rummager, and that these doctrines are not mine at all, that I have simply phrased them. That is true; for they are God's truth. In that way, I may be able to point out their merits from a disinterested standpoint.

You will perceive that, according to pragmatism, our meaning is always more or less vague, and the more so the more the meaning approximates to what we see out of our eyes. A highly precise (i.e. "abstract") character, like the hardness of the diamond, is tolerably precisely conceived. And yet which of these four things is what we *mean* by the word hardness (as applied to a diamond more than to carborundum), leaving the other three as *properties* of hard things? 1. The possibility of scratching carborundum with a diamond. 2. The possibility of passing an edge of carborundum with great pressure over the face of a diamond without making a scratch. 3. The impossibility of drawing the edge of a diamond heavily over the face of a crystal of carborundum without scratching it. 4. The impossibility of scratching a diamond by drawing an edge of carborundum over its face. But now let us turn to the most familiar object there is, the material universe. You cannot define it or describe it, or do anything but just talk of IT. *It* is raining here. *It* is plain to be seen, but hard to express. Of course *grammatically* the "it" does not refer to the universe. But that is at the bottom of such personals. We also call it, *The Truth*, where the definite article shows we mean the universe.

If a pragmatist is asked what he means by the word "God," he can only say that just as long acquaintance with a man of great character may deeply influence one's whole manner of conduct, so that a glance at his portrait may make a difference, just as almost living with Dr. Johnson enabled poor Boswell to write an immortal book and a really sublime book, just as long study of the works of Aristotle may make him an acquaintance, so if contemplation and study of the physico-psychical universe can imbue a man with principles of conduct analogous to the influence of a great man's works or conversation, then that analogue of a mind,—for it is impossible to say that *any* human attribute is *literally* applicable,—is what he means by "God." Of course, various great theologians explain that one cannot attribute *reason* to God, nor perception (which always involves an element of surprise, and of learning what one did not know), and, in short, that his "mind" is necessarily so unlike ours, that some,—though wrongly,—high in the church say that it is only negatively, as being entirely different from everything else, that we can attach any meaning to the Name. This is not so; because the discoveries of science, their enabling us to *predict* what will be the course of nature, is proof conclusive, that, though we cannot think any thought of God's, we can catch a fragment of His Thought, as it were.

Now such being the pragmatist's answer to the question what he means by the word "God," the question whether there really *is* such a being is the question whether all physical science is merely the figment,—the arbitrary figment,—of the students of nature, and further whether the *one* lesson the Gautama Boodha, Confucius, Socrates, and all who from any point of view have had their ways of conduct determined by meditation upon the physico-psychical universe, be only their arbitrary notion or be the Truth, behind the appearances which the frivolous man does not think of; and whether the superhuman courage which such contemplation has conferred upon priests who go to pass their lives with lepers and refuse all offers of rescue is mere silly fanaticism, the passion of a baby, or whether it is a strength derived from the power of the truth. Now the only guide to the answer to this question lies in the power of the passion of love which more or less overmasters every agnostic scientist and everybody who seriously and deeply considers the universe. But whatever there may be of *argument* in all this is as nothing, the merest nothing, in comparison to its force as an appeal to one's own instinct, which is to argument what substance is to shadow, what bed-rock is to the built foundations of a cathedral.

Caldecott's *Philosophy of Religion* explains 13 different *types* of reasons for believing in God, with different varieties of several of them. I have examined them all with care, and think each one proves *something*. But I do not think their conclusions always have much to do with *religion*.

SUGGESTIONS FOR FURTHER READING

Works by Peirce

Charles Sanders Peirce: Contributions to The Nation. Three volumes. Edited by K. L. Ketner and J. E. Cook. Lubbock: Texas Tech University Press, 1975-1979.

The Collected Papers of Charles Sanders Peirce. Eight volumes. Edited by C. Hartshorne and P. Weiss (vol. 1 - 6), and A. Burks (vol. 7-8). Cambridge, Mass.: Harvard University Press, 1935, 1958.

Dictionary of Philosophy and Psychology. Edited by James Mark Baldwin. Two volumes. New York: Macmillan, 1901, 1902. (Peirce made many contributions, identified in the *Comprehensive Bibliography*)

Historical Perspectives on Peirce's Logic of Science: A History of Science. Edited by C. Eisele. Berlin: Mouton-

DeGruyter, 1985.

The New Elements of Mathematics. Edited by C. Eisele. The Hague: Mouton, 1976.

Semiotic and Signifies. Edited by C. S. Hardwick. Bloomington: Indiana University Press, 1977.

Writings of Charles S. Peirce. Twenty volumes projected; two volumes have appeared. Edited by M. H. Fisch et al. Bloomington: Indiana University Press, 1982, 1984.

Anthologies

Chance, Love and Logic. Edited by Morris Cohen. New York: Century, 1923, 1980.

Charles S. Peirce: Selected Writings. Edited by Philip P. Weiner. (Original title: *Values in a Universe of Chance*.) New York: Dover, 1961.

Philosophical Writings of Peirce. Edited by Justus Buchler. New York: Dover, 1940.

Essential Works on Peirce

Carolyn Eisele. *Studies in the Scientific and Mathematical Philosophy of Charles S. Peirce*. Edited by R. M. Martin. The Hague: Mouton, 1979.

Joseph L. Esposito. *Evolutionary Metaphysics: The Development of Peirce's Theory of Categories*. Athens: Ohio University Press, 1980.

Max H. Fisch. *Peirce, Semeiotic, and Pragmatism: Essays by Max H. Fisch*. Edited by K. Ketner and C.

Kloesel. Bloomington: Indiana University Press, 1986.

Christopher Hookway, *Peirce*. London: Routledge and Kegan Paul, 1986.

Kenneth L. Ketner, editor. *A Comprehensive Bibliography of the Published Works of Charles Sanders Peirce*.

Second ed. rev., Bowling Green, KY: Philosophy Documentation Center, 1986.

Kenneth L. Ketner, editor. *Proceedings of the C. S. Peirce Bicentennial International Congress*. Lubbock: Texas Tech University, 1981.

R. S. Robin. *Annotated Catalogue of the Papers of Charles S. Peirce*. Amherst: University of Massachusetts Press, 1967. This is supplemented by Robin's "The Peirce Papers: A Supplementary Catalogue," *Transactions of the Charles S. Peirce Society*, Vol. 7, 1971, pp. 37-57.

Don D. Roberts. *The Existential Graphs of Charles S. Peirce*. The Hague: Mouton, 1973.