Charles Peirce's Theory of Scientific Method

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NOTES—CHAPTER I

1. Most of Peirce’s writings have been published in the Collected Papers of Charles Sanders Peirce, edd. Charles Hartshorne, Paul Weiss, and Arthur W. Burks (8 vols.; Cambridge: Harvard University Press, 1931–1935 and 1958). The convention in citing from this edition is as follows: the number to the left of the decimal point designates the volume of the Collected Papers; the number to the right designates a numbered section in that volume. For example the reference (1.3) refers to the first volume, section 3. These references will occasionally be inserted in the main text.

2. See 6.604 and 1.3. As Wiener notes, “Charles S. Peirce made it his life work to analyze, as thoroughly as any single mind could, the basic logic and structure of the sciences” (Values in a Universe of Chance, ed. Philip P. Wiener [Garden City, N.Y.: Doubleday, 1958], p. xiii). This is a short collection of Peirce’s writings including materials already published in the Collected Papers and elsewhere, as well as materials previously unpublished. In 1966 Dover Publications Inc. (New York) issued an unabridged republication of this collection, unaltered except for the title, Charles S. Peirce: Selected Writings, with the previous title as a subtitle. This book will hereafter be referred to as Wiener, Values.

3. For him logic embraced a study of the necessary and general conditions for the attainment of truth, and for its expression in thought-signs, as well as an inquiry into “laws of evolution of thought” and its communication from man to man (1.444).

4. Toward the end of his life, when considering the influence that ethics should have on logic, he wrote: “Life can have but one end. It is Ethics which defines that end. It is, therefore, impossible to be thoroughly and rationally logical except upon an ethical basis” (2.198).


6. Values, p. ix. Feibleman agrees that Peirce is America’s greatest philosopher, and Young indicates why. Peirce, the latter writes, was possessed of “an intellect masculine in its boldness and sweep, vast in its learning, austere in its self-discipline, and comparable to that of a Leibniz in its combination of mathematical, logical, scientific, and metaphysical power” (James K. Feibleman, An Introduction to Peirce’s Philosophy Interpreted as a System [New York: Harper, 1946], p. 4; Frederic H. Young, “Charles Sanders Peirce: 1839–1914,” in Studies in the Philosophy of Charles Sanders Peirce, edd. Philip P. Wiener and Frederic H. Young [Cambridge: Harvard University Press, 1952], pp. 271f), Young notes that in letters written to him both F. S. C. Northrop and Charles Hartshorne compare Peirce to Leibniz. Alfred North Whitehead also wrote to Young that “Peirce was a very great man, with a variety of interests in each of which he made original contributions. The essence of his thought was originality in every subject that he taught. For this reason, none of the conventional labels apply to him. He conceived every topic in his own original way.”

8. Much of the biographical information which follows comes from the article on Charles Sanders Peirce by Paul Weiss in the Dictionary of American Biography (New York: Scribner's, 1934), XIV, 398-403.

9. Famous scientists and literary personalities were frequent visitors at Peirce's home. Among them can be named Agassiz, Asa Gray, Longfellow, Oliver Wendell Holmes, Ralph Waldo Emerson, and Margaret Fuller. Charles Peirce wrote in The Monist in 1892: "I may mention for the benefit of those who are curious in studying mental biographies, that I was born and reared in the neighborhood of Concord—I mean in Cambridge—at the time when Emerson, Hedge, and their friends were disseminating the ideas that they had caught from Schelling, and Schelling from Plotinus, from Boehm, or from God knows what minds stricken with the monstrous mysticism of the East. But the atmosphere of Cambridge held many an antiseptic against Concord transcendentalism; and I am not conscious of having contracted any of the virus" (6.102). See also Charles S. Peirce's Letters to Lady Welby, ed. Irwin C. Lieb (New Haven: Whitlock, 1953), p. 37.

About 1907 Peirce wrote of his father's "remarkable aesthetical discrimination," and of visitors to the family home in Cambridge during the years of his boyhood. See Charles S. Peirce Papers, Houghton Library, Harvard University, # 296 (this number is from Richard S. Robin, Annotated Catalogue of the Papers of Charles S. Peirce [Amherst: University of Massachusetts Press, 1967]).


11. Ibid., p. 17.


13. An excellent and well-known study of the thought of some of the members of the Metaphysical Club on the question of evolution and related topics has been written by Philip P. Weiner, Evolution and the Founders of Pragmatism (Cambridge: Harvard University Press, 1949). In this work Wiener expresses certain doubts about the accuracy of Peirce's claims and evidence for real existence of such a club in Cambridge, asking, for lack of evidence outside Peirce's own writings, whether the club might have been primarily a symbol in Peirce's imagination. Now, however, these doubts have been laid to rest by Max H. Fisch, who concludes from Peirce's own testimony and from that of others that there really was such a club (Max H. Fisch, "Was there a Metaphysical Club in Cambridge?" in Studies in the Philosophy of Charles Sanders Peirce, edd. Edward C. Moore and Richard S. Robin [second series; Amherst: University of Massachusetts Press, 1964], pp. 3-32. [In order to distinguish this collection of essays from the earlier collection with the same title, mentioned in note 6, the two will be referred to as Studies (first series) and Studies (second series).]).

Around 1907 Peirce wrote several accounts of the members of the Metaphysical Club. See Charles S. Peirce Papers, ## 319-322 and 324.


16. Ibid., II, 117.

17. Peirce wrote in 1909 of his natural powers as being "rather below than
above mediocrity," but acknowledged his own habits of "self-criticism, persistence and logical analysis" (Charles S. Peirce Papers, # 631 and 632).

18. The first six volumes (bound as three) were published again in 1960.

19. Murphey in his detailed study of Peirce's development shows that though Peirce was a system builder after the manner of Kant's architectonic theory of philosophy, he continually worked over parts of the system, improving the whole, reviewing and reformulating it in keeping with new insights. But the reformulations, since they keep as much of the preceding system as possible, should be regarded as revisions and not as distinct systems. Development, pp. 1ff.


22. Ibid., p. 270.

23. Feibleman states it this way: "The reputation of a philosophy frequently owes as much to its random suggestiveness as to its complete and systematic form. Peirce's writings are systematic by implication only; but they continue to be immensely suggestive in every line. If the occasional insights which have been gleaned from Peirce have had so much effect, how much more valuable would be the full force of his whole philosophy when viewed in the round" (An Introduction to Peirce's Philosophy, p. 389).

NOTES—CHAPTER II

1. Wiener, Values, p. 227. See also 1.8, composed around 1897, where science is described as a pursuit of men "devoured by a desire to find things out."

2. That there is a spirit of inquiry is indicated by Peirce's repeated use of "emotive" language: impulse, burn to learn, Eros, desire, being seized, possessed by a passion to learn, devotion, animated. Such language for Peirce points out the scientist's aim (1.618; 7.605).


4. Ibid., p. 267. This article is taken from the Annual Report of the Smithsonian Institution for the Year ending June 30, 1900 (Washington, D.C., 1901), pp. 693–699, as Wiener notes.

5. Ibid., p. 268.

6. At the beginning of the projected "History of Science," Peirce remarks that there are three classes of men. There are the men who create art, and for these nature is a picture. There are the men who regard nature as an opportunity for power and business. And finally there are the men of science who are "possessed by a passion to learn" (1.43).

7. See 5.589 for contrast of science with practice.

8. Peirce repeatedly emphasizes the dichotomy between scientific work and practical work, partially because of the widespread error of extolling the merit of doing things. In a brief work expressing his views on education, found in Science (April 20, 1900), pp. 620–622, as Wiener notes (Values, pp. 331f), Peirce reports the prevalent enthusiasm for activity, which has gained the ascendancy over knowledge, even in American colleges. He admits that in his youth even he made
the mistake of subordinating the conception to the act in his understanding of pragmatism. However, “subsequent experience of life has taught me that the only thing that is really desirable without a reason for being so, is to render ideas and things reasonable.” In his emphasis on the theoretical, however, he does not want to deny that some of the sciences may, as a matter of fact, have sprung originally from practical arts, as geometry did from surveying (1.226). He also admits that historically science has made much progress as a result of the stimulus received from men of practice, looking for knowledge to guide their activities (7.52).

9. In his uncompleted “Minute Logic” Peirce describes how a man is transformed into a scientist. The transformation, he says, is usually sudden, and, when sudden, it consists in “their being seized with a great desire to learn the truth, and their going to work with all their might by a well-considered method to gratify that desire” (1.235). The primacy of motive and method are unmistakable here.

10. Thomas A. Goudge considers this contrast of theory and practice in Peirce characteristic of a transcendentalism, which Goudge opposes. (The presence of two main irreconcilable themes in Peirce—sc., naturalism and transcendentalism—is one of Goudge’s favorite topics.) It may be that Peirce treats practical living with an unbecoming jocoseness, and even with obvious error in excluding reason from practice, and advocating an immoderate reliance on sentiment and instinct. But Goudge seems to weigh the balance on the opposite side, to the detriment of pure science. Thomas A. Goudge, The Thought of C. S. Peirce (Toronto: University of Toronto Press, 1950), p. 255. See also Thomas A. Goudge, “The Conflict of Naturalism and Transcendentalism in Peirce,” The Journal of Philosophy, XLIV (1947), 366–368.

11. There is, however, a difficulty in this matter. In reading through Peirce, one comes upon certain passages which seem to deny the purely theoretical aim of science. In two separate works on the classification of the sciences we find mention of “practical science” (1.181 and 1.239). Is it true, then, that an inquiry undertaken for the sake of practical results can still be a genuine science? A hint at the solution may be found in Peirce’s understanding of the meaning of branch. Theoretical and practical are branches of science. Branch is a special term, dividing science according to its fundamental purpose. Class, order, and family are also special terms, dividing the branches and sub-branches according to other criteria. While pure science is an energetic pursuit of the truth only for the sake of knowing it, practice aims at doing things.

12. See also 1.640–642. Peirce claims to be an Aristotelian in that both he and Aristotle agree that theoretical science has “knowledge of theory as its ultimate end and aim” (1.618).

13. An undated manuscript, besides mentioning that science is the living pursuit of inquirers, also emphasizes the importance of the method and of the scientist’s knowing “What justifies the belief, and just why and how the justification is sufficient” (7.49f).


15. The Appendix contains some historical information on the beginning of both the doctrine and the word “pragmatism.” The same appendix mentions the
change from "pragmatism" to "pragmaticism." I shall use the word "pragmaticist" as both a noun and an adjective, as the context requires.


17. The importance of these two articles can also be judged from their prominence in most expositions of Peirce's pragmatism, and their inclusion in all the selections from Peirce's writings which I have seen.


19. The editors of the *Collected Papers* have indicated numerous corrections made by Peirce; they have also pointed out that the two articles were meant to be included in two projected books that Peirce was working on in 1893, along with many clarifying notes written by him at that time. Again in 1903 Peirce undertook the work of revising the articles, and the editors have included the revisions in the notes. Finally in 1909 and 1910, as Burks states, Peirce was preparing a revision of the two articles, with the intention of publishing them together. Burks has given us the following words of Peirce, contained on page 1 of the 1909-1910 draft: "The main part of this Essay—the characterizations of Belief and of Doubt, the argument as to the effective aim of inquiry, the description of four methods directed toward that aim, with the criticisms of them, the discussion of the proper function of thinking, and the consequent maxim for attaining clear concepts,—reproduces almost verbatim a paper I read,—it must have been in 1872,—to a group of young men who used, at that time, to meet once a fortnight in Cambridge, Mass., under the name of 'The Metaphysical Club,'—a name chosen to alienate such as it would alienate" (7.313n1).

In addition to these corrections and revisions, there are numerous references back to the two articles, explicitly mentioning them, and quoting the pragmatic maxim either verbatim, or with a change of pronouns from the first to the second person. See the following, all written in 1903 or later: 5.17f, 28; 5.414-422; 5.438-442; 5.526-529; 5.563f; 6.485.

Hjalmar Wennerberg detects distinct earlier and later theories of belief and doubt in Peirce, but emphasizes that they "are not incompatible with each other but can be combined into a more general theory of belief and doubt" (Hjalmar Wennerberg, *The Pragmatism of C. S. Peirce: an Analytic Study*, Library of Theoria No. IX [Lund: Gleerup, 1962], p. 53).

20. See 5.372-375; 5.394; 5.510; 7.313-326.

21. The same dissatisfaction with certain ideas expressed in "The Fixation of Belief," is found again in an article published thirty years later. It is not true to say that because inquiry begins with doubt and ends with belief, truth amounts merely to a state of satisfaction, as the earlier work assumed. Scientific inquiry is more than a mere quest for mental satisfaction. "A Neglected Argument for the Reality of God," *Hibbert Journal*, VII (1908), 90-112. This work is found in the *Collected Papers* (6.452-493).

22. In the next chapter the four methods of fixing belief will be described and the superiority of the scientific method will be explained.

23. See also 6.3; 6.485.

24. There is an apparent inconsistency in Peirce's view on the extent of doubt.
On the one hand he excludes Descartes' universal methodic doubt with such vigor that he ends up with infallible, absolute truths. "There is much that you do not doubt, in the least. Now that which you do not at all doubt, you must and do regard as infallible, absolute truth" (5.416).

And yet, in quite another spirit he maintains that propositions which are here and now undoubted may later come under the scrutiny of doubt. This is a characteristic of all undoubted propositions (5.376n). In another place he asserts that "sure knowledge" is impossible, where sure knowledge means perfect knowledge that we have reached perfect knowledge on some point (4.63). "Perfect knowledge" is itself a technical term, meaning opinion which is so settled that no further inquiry can shake it. We cannot, then, be unshakably certain that we have attained unshakably certain knowledge. (The same view is expressed, in equivalent terms, in 5.514 and many other places.) There is, however, a "practically perfect belief," by which we treat some propositions as certain (4.64).

A solution of the apparently conflicting positions must take into account a fundamental maxim of all knowledge for Peirce: "Do not block the way of inquiry" (1.135). Now to maintain that there are ultimately indubitable beliefs blocks the way of inquiry, for Peirce. However, we must hold on to those beliefs that are actually not doubted. They can even be used as bases for demonstration, at least temporarily (5.376). For all practical purposes we are to leave these actually undoubted propositions alone: they are to be treated as if they were absolute and infallible, and they must not be submitted to any artificial, willful doubt. But, whenever we are impelled by some external circumstance to suspect the truth of propositions which we have believed up to now, then their mere seniority gives them no immunity from the careful probing of inquiry. So long as there is no reason for doubting them, they must be left alone; but when experience detects a weakness, then they should be submitted to doubt.

25. See also 2.192; 5.451.

26. The action of the man in doubt "is in imagination (or perhaps really) brought to a stop because he does not know whether (so to speak) the right hand road or the left hand road is the one that will bring him to his destination; and (to continue the figure of speech) he waits at the fork for an indication, and kicks his heels," as Peirce wrote about 1905 (5.510).

27. The habit-taking tendency of nature will be treated in Chapter V.

28. See also 5.371, 373, 387, 394.

29. Peirce frequently asserts that practical belief, since it is directed toward action, has nothing to do with science. Practical belief is a position that does not result from scientific reasoning. Rather it is an attitude of mind that is unaware of its own weakness, and that brashly disregards careful criticism. Peirce thinks that these defects are almost necessary for non-scientific belief, since this type of belief is meant for action. Action requires a certain brave and blind attitude of self-confidence, based largely on instinct and sentiment.

30. It is important to distinguish between Peirce's fake doubt and his feigned hesitancy. Fake doubt is Cartesian; it is opposed to the genuine doubt that should inaugurate a scientific inquiry, and is rejected by Peirce. But feigned hesitancy is the theoretical doubt which marks the beginning of a scientific investigation. It is a question concerning the constitution of the universe. Its answer will be presented
in terms of action, as here described—i.e., of imagined action. Only in this sense is scientific doubt feigned.


32. This statement of Peirce’s is open to serious objection. And it seems quite clear that Peirce himself later became aware of the shortcomings of the formulations of pragmatism in the two articles of 1877 and 1878. There are certain constants in Peirce’s pragmatic theory of meaning, but there is also a considerable amount of development, and even of drastic revision. This is one of the main topics of Wenerberg’s The Pragmatism of C. S. Peirce; see especially pp. 116 and 126ff.

According to some authors, although Peirce claims to be a scholastic realist and a follower of Scotus, his pragmatism sets him off from the latter, for it involves an identification of essence with behavior. For an elaboration of this, see Ralph J. Bastian, s.j., “The ‘Scholastic’ Realism of C. S. Peirce,” Philosophy and Phenomenological Research, XIV (1953), 246-249, and Murphey, Development, pp. 154-163. However, as will be seen later, there is another interpretation, not devoid of likelihood, that in his later years Peirce developed a pragmatism closer to the understanding of the scholastic metaphysicians. See p. 136.

33. The importance of the conditional proposition is brought out in Peirce’s “Issues of Pragmaticism,” published in 1905, in which he writes as follows: “Pragmaticism makes the ultimate intellectual purport of what you please to consist in conceived conditional resolutions, or their substance; and therefore, the conditional propositions, with their hypothetical antecedents, in which such resolutions consist, being of the ultimate nature of meaning, must be capable of being true, that is, of expressing whatever there be which is such as the proposition expresses, independently of being thought to be so in any judgment, or being represented to be so in any other symbol of any man or men. But that amounts to saying that possibility is sometimes of a real kind” (5.453). The conditional aspect of pragmatism is also brought out in the two Popular Science Monthly articles of 1877 and 1878, as Murphey points out (Development, pp. 155-159).

34. In his later writings Peirce himself calls this rule a maxim.


37. Perry, Thought and Character, II, 424f. With regard to the meaning of concepts, it is interesting to read in a letter to William James, composed late in 1904, that Peirce disowns any quotation of his that may speak of “the meaning of a concept.” The letter emphasizes the intellectual aspect of pragmatism. See Perry, Thought and Character, II, 432f. But in a letter to Mrs. Christine Ladd-Franklin, Peirce speaks of the pragmatic method and its reference to the meaning of concepts. “The meaning of a concept . . . lies in the manner in which it could conceivably modify purposive action, and in this alone” (Christine Ladd-Franklin, “Charles S. Peirce at the Johns Hopkins,” The Journal of Philosophy, Psychology
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and Scientific Methods, XIII [1916], 718). The same letter of Peirce contains his own summary of the origin of pragmatism, the friends and associates constituting the Metaphysical Club where the method was first crystallized, the articles proposing it, the appearance of the word, and many significant biographical facts. The same letter also gives very brief evaluations of the opinions of William James, Dewey, and Royce. Ibid., pp. 719f.

This letter to Mrs. Franklin and paragraph 5.12 of the Collected Papers contain some of Peirce's main references to the origins of pragmatism.

38. One of the main points of difference between the pragmatism of Peirce and that of William James is their attitude toward particular actions. Peirce emphasized the kind of action involved (5.426), while James stressed the particular consequence. James spoke as follows in his California Union address of 1898: "The effective meaning of any philosophic proposition can always be brought down to some particular consequence, in our future practical experience, whether active or passive; the point lying rather in the fact that the experience must be particular, than in the fact that it must be active" (quotation [with emphasis added] in an article by John Dewey, "The Pragmatism of Peirce," The Journal of Philosophy, Psychology and Scientific Methods, XIII [1916], 710f). In another article Dewey mentions two misunderstandings of pragmatism—that pragmatism makes action the end of life, and that it subordinates thought and rational activity to the narrow purposes of interest and profit. "Le Developpement du Pragmatisme Americain," Revue de Metaphysique et de Morale, XXIX (1922), 413.

Perry describes the situation briefly: "The modern movement known as pragmatism is largely the result of James's misunderstanding of Peirce" (Thought and Character, II, 409). Robert Roth, however, has recently asked for a reconsideration of Perry's commonplace, by pointing out strong similarities between Peirce and James, without eliminating the differences. Roth asks whether James, instead of misunderstanding Peirce, might rather have extended certain of the latter's insights. Roth sees two dimensions in both thinkers: the scientific and the more inclusive non-scientific tradition that is open to vitally important matters (in the favorable sense) and to a knowledge of God's existence. But at the same time he admits a difference of emphasis in Peirce and James, because of their different temperaments (Robert J. Roth, s.j., "Is Peirce's Pragmatism Anti-Jamesian?" in International Philosophical Quarterly, V [1965], 541-563).

39. On the conditional and general aspect of pragmaticism, see also 6.485.


NOTES—CHAPTER III

1. The main source of these views is "The Fixation of Belief." Peirce writes of the intent of this article as follows: "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" (5.385).
NOTES—CHAPTER III

2. Peirce is even more forceful about the primacy of the scientific method over the other three, in a work which appeared in the Popular Science Monthly in 1878 as the last essay of the series "Illustrations of the Logic of Science," of which "The Fixation of Belief" and "How to Make Our Ideas Clear" were the first and second. In the last essay he asserts that the other three methods are of no value at all in the pursuit of knowledge. "Knowledge can only be furthered by the real desire for it, and . . . the methods of obstinacy, of authority, and every mode of trying to reach a foregone conclusion, are absolutely of no value" (2.635).

3. Wiener, Values, p. 326. The same view is expressed in the Collected Papers (4.530), though the context is more directly concerned with experiment.


7. The editors of the Collected Papers note that this lecture was entitled "Early Nominalism and Realism," from the series "Lectures on British Logicians." It was delivered at Harvard in 1869.

8. Peirce's reference is to William Whewell, History of the Inductive Sciences, from the Earliest to the Present Time. The intellectual character of experience is brought out quite sharply in the distinction which Peirce draws between perception and experience. Although it is probably true, as Peirce thinks, "that every element of experience is in the first place applied to an external object," experience still does not consist entirely in sense-perception (1.334f). The difference between experience and perception is explained briefly by Maurice Natanson, "The Concept of the Given in Peirce and Mead," The Modern Schoolman, XXXII (1955), 144f.

9. The book to which Peirce has reference is Ernst Mach, Popular-wissenschaftliche Vorlesungen. Sometimes the scientist would do well to substitute rational calculation for experiment, Peirce cites with contempt the example of the foolish experimenter who spent a month or more dropping a stick on the floor to ascertain experimentally the value of pi with much less exactness than it could have been approximated by five minutes of calculation (4.69). Similarly ideal experimentation (which for Peirce seems to be the same as reasoning, or at least reasoning in regard to known possibilities) can sometimes supply a better answer than sensible experimentation. A chemist who hears from one assistant that fluorine is present in a majority of a given set of bottles, and from another assistant that oxygen is present in a majority of the same, and from both that fluorine and oxygen cannot exist together, knows apart from experimentation that there is an impossibility involved. It is impossible for both assistants to be right, as the head chemist knows, without testing the truth of their reports sensibly (3.527).

10. By "reason," I do not mean merely inference. In this context the term includes all types of intellectual activity and habits.

11. This process of experimentation, including reason, Peirce sometimes calls
"indagation," the tracking down of the constitution of the universe. It is not, however, a frequently used term.

12. For Peirce, therefore, observation seems to be a special kind of experience. While experience involves the forceful action of an independent object on the knower, observation seems to include an attitude of attentive studiousness on the observer's part. Experience is a forceful modification of our ways of thinking. But observation seems to be experience undertaken deliberately and with great attention and analysis. The citations on the last few and the next few pages document this interpretation.

13. Such a method, of course, Peirce claims to have followed in his own investigations.

14. For Peirce, percepts are initial data altogether within the order of thought. "I see an inkstand on the table: that is a percept. Moving my head, I get a different percept of the inkstand" (8.144; also 2.141). Percepts are not, however, the first impressions of sense. They are very fleeting thought-operations, not subject to the control of the will or to criticism. "Perceptual facts" are memorial records of percepts, and constitute the data from which inference begins. See Murphey, Development, p. 369.


16. Peirce uses the example of the inkstand and the observer also in 8.153.

17. Goudge, surprisingly, makes use of this text to support his thesis that Peirce's naturalistic strain regards experience as noncognitive. For Goudge, the "brutality" of experience argues against its mental nature, despite the fact that, in the text just quoted, Peirce writes of the "brutal inroads of ideas from without" (1.321, emphasis added). According to Goudge, Peirce's naturalistic side takes experience as affective and "wholly non-cognitive," although Goudge is well aware of the "transcendental" view in Peirce that experience is cognitive. On this question the conjectured schizophrenia seems immoderate. Goudge, The Thought of C. S. Peirce, pp. 265-268. See also his articles in The Journal of Philosophy, XXXII (1935), 538; XXXIII (1936), 289; XLIV (1947), 366, 370f.

In fact, in a review of William James's Principles of Psychology, Peirce opposes the view, maintained also by Goudge's naturalistic sympathies, that "through feelings we become acquainted with things." This opinion, Peirce says, lies at the root of a large area of bad metaphysics. "On the contrary, the feelings are matters of indifference. . . . It is by the reactions of ourselves upon things and of their parts on one another that we become acquainted with things, as it seems to me" (Perry, Thought and Character, II, 107).

Regarding those commentators who see irreconcilable strains in Peirce, Burks has this to say: "It is fashionable today to conclude from the fact that Peirce's writings are fragmentary that his thought was likewise fragmentary. . . . But the lack of unity in his thought has been greatly overemphasized because of a failure to recognize three facts: first, that his logic is foundational to the rest of his philosophy, and hence that his three categories are basic in all his thought; second, that in a scientific spirit Peirce pursued the implications of different hypotheses (and as a consequence varied his terminology from paper to paper);
and third, that there was a temporal development in his thought" (Arthur W. Burks, "Peirce's Theory of Abduction," *Philosophy of Science*, XIII [1946], 301).

18. Although in this work I do not intend to go into the psychology of experience, except insofar as it is necessary for some understanding of the first moment of the scientific method, it should still be noted in passing that the existence of effort, or, as Peirce calls it, the oppositional aspect of experience, is known through inference (1.332-336).

19. Paragraph 5.539 also deals with some of the topics presented here. But 1.332-336 seem more adequate than 5.539, and were composed about three years later. In addition it should be mentioned that in 5.539 Peirce professes his agreement with the opinion of Thomas Reid on the direct perception of the world of material things. The same agreement with Reid is also mentioned in 5.56 and 6.95. Feibelman gives a helpful presentation of the influence of Reid on Peirce and on other nineteenth- and early-twentieth-century thinkers in *An Introduction to Peirce's Philosophy*, pp. 450ff.

20. In another work, also directed against Carus, but composed about ten years earlier, Peirce asserted that "being, and the uniformity in which being consists, require to be explained. The only thing that does not require it is non-existent spontaneity. This was soon seen to mean absolute chance" (6.604). Chance or irregularity he describes as "the absence of any coincidence," and asserts that such an event "calls for no explanation" (6.612). A surprising event—one which calls for explanation—is, accordingly, described as a coincidence.

Carus asserts that there is no need, in fact no possibility, of giving an account of facts. Peirce strongly disagrees and maintains that the existence of a fact demands an account (6.612). The role of chance will be treated in Chapter V.

21. For example, the different terms are used in the following sections: 1.354, 1.369, 2.774-791, 5.273, 6.144.

22. Paul Weiss sums up the importance of abduction for Peirce in words of high praise for this mental operation: "Under such titles as abduction, hypothesis, retroduction, and presumption, C. S. Peirce struggled over the years to lay bare the logic by which we get new ideas. He was, I think, more perceptive and bolder, and traced the problem into more crannies than anyone before or since. He took abduction to be of the very essence of pragmatism, saw that it was essential to history, and that it constituted the first stage of all inquiries. He insisted that it was a necessary part of perception, memory, and science. He thought it had a bearing on a proof of God, and that it was presupposed by all induction" (Paul Weiss, "The Logic of the Creative Process," *Studies* [first series], p. 166).

23. In the early days of the century poverty forced Peirce to give his time and talent to various jobs, like translating scientific papers for the Smithsonian Institution. Samuel P. Langley, secretary of the Smithsonian, took an interest in Peirce and helped him out of some financial difficulties. In the spring of 1901 Langley invited Peirce to write on the change in the meaning of "laws of nature" since Hume's day. Peirce replied with "Hume and the Laws of Nature," but did not satisfy Langley's request that he treat the change in the idea of laws of nature from Hume's time to Peirce's. Peirce disagreed with Langley's understanding of the history of the question, but wrote in reply another paper, "Hume on Miracles and Laws of Nature," later revised and re-entitled "The Laws of Nature and Hume's Argument against Miracles." These two works are dated June 1, 1901,
and September 5, 1901, respectively. Langley, because of his limited understanding of the question, was still unsatisfied, and neither of the works was published. (All this information is drawn from Wiener, *Values*, pp. 275–289. The composite text of the two last-mentioned articles is also given by Wiener, pp. 289–321. Wiener’s article and the Peirce–Langley correspondence were originally published in the *Proceedings of the American Philosophical Society*, XCI [1947], 201–228.)


26. In 1891 he wrote of the development of his ideas: “I hope my mind has not been stationary during all these [sixteen] years; yet there is little in those old articles which I now think positively erroneous. . . . My present views had, at that time, already begun to urge themselves on my mind; but they were not ripe for public avowal.” He then goes on to give explicit approval of the ideas presented in two of the essays intended for republication in “Search for a Method” (6.609). Similarly in 1903 he wrote approvingly of his views of the three types of inference as explained in 1867 (5.144).

27. The article was published in the *Proceedings of the American Academy of Arts and Sciences*, VII (1867), 261–287.

28. This was published in the *Journal of Speculative Philosophy*, II (1868), 140–157.

29. Peirce presents his justification of the spelling of “premiss” and “premisses” in 2.582f.

30. A helpful example of classifying a particular man as a “mugwump” from characteristics learned from conversation with him, is given in 6.145.


32. Peirce regards as accidental the relation of the genera of arguments to the various figures of the syllogism. Induction and abduction must not be expected to result in necessary conclusions, as strictly syllogistic reasoning does. Thompson, *Pragmatic Philosophy*, pp. 97ff.

33. This article also notes the relevance of mathematical ratios, and hence of probability, to reasoning processes. It further proposes both induction and hypothesis as types of synthetic inference, which, as we shall see, is a way of understanding the introduction of new, and perhaps not directly observable, facts into scientific procedure (2.623, 641, 644).

34. The explanatory role of abduction is also mentioned but not emphasized earlier in the essay (2.707). “A Theory of Probable Inference” was originally published in *Studies in Logic, by Members of the Johns Hopkins University*, ed. C. S. Peirce (Boston: Little, Brown, 1883).

35. Arthur W. Burks presents some brief considerations on abduction as a process of reasoning, and as a distinct kind of argument from induction and deduction. When he confines his discussion to the difference between induction and abduction he too asserts that Peirce first regarded them both as modes of argument and later as methods in scientific inquiry. The question then is to justify this latter view of abduction as a reasoning process. Is there a logic of discovery? According to Burks there is such a logic, since for Peirce reasoning is a deliberate and logically controlled process; it is the adoption of a conclusion because the man sees that the conclusion follows according to a leading principle which he approves. Abduction fulfills the requirement
NOTES—CHAPTER III


36. Explanation consists in the reduction of a complex predicate to a simple predicate “from which the complex predicate follows on known principles,” as he wrote in 1891 (6.612).

37. Note that in this passage the scientist reaches an explanatory hypothesis “at once.” Later we will see that the scientific imagination devises an explanatory theory by a step that is sudden, free, and brilliant. It progresses by leaps. See p. 37.

38. The title of this paper is “On the Logic of Drawing History from Documents especially from Testimonies.” Part of it is directed against Paul Carus. In another lengthy work also directed against Carus, but written about ten years earlier, Peirce repeats that the function of explanation is to show that the fact explained is a necessary or probable result of another fact (6.606).

39. In his famous article “A Neglected Argument for the Reality of God,” Peirce summarizes these topics. Inquiry begins with a surprising event that the inquirer attempts to explain, by proposing a possible explanation, “by which I mean a syllogism exhibiting the surprising fact as necessarily consequent upon the circumstances of its occurrence together with the truth of the credible conjecture, as premisses” (6.469). The logical aspects of abduction, the surprising event, the conjecture as an explanation which renders the observed fact necessary, are important points of Peirce’s basic teaching on abduction.

40. Peirce’s long and somewhat exaggerated reply to Paul Carus, published in The Monist in 1893, should be consulted; Collected Papers, 6.588–618.

41. Selections from this undated paper are given in Wiener, Values, pp. 137–141.

42. A helpful article on Peirce’s opposition to positivism is that of Matthew J. Fairbanks, “C. S. Peirce and Positivism,” The Modern Schoolman, XLI (1964), 323–337. Fairbanks describes Peirce’s rejection of the antimetaphysical bias of positivism, and includes some of Peirce’s recommendations concerning the manner in which positivists might profit from a study of metaphysics.

43. The same view is expressed in 2.96: “An Abduction is Originary in respect to being the only kind of argument which starts a new idea.”

44. An appeal to the continuity of the human mind with developing nature must be brought in also, in order to account for the success of abduction.

45. “The principal rule of presumption is that its conclusion should be such that definite consequences can be plentifully deduced from it of a kind which can be checked by observation” (2.786).

46. A major source of doctrine on economy in abduction is 7.218–223, a work composed about 1901.

47. Peirce’s views on economy in research were developed in his minute experimental studies in physics and astronomy with the Coastal Survey in the eighteenth-seventies. See his “Note on the Theory of the Economy of Research” (7.139–157).

48. In this same work, he also lists several rules for the economics of research (1.120–125). His work on Hume and the laws of nature expresses similar views. Wiener, Values, p. 302.

49. Apparently Peirce’s views on instinct as based on the kinship of the human mind with the cosmos are themselves formed by a process of abduction. The openness of phenomena to rationalization is known by abduction. The affirmation of
the mind's kinship to the universe he calls a hypothesis, and asserts that this is the only explanation of the marvelous success that scientists have had in hitting on the correct hypothesis relatively early in the inquiry (7.219f).

50. It is to be noted, however, that besides this "scientific" instinct there is also a practical instinct that should guide men in everyday living, in certain cases even more reliably than reason. We are not dealing with practical intellect here (2.176f).

51. In these sections Peirce makes reference to Ockham's razor as a maxim of scientific procedure. For him the razor means that the inquirer should test the simpler explanation, the one with the fewest elements, first.

52. In at least one piece of writing composed in 1901 he seems to interpret simplicity as he did in 1908. But the interpretation is not emphatic: "We may, with great confidence follow the rule that that one of all admissible hypotheses which seems the simplest to the human mind ought to be taken up for examination first" (6.532).


54. There are also some references to practical concerns in the section 6.496-500.

55. On this point, W. H. Hill has misjudged Peirce as having recourse to the a priori method of fixing belief. Hill represents Peirce as holding that man attains this knowledge of the universe by checking his beliefs, with "those insights upon which we can agree." Hill therefore interprets instinct (which Peirce proposes as a faculty for selecting hypotheses) as a kind of ultimate verification. "Peirce's 'Pragmatic' Method," Philosophy of Science, VII (1940), 180. See 6.530.

56. In addition to the perceptual indubitables, Peirce also considers as commonsense beliefs what Buchler calls the social indubitables such as the almost universal belief of the criminality of incest. Both the perceptual indubitables and the social indubitables can be described as primitive in some sense, at least inasmuch as they have not as yet been subjected to controlled criticism. Buchler, Peirce's Empiricism, pp. 59-61. See also Thompson, Pragmatic Philosophy, pp. 223f.

57. Peirce frequently refers to his own philosophy as "critical common-sensism." This, as Dewey points out, does not mean that it consists merely in a widely held body of opinion, but in ideas forced upon us by the world in which we live. Common sense is an affair of experience, but not of sensations exclusively, as most previous empiricists said. Again, with Dewey, Peirce's common-sensism is critical, since an uncritical acceptance of philosophical positions would block the way of inquiry. It is difficult, however, to accept Dewey's paraphrase as representative of the real Peirce: the opinions forced on us are "the ideas and beliefs that a man must hold in order to meet in his activities the urgent and imperative demands made upon him by his situation" (John Dewey, Review of Collected Papers of Charles Sanders Peirce, The New Republic, LXXXIX [1937], 415).

James O'Connell has explained quite competently the continuing presence of the common-sense indubitables in scientific work, as well as the function of the scientist in adjusting to these: "C. S. Peirce's Conception of Philosophy," The Downside Review, LXXVII (1959), 277-295.

58. As the editors of the Collected Papers note, Peirce was scheduled to give six lectures on pragmatism from March to May of 1903. But another written lecture,
entitled "Pragmatism—Lecture VII," was found in a notebook belonging to the same set of notebooks in which the other six lectures were found.

59. This is the third of his three "cotary propositions." Peirce informs the reader that the Latin *cos*, *cotis* means a whetstone; the three cotary propositions are supposed to put the edge on the pragmatic maxim. The form "cossal" is also used (5.180f).

60. The article was published in *The Monist*, and was entitled "Prolegomena to an Apology for Pragmaticism."

61. In the same sentence Peirce says that this is the only difference between the two.

62. Buchler holds the same, but I would hesitate to agree with him when he asserts that for Peirce the perceptual judgment is the conclusion of an inference. As Peirce says, the perceptual judgment is outside the field of rational control (5.181). In addition, Peirce frequently says that one of the distinguishing marks of inference is that it is subject to criticism and control. This would seem to deny Buchler's general statement that every synthetic proposition is a hypothesis (Peirce's Empiricism, pp. 396, 135).

63. There are other examples of interpretation given by Peirce. We wake up at the hour we choose much more accurately than we could consciously guess; while preoccupied with study, we are oblivious of a clock striking the hours very audibly; proofreaders notice mistakes which the untrained eye, accustomed to correct spelling, will miss. Adjustment for interpreting the percept is a more relevant aspect of experience than the objective intensity of the percept.

64. Abductive inference and the perceptual judgment are seen to be both similar and dissimilar with regard to their interpretative character, in an illustration given by James O'Connell: a collection of dots on a page may in some cases very easily be recognized as the outline of a rabbit, while in other cases the observer may approach a group of points with the purpose of finding a rabbit's outline there, and may succeed only in view of this deliberately assumed attitude. The latter, O'Connell says, is more like the process of scientific abduction, while the former is more of an instance of the perceptual judgment (James O'Connell, s.m.a., "C. S. Peirce and the Problem of Knowledge," Philosophical Studies, VII [1957], 13-14).

65. This is a somewhat vague, though valuable, answer to the very important epistemological problem regarding the contributions that outside reality and the observer's constitution make to knowledge. James O'Connell understands Peirce correctly in saying that our knowledge is dependent on the nature of the external object known. The interpretative character both of explanatory hypotheses and of perceptual judgments O'Connell attributes to the "selective nature of our senses, and the general nature of our concepts, ... our temperament, motives, and history, and ... the actual situation at the moment of knowing" (Ibid., p. 14). The subjectivity involved here is overcome by the verification process, which alone validates abductive conclusions, as O'Connell also points out, pp. 14f.

66. There is a genuine need for answering this question, since we cannot claim that Peirce did not really hold both these views. His position is too clearly put, and too frequently repeated, to allow us to deny either part.

67. There is evidence here of Peirce's opposition to nominalism, a theme which will be treated in Chapter V.
68. There is also an interesting analysis of the form of abductive inference, and of the way in which it is known. Peirce admits that he is venturing rather far in claiming that "every general form of putting concepts together is, in its elements, given in perception" (5.186). This is a difficult position to justify, more so since the position is general, including all forms of reasoning: deductive necessity, inductive probability, abductive expectability, the conception of inference itself. A formal conception originates when the reasoner perceives that one might conceivably reason in this way. "What can our first acquaintance with an inference, when it is not yet adopted, be but a perception of the world of ideas? In the first suggestion of it, the inference must be thought of as an inference, because when it is adopted there is always the thought that so one might reason in a whole class of cases. . . . The inference must, then, be thought of as an inference in the first suggestion of it" (5.194). In this way inference is known as inference. It becomes an object of thought, part of the matter of thought.

69. Murphey, Development, pp. 370f.

70. Ibid., p. 372. Chisholm also brings out the central importance of the perceptual judgment for Peirce (Roderick M. Chisholm, "Fallibilism and Belief," Studies [first series], p. 104). On perception as the starting point and testing ground of speculation, see also Richard J. Bernstein, "Peirce's Theory of Perception," Studies (second series), p. 184.


72. One formulation of the maxim is the following: "The maxim of pragmatism is that a conception can have no logical effect or import differing from that of a second conception except so far as, taken in connection with other conceptions and intentions, it might conceivably modify our practical conduct differently from that second conception" (5.196).

73. In the second chapter the intellectual emphasis of Peircean pragmatism has already been noted.

74. Ernest Nagel, it seems, misses the stress which Peirce places on conceived action in the pragmatic maxim ("Charles S. Peirce, Pioneer of Modern Empiricism," Philosophy of Science, VII [1940], 73–76).

75. In confirmation of this interpretation, see also 4.447 and 5.412.

NOTES—CHAPTER IV

1. The book to which Peirce is referring is George Henry Lewes, Aristotle: A Chapter from the History of Science (London, 1864), as the editors note.

2. In the verification stage, the inquirer directs his attention to the hypothesis, rather than to the facts from which the hypothesis was generated. He studies out "what effect that hypothesis . . . must have in modifying our expectations in regard to future experience." Then he tests to see how the new expectations materialize (7.115). In the lecture quoted here, Peirce refers to the testing of the predictions as "quasi-experimentation," meaning by this word the operation of absolutilzing the conditional propositions deduced from the hypothesis, and of noting how the matter turns out (7.115n).
3. Sections 2.755–772 are from a manuscript on induction and methodology, composed around 1905, and thought to be a draft of a section of "A Neglected Argument for the Reality of God," as mentioned in the general bibliography of Peirce's writings in the eighth volume of the Collected Papers, p. 298.

A considerable section (6.468-480) of the "Neglected Argument," published in 1908, is concerned with a presentation of scientific method. The following pages on deduction rely heavily on this work.

4. Peirce frequently uses the words "consequences" and "consequents" interchangeably. Boler, however, following the more usual understanding of the logicians, detects a difference between consequent (the observable result of provisionally accepting a hypothesis) and consequence (the nexus between the hypothesis and its consequent). I shall employ Boler's distinction in a later chapter where it will be quite helpful (p. 123), but for the most part I shall follow Peirce's policy of interchangeable usage, according to which "consequence" usually means "consequent" (John F. Boler, Charles Peirce and Scholastic Realism [Seattle: University of Washington Press, 1963], pp. 70, 97-99).

5. There are two difficulties that one meets in studying what the role of deduction is for Peirce in a scientific inquiry: 1.) in many places Peirce refers to the whole operation of verification as induction, without mentioning the word "deduction"; 2.) he frequently treats deductive inference apart from any relation to the scientific method. Later on in this chapter I shall explain somewhat more fully the different senses of induction for Peirce.

6. James Ward Smith wisely points out that the deductive stage of scientific inquiry is an application of pragmatism. In drawing observable consequences from his explanatory hypotheses, the scientific investigator is explicating the meaning of the predicate of the abductive proposition, in terms of observable consequences (James Ward Smith, "Pragmatism, Realism, and Positivism in the United States," Mind, LXI [1952], 191-192).

7. The proposition, then, that is deduced from the explanatory hypothesis is just as shaky as that hypothesis, up to the time of the actual testing. Nevertheless, deduction is for Peirce a real tool of progress in knowledge. The final evaluation of the hypothesis after the completion of the verification process is a real addition to knowledge, achieved partially through deduction. Furthermore, the verifiable propositions generated by deduction from the hypothesis are no more than virtually known before the deduction takes place. Peirce here goes beyond J. S. Mill in his estimate of deduction.

8. Virtual antecedence is best described by the illustration which Peirce gives (2.759). Suppose that an investigator, during the course of the deductive phase of scientific inquiry, finds to his surprise that the adopted hypothesis leads him to predict an event whose truth he already knows. He has not verified the prediction by testing it after deducing it from the hypothesis, in ignorance of the result. But just as soon as he sees that the hypothesis leads him to predict the event, he realizes that he already knows its truth from previous experience. May such an event be taken into consideration in evaluating the worth of the hypothesis? Peirce answers that if the predicted event has influenced the formation of the hypothesis, then it has performed its function in this inquiry, and may not be used again. If, however, the event has not been used in the generation of the hypothesis, then it not only may be considered in evaluating the hypothesis, but
must be so used. Such a prediction "virtually antecedes" the investigator's knowledge of it, since in this case it has been brought to his mind as an uncertain conclusion from an uncertain hypothesis (2.759). Hence its truth is "virtually unknown" (2.775), i.e., the prediction has been made only in virtue of a hypothesis, whose worth is as yet in doubt. See also 7.89f.

9. In a more compressed form: "Induction, is an Argument which sets out from a hypothesis, resulting from a previous Abduction, and from virtual predictions, drawn by Deduction, of the results of possible experiments, having performed the experiments, concludes that the hypothesis is true in the measure in which those predictions are verified, this conclusion, however, being held subject to probable modification to suit future experiments" (2.96).

10. Peirce makes it clear in this section that he does not understand experimentation in the narrow sense of varying the conditions of an experiment as much as one pleases. Such a method is accurate and easy, but the experimental method is rather putting a question to nature, and awaiting her reply.

11. Peirce uses the term "induction" to refer to different processes of reason, some more inclusive than others. There are four meanings which must be distinguished. 1.) In its most inclusive sense the term "induction" refers to all the stages of the scientific method. The method of the sciences is the inductive method. 2.) Peirce also uses the word to designate the process of verification; in this sense it includes the deductive phase. 3.) The term is also used by Peirce to designate that part of the verification process which occurs after experiential consequents have been deduced from the explanatory hypothesis. 4.) Its strictest meaning is the evaluation of a ratio. In this last sense, the inquirer concludes inductively that probably a given characteristic will be found in a whole class, in the same proportion as it has been found in a sample of that class. Toward the end of this chapter I will treat the fourth meaning of induction, in relation to the process described under the third meaning of induction. In the meantime, however, the word will be used mostly in the third sense; but the reader must be cautioned that the word is also used here both in the second sense and in the fourth sense, depending on the precise context.

The above quotation (5.170) is an example of the more inclusive meaning of induction, including deduction. In the text quoted, Peirce makes reference to the explanatory hypothesis (formed by abduction), to the predicting phase (a process of deduction, as he explicitly states), and to the testing operation which compares the theory with observed facts. The last step is induction, in its more restricted meaning.

12. For information on this work, see note 3, above.

13. The book was published by Little, Brown and Co., Boston, in 1883. Peirce intended to republish the article as Essay xiv of the projected "Search for A Method." Like the other essays of this projected book, "A Theory of Probable Inference" follows an approach somewhat like that of formal logic, as has already been mentioned, p. 34.

14. Both these requirements are mentioned and briefly explained in Peirce's projected "History of Science" (1.93-95).

15. Predesignation could have been considered under the heading of deduction, since strictly it is by a process of deduction that the predesignation actually occurs. However, it is better to consider it here, since Peirce usually considers predesigna-
tion under induction, and since the reasons for predesignation can be more fully appreciated here.

16. Peirce gives the example of a man doing biographical research who notes the ages at death of the first five poets listed in a biographical dictionary. After long contemplation of the five numbers, he finds several characteristics that they have in common, e.g., “the first digit [of each of the ages] raised to the power indicated by the second, and then divided by three, leaves a remainder of one.” And yet, he says, “there is not the smallest reason to believe that the next poet’s age would possess these characters” (2.738). The results of not predesignating the character sought for are most fallacious, and disastrous to science.

Another example of faulty induction, based on failure to predesignate, is found in an article by Peirce in Baldwin’s Dictionary. This passage also brings out the importance of random sampling as the basis of induction. “Thus Macaulay, in his essay on the inductive philosophy, collects a number of instances of Irish whigs—which we may suppose constitute a random sample, as they ought, since they are to be used as the basis of an induction. By the exercise of ingenuity and patience, the writer succeeds in finding a character which they all possess, that of carrying middle names; whereupon he seems to think that an unobjectionable induction would be that all Irish whigs have middle names. But he has violated the rule, based on the theory of probabilities, that the character for which the samples are to be used as inductive instances must be specified independently of the result of the examination. Upon the same principle only those consequents of a hypothesis support the truth of the hypothesis which were predicted, or, at least, in no way influenced the character of the hypothesis” (2.790).

17. Peirce in one text admits the possibility under certain conditions of a successful test without the predesignation of the character. If striking characters are discovered in a large sample without being predesignated, we may infer inductively that the striking characters belong to the whole class. Again, if the objects being examined possess a large number of characters in common with some familiar object, the inductive inference may be drawn that the two classes of objects are practically identical. An inductive inference without predesignation, however, is less reliable than the same inference in which the character sought for has been predesignated (2.740).

18. This teaching is the same as that found in the Johns Hopkins Studies, although the latter was published almost twenty years before the articles in Baldwin’s Dictionary.

19. Again in the article on “Probable Inference,” in Baldwin’s Dictionary, Peirce repeats the same instructions for induction. The investigator asks how often certain conditions will be followed by results of a predesignated character. Then, after a number of instances, he infers that about the same ratio will hold true of the whole class, as he has found in the instances examined (2.784). See also 2.661.

20. “Presume” is a misleading word. At the end of the chapter we shall see that such a “presumption” is not a postulate. It is a reasoned position concerning the trustworthiness of the testing procedure.

21. This double restriction is also mentioned in 2.720, 2.733, and other places. In the rest of this chapter I shall discuss probability passim, but without any attempt to treat it with the adequacy which Peirce’s views on the subject deserve. The respect, which Peirce’s work on probability deserves, is brought out by
Goudge, who, however, is not in complete agreement with Peirce. "What impresses me most about his discussions [on probability] is their sensitiveness to the manifold aspects of this difficult subject. They are particularly valuable, also, because they seek to formulate a doctrine of probability that is in harmony with the practice of the empirical sciences, to ground the doctrine in objective fact, and to state it in such a way that subsequent refinement has been not only possible but fruitful. The recent development of the frequency theory by men like von Mises and Reichenbach has stemmed in large measure from Peirce's pioneering" (*The Thought of C. S. Peirce*, pp. 171f).

It is difficult to agree with the opinion of Chisholm that Peirce's theory of inquiry can be suitably described without reference to his positions on probability and induction (Roderick M. Chisholm, "Fallibilism and Belief," *Studies* [first series], p. 95).

22. Quantitative induction, one of several types of induction, will be explained in the next section of this chapter.


24. I have used the word "subject-class" in order to avoid ambiguity. The testable consequences of an explanatory hypothesis are, of course, proposed as hypothetical assertions, "If such-and-such an explanation is true, then the members of class $A$ should be marked by the character $x$." The inquirer then chooses at random certain members of class $A$, and tests them to see whether they actually are marked by the character $x$. He must, in fact, choose $A$'s—sc., members of the subject-class—for testing.

25. This paragraph is taken from his article "The Probability of Induction," published in 1878 in the *Popular Science Monthly*, and intended for republication in 1893 in the projected "Search for a Method."

26. This same position is again emphasized in a work written about 1905 (2.763 and 2.766).

27. The "Third Stage" is, of course, the process of induction, which tests the consequences drawn by deduction from the hypothesis.

28. For Peirce, the probability of the ratio with which induction deals is concerned with the future, as Goudge points out. A projection into the future of a ratio gained from past experience is quite shaky, and is subject to continual modification as new instances of the class under investigation turn up (*The Thought of C. S. Peirce*, pp. 169f).

29. As Davis says, "If science lead us astray, more science will set us straight" (Ellery W. Davis, "Charles Peirce at Johns Hopkins," *The Mid-West Quarterly*, II [1914], 49). This is a brief article presenting several of the major themes of Peirce's work. The article was published in October, 1914, about six months after Peirce's death, although no mention of his death is made.

30. Braithwaite judges it of some importance that Peirce is not defending the validity of any particular induction. A particular induction in Braithwaite's opinion is valid, not in itself, but only as a member of a class of reasonings valid because of their method. What Peirce is justifying, therefore, is the method (R. B. Braithwaite, Review of *Collected Papers of Charles Sanders Peirce*, Vols. 1-4, *Mind*, XLII [1934], 508). That Braithwaite has interpreted Peirce correctly becomes more evident by reading a short section from the seventh of the Lowell Lectures of 1903: "Suppose we define Inductive reasoning as that reasoning whose
conclusion is justified not by there being any necessity of its being true or approxi-
mately true but by its being the result of a method which if steadily persisted in
must bring the reasoner to the truth of the matter or must cause his conclusion in
its changes to converge to the truth as its limit” (7.110). This is more than a
mere supposition; it is a real assertion.
31. E.g., 5.575f.
32. As Murphree says, “what we fix upon is a method, not a set of unchanging
beliefs” (Idus Murphree, “Peirce’s Theory of Inquiry,” The Journal of Philosophy,
LVI [July 1959], 670).
33. This is a position held by Peirce late in life; the articles cited were written
or published after 1900.
34. Madden criticizes Peirce’s position on the “long run” corrective function of
induction, but he does not take into consideration this second aspect of prolonged
testing and the contribution that it makes to progress in knowledge (Edward H.
35. Recall a selection, which I have already quoted (p. 64), which asserts that
the investigator may judge that the hypothesis “ought to receive a definite modifi-
cation in the light of the new experiments, . . . or whether finally, that while
not true it probably presents some analogy to the truth, and that the results of the
induction may help to suggest a better hypothesis” (2.759).
36. P. 74, and the paragraphs cited there: 2.781; 5.145; 6.474, among others.
The seventh Lowell Lecture of 1903 presents the same view of induction (7.110).
37. See pp. 67–69.
38. See also 2.750, where a similar position is upheld. There are, however, places
in Peirce’s writings where he seems to assert that a process of induction presupposes
that all members of a class will have all the characters common to the known
members (5.272). This early writing, “Some Consequences of Four Incapacities,”
was published in 1868 at a time when Peirce, while interested in statistical reason-
ing, tended to consider inductive inference as an inversion of deductive inference.
The same position is found in his work of 1867, “On the Natural Classification of
Arguments” (2.515). Both works were intended for republication in 1893 in
“Search for a Method,” even though by that time Peirce seems to have rejected
any dependence of induction on such presumptions (2.750; 6.39–42).

NOTES—CHAPTER V

1. In this chapter I am going counter to the advice of Justus Buchler who main-
tains that to attempt to associate Peircean fallibilism with Peircean metaphysical
evolutionism leads to a misunderstanding of fallibilism. Buchler warns that, in
general, interpreting Peirce’s individual theories primarily in the light of his whole
scheme leads to vicious consequences. Buchler’s exegetical principle seems unre-
asonable (“The Accidents of Peirce’s System,” The Journal of Philosophy, XXXVII
[1940], 265).
Weiss, on the other hand, maintains that the main prima facie inconsistencies in
Peirce can be reconciled (“The Essence of Peirce’s System,” Ibid., p. 261). This ap-
proach to interpretation is more moderate.

3. According to Goudge, Peirce attributes the validity of induction to the regularity of the universe which induction, if continued long enough, will discover. The regularity, however, Goudge says, is **postulated** by Peirce (*The Thought of C. S. Peirce*, pp. 189–193). A later section of this chapter may lead one to think that the orderly character of the universe is not a postulate.

4. It is not absolutely certain how far Peirce intended his fallibilism to extend. In one piece of writing he confines fallibilism to a knowledge of **fact**, asserting that one may well accept the multiplication table as certain, while in another place the multiplication table does not enjoy any immunity from fallibilism. According to the latter place there is only one absolutely certain judgment: "If I must make any exception, let it be that the assertion that every assertion but this is fallible, is the only one that is absolutely infallible" (2.75; also 1.149).


7. Ibid., p. 59; see also 5.451 and 5.514.


9. Peirce, though he does not reject the possibility of revelation, still finds many weak spots in a person's maintaining that he comprehends a proposition which he is certain has been revealed. Similarly, innate judgments, direct experience, and memory are known sources of error. Hence there is no way of reaching perfect certitude or exactitude (1.143–146).

10. In the chapter on abduction I have already mentioned the mind's instinctive scent for truthful hypotheses along the lines of mechanics and psychics. These two instincts have been influential because they are necessary for the survival of the individual and for the propagation of the species. In an evolutionary spirit, Peirce compares man's facility at guessing the truth with the instincts of animals which guide their activities of feeding and breeding. By "psychics" he seems to mean a discipline which has some knowledge of what occurs in people's minds, how they react to certain situations, what their needs and desires are.

11. The "biographical" approach to fallibilism is found in a fragment which his editors have used as a preface to the first volume of the *Collected Papers*.


15. Ibid., pp. 61f; see also Buchler, *Peirce's Empiricism*, p. x.

16. By "laws of perception," Peirce may mean the general truths about perception, i.e., those characteristics that we are considering here. In perception, outside reality forces itself on us, and if we investigate it with the intention of learning the truth, we will inevitably be forced to attain some knowledge of it. We must, of course, recognize its cognizability and its public character.
17. "The real is that which insists upon forcing its way to recognition as something other than the mind’s creation" (1.325). The outer world, when it presents itself to thought, does so with force and compulsion (5.474).

18. In this article, entitled “Truth and Falsity and Error,” Peirce writes that a statement can be perfectly true only if it admits its own inaccuracy and imperfection (5.565, 567). The emphasis on the fallible character of knowledge is obvious here. See also note 4, supra.

19. In a letter to William James composed in 1904, Peirce states that one cannot believe what one pleases. “As for people who say that pragmatism means believing anything one pleases, my answer to that . . . is, in brief, that if one could believe what one pleased that would be true. But the fact is that one cannot. I wish I had Royce’s text where he asks how the mere pragmatist can feel it a duty to think truly, for he was present at my lecture where I showed that pragmatism (my pragmatism) makes logic a mere special case of ethics” (Perry, Thought and Character, II, 433).

20. The same view is presented also in 2.153, 4.432, 5.525, 6.328, and other places. It is also found in his review of Fraser’s work on Berkeley (8.12) and in the letter to Lady Welby, in Charles S. Peirce’s Letters to Lady Welby, ed. Lieb, pp. 38f, and in Wiener, Values, pp. 419f.

21. In a work “Why Study Logic?” Peirce repeats this theme of the independence of facts from what individuals have thought them to be (2.173). However, reality for Peirce includes generals and possibles besides facts. A diamond, for instance, which was consumed without ever being subjected to pressure would still be hard. Pragmaticism insists upon the reality of certain possibilities (5.453, 457).

22. This was written as a sequel to “Questions Concerning Certain Faculties claimed for Man.” Both of these anti-Cartesian and anti-Kantian articles touch on the theme: “We have no conception of the absolutely incognizable” (5.265). Hence, “whatever is meant by any term as ‘the real’ is cognizable” (5.310). Throughout this section, I shall also make frequent use of “How to Make Our Ideas Clear,” published in the Popular Science Monthly in 1878.

23. Peirce may consider this position Cartesian in the sense that for Descartes we have no initial certainty about the external world; certainty comes only after knowing the self first. For Peirce, however, as well as for William James, self-consciousness is suspect. “It appears, therefore, that there is no reason for supposing a power of introspection; and, consequently, the only way of investigating a psychological question is by inference from external facts” (5.249). “Self-consciousness may easily be the result of inference” (5.237). For Peirce the method of intuitive introspection is not primary as it is for Descartes.

24. The knowability of reality is the theme of the last section of “Some Consequences,” in which Peirce insists that whatever is real is knowable. There is no thing which is not related to the mind, as knowable by the mind. However, “things which are relative to the mind doubtless are, apart from that relation” (5.311). In other words, although all reality is related to the individual mind, it has not been generated by that mind.

25. “One man’s experience is nothing, if it stands alone. If he sees what others cannot, we call it hallucination. It is not ‘my’ experience, but ‘our’ experience that has to be thought of; and this ‘us’ has indefinite possibilities” (5.402n2; also 5.384). “The objective final opinion is independent of the thoughts of any parti-

26. This is the sense of Peirce's own personal habit of examining the opinions of others before assenting to a conclusion in his own mind. As mentioned above, he used to give special consideration to views inconsistent with his own, attempting to place himself in the point of view of his opponents (6.181). The same emphasis on the social character of science is brought out in his "The Ethics of Terminology," where he says: "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" (2.220).


28. Buchler's presentation of this matter is excellent: *Peirce's Empiricism*, pp. 73f and 145–149. Murphey places greater emphasis on the questions of the actual future agreement of investigators and the reality of other minds than I do (*Development*, pp. 141–147, 165–171, and 302f). See also Manley A. Thompson, Jr., "The Paradox of Peirce's Realism," *Studies* (first series), pp. 137 and 139, and *Pragmatic Philosophy*, pp. 177f, where the uncertainty of the indefinite continuation of inquiry is proposed as an additional ground of fallibilism.

Haas is in substantial agreement with the interpretation I have given when he explains that the dependence of the real on the community is a *notional* dependence, and that the community in this context is a possible condition of knowledge in general (William Paul Haas, o.p., *The Conception of Law and the Unity of Peirce's Philosophy* [Fribourg, Switzerland: The University Press; Notre Dame: The University of Notre Dame Press, 1964], pp. 114f).

John E. Smith also holds that Peirce's theory of the real is pragmatistic. Peirce, according to Smith, was attempting to combine elements of realism, idealism and pragmatism in presenting his theory of the real. While not denying the combination, I would hesitate to agree that Peirce's presentation of thirdness is as idealistic as Smith says it is (John E. Smith, "Community and Reality," in *Perspectives on Peirce: Critical Essays on Charles Sanders Peirce*, ed. Richard J. Bernstein [New Haven: Yale University Press, 1965] pp. 92–119).

29. In this connection see 7.336, quoted in note 25.

30. It is important to note here that the community of scientists form more than a *jury* deciding that certain opinions are right, and others wrong. The community of scientists are also *workers*, achieving more and more accurate formulations of the truth by virtue of their solidarity and cooperation. "It is quite true that the
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success of modern science largely depends upon a certain solidarity among investigators” (2.166). The community, of course, includes not only contemporaneous workers, but the men of the past on whose accomplishments current theories are built. See 7.51.


32. Thompson considers cosmic evolution the central theme of Peirce’s metaphysics, and rightly bases the fallible character of knowledge on such a general evolution (Pragmatic Philosophy, pp. 264f).

33. Philip Wiener summarizes the fields in which Peirce judged evolution operative: “(1) intellectual history, especially the history of science; (2) the logic of the sciences, especially that of probable induction; (3) the metaphysics of history and of science” (Evolution, p. 86). Royce and Kernan are right in asserting that Peircean evolution applies to the development of the laws of nature, but their exclusion of its application to the development of the bodies in the universe is open to question (Josiah Royce and Fergus Kernan, “Charles Sanders Peirce,” The Journal of Philosophy, Psychology and Scientific Methods, XIII [1916], 703).

Goudge, too, gives a rather good summary of evolution, emphasizing its generality. “Peirce was convinced the empirical evidence obliged the metaphysician to recognize (a) that change or becoming is a primary aspect of reality; (b) that the most important form of change is development or growth; (c) that growth cannot be understood in purely mechanical terms; (d) that it is a unidirectional process involving ‘creativity’ or the ‘emergence of novelty’; and (e) that the facts entitle us to extend the category of evolution, thus conceived, beyond the domain of the biological to the interpretation of physical, social, and historical phenomena” (The Thought of C. S. Peirce, p. 229).

34. In the present text he does not mention King by name, but merely refers to a “third” theory. That he is thinking of King is evident, however, from 6.17 where he again lists the same theories and designates the third theory as King’s. King’s dates are 1842–1901. Like Peirce, he was a field worker in geology, particularly along the 40th parallel, and in Southern California and Arizona. In 1877 he published Catastrophism and the Evolution of Environment. He has two other works, Systematic Geology and Mountaineering in the Sierra Nevada. A biography of this colorful, but little known, American is now available: Thurman Wilkins, Clarence King: A Biography (New York: Macmillan, 1958).

35. Peirce maintains that the three types of evolution are distinct, though no sharp line of demarcation can be drawn between them (6.306). He gives some treatment of Darwin’s and Lamarck’s theories and their backgrounds in his article called “Evolutionary Love” (6.296–305).

36. Furthermore, “these three modes of organic evolution have their parallels in other departments of evolution” (1.105). For example, the revisions that have taken place in weights and measures could have occurred in a way resembling Darwinian evolution in organic species or in a manner more like Lamarck’s or King’s explanations. Agassiz was also a defender of the cataclysmic mode of evolution, as Wiener notes. Peirce was a student and admirer of Agassiz. Evolution, p. 77.

37. As Peirce warns, however, the scientist must not attempt to make any prog-
ress without painstaking work, or without careful regard for the work of his predecessors. This is a severe limitation, almost a denial, of cataclysmic progress in science (2.157).

I shall discuss the mind's evolution later. Here I am interested in showing that, for Peirce, evolution is not tied down to the development of the organic species. Rather it extends downward to the changes in the environment, and upward to the progress of knowledge.

38. A text confirming the generality of evolution can be found in the first section of his "A Guess at the Riddle," where he says that the evolutionist will hold that "the whole universe is approaching in the infinitely distant future a state having a general character different from that toward which we look back in the infinitely distant past" (1.362). See note 41.

39. In another place (6.336) Peirce defines existence as "that mode of being which consists in the resultant genuine dyadic relation of a strict individual with all the other such individuals of the same universe." The strength of this dyadic relation between individuals and knowing beings becomes stronger as the world evolves.

40. In an article in The Monist (1 [1891], 161-176) entitled "The Architecture of Theories," Peirce makes reference both to the general character of evolution, and to the direction in which the universe is evolving—sc., toward an increase of law and regularity. He says that evolution accounts for the laws of nature and for uniformity in general without restricting it to organic species. The discrepancy between our predictions may be due either to errors of observation, or to "the imperfect cogency of the law itself, to a certain swerving of the facts from any definite formula" (6.13). In the same context he asserts that the Darwinian principle (of accidental variations in reproduction and of the destruction of weaker breeds) is capable of great generalization. Similarly, King's process of sudden leaps resulting from external forces "certainly has been the chief factor in the evolution of institutions as in that of ideas; and cannot possibly be refused a very prominent place in the process of evolution of the universe in general" (6.16f, emphasis added). Some of these themes will be developed later.

41. The material for the next several pages comes from Peirce's projected "A Guess at the Riddle," composed about 1890, in which he presents a moderately full treatment of the evolution of the universe toward law and regularity. In general this proposed book is a treatise on the triadic character of the world. The section most relevant to our interest is the last of the completed divisions, entitled "The Triad in Physics" (1.400-416). The title of the projected work derives from Emerson's poem "The Sphinx," whose riddle is concerned with the ultimate nature of the universe. The editors of the Collected Papers note that one of the drafts of this work is headed "Notes for a Book, to be entitled 'A Guess at the Riddle,' with a Vignette of the Sphinx below the Title."

42. Idioscopy or the idioscopic sciences are those sciences which depend on special ways of observing, and are distinguished from philosophy, a coenoscopic science, which makes use of the data of everyday life. Both words are used by Bentham.

43. Although uniformity in some sense is an obvious character of the universe, the pragmatist will refuse to allow uniformity in Mill's sense to substitute for law. Uniformity, it is true, might be perfectly realized in a short series of past
events, Peirce admits; but law is "essentially a character of an indefinite future, and . . . only requires an approach to uniformity in a decided majority of cases" (8.192).

44. This article was published in *The Monist*, XV (1905), 161-181.

45. This fits in with Peirce's antinominalistic views.


47. The same idea is brought out in the sixth Lowell Lecture: "The hypothesis suggested by the present writer is that all laws are results of evolution; that underlying all other laws is the only tendency which can grow by its own virtue, the tendency of all things to take habits. Now . . . this same tendency is the one sole fundamental law of mind" (6.101). See also 6.58 and 6.64.

48. Because these views are proposed as hypotheses according to the approved method of the sciences, and because of Peirce's insistence on the necessity of this method, it is difficult to agree with Eugene Freeman who asserts that Peirce's metaphysics is rationalistic (Eugene Freeman, *The Categories of Charles Peirce* [Chicago: Open Court Publishing Co., 1934], pp. 1-6, *et passim*).

49. It is interesting to note that, in the seventh lecture on pragmatism, Peirce compares an abductive suggestion to a flash. "The abductive suggestion comes to us like a flash. . . . The idea of putting together what we had never before dreamed of putting together . . . flashes the new suggestion before our contemplation" (5.181). See also 2.755 where he says that retroductive inferences are like chance variations.

50. Physical scientists must not think that theorizing at such a general level is of little importance to them. High theorizing of the above type may well save the special scientists some fifty years of work. Peirce asserts that at the time of writing the theory of the molecular construction of matter had advanced as far as indications allowed. Further progress could be made only by hypothesis and verification. But the possible hypotheses were innumerable, and none enjoyed more antecedent probability than another. Framing and testing so many possible hypotheses would take half a century or more. However, if the chemist or physicist knew how the laws of nature developed, he might be able to distinguish with some accuracy between laws that might, and laws that could not, have resulted from this process of development (1.408). A knowledge of the history of the development of laws might lead one to an accurate conjecture about the individual laws themselves. Such a highly generalized knowledge might prove very economical in enabling the special scientist to select the correct explanatory hypothesis rather early in the inquiry. "Tell us how the laws of nature came about, and we may distinguish in some measure between laws that might and laws that could not have resulted from such a process of development" (1.408).

51. Gallie is quite critical of Peirce's proposals about the origin of the universe. For Gallie, Peircean cosmogony is outside the competence of the pragmatic, scientific method. Metaphysical statements, such as Peirce's views on the *dpxη*, are vague and hopelessly beyond the clarifying power of the pragmatic method.
Peirce's explanations cannot be made to generate empirically testable concepts (Gallie, Peirce and Pragmatism, pp. 179-180).

52. Peirce calls his doctrine on chance "tychism," from the Greek word for chance, τύχη, as he himself notes. At the beginning of an article for The Monist, II (1892), 533-599, he gives a brief autobiographical sketch of his views on tychism (6.102).

53. In this section, as in many others, Peirce is writing against the doctrine of mechanistic necessitarianism. See 6.60, 6.588, 6.553-556, where Spencer and Carus are special targets of Peirce's criticism. Both Spencer's popularity in America and the opposition of Spencer from Peirce, William James, and Chauncey Wright are brought out in an article by Max H. Fisch, "Evolution in American Philosophy" (The Philosophical Review, LVI [1947], 357-373). Hartshorne regards Peirce as one of the leading figures in turning philosophical minds away from the opinion that the laws of nature are absolute and immutable. Determinism, according to Hartshorne, was at its height from 1670 to 1870 (Charles Hartshorne, "Charles Sanders Peirce's Metaphysics of Evolution," The New England Quarterly, XIV [1941], 50).

As Haas points out, although Peirce regards chance as an explanation of law, he nowhere considers it a cause of order. In fact, as will be seen later, chance itself cannot be explained apart from law.


54. In the rejoinder, Peirce lists four arguments for believing in chance. My restriction of the arguments to two is in no sense a betrayal of Peirce.

55. This of course, does not deny the regularity of things, as the same text indicates.

56. As Weiss says, the meaning of variety is explainable, though not its occurrences (Paul Weiss, "The Essence of Peirce's System," The Journal of Philosophy, XXXVII [1940], 255).

57. At this point Peirce inserts a footnote stating that he admits the absolute truth of this proposition, because it relates to the Absolute. This is an aspect of fallibilism that was never developed.

58. In the sixth Lowell Lecture Peirce describes several opinions on the amounts of law and variety in the universe. His own view is presented rather briefly and echoes some of the ideas expressed in "A Guess at the Riddle." The lecture, however, was composed about thirteen years after the "Guess." In the lecture, he says that the uniformities of the universe are never absolutely exact, and that "the variety of the universe is forever increasing" (6.91).

59. In the rudimentary nothingness, Peirce says, there is no variety. But there is what he calls "an indefinite specificability, which is nothing but a tendency to the diversification of the nothing, while leaving it as nothing as it was before" (6.612).

In a paragraph in "The Logic of Events," Peirce states that, before the universe existed, the initial condition was a state of "just nothing" (6.215). But a few lines later he makes it clear that this was not the nothing of negation. "It is the germinal nothing, in which the whole universe is involved or foreshadowed. As
such, it is absolutely undefined and unlimited possibility—boundless possibility. There is no compulsion and no law. It is boundless freedom. So of potential being there was in that initial state no lack" (6.217).

60. That is, the habit-taking tendency is responsible for those new patterns which last. Not every thing or every event formed by chance gets stabilized and brought to the perfection of law. Some chance events, in evolutionary terms, are not fit to survive. They may deviate so far from a firmly established habit of nature that they must necessarily perish without developing. Nature is a reasonable structure, in which uniformity, law, and regularity are continually increasing. Not just any chance event can be repeated and developed into the status of habit.

61. "Synechism" derives from the Greek word for continuity, συνέχεια. The formation of such derivatives is a familiar Peircean practice; cf. tychism, agapism, anancasm.

62. This short paragraph points out the importance of continuity for mathematics, for science, and for philosophy. It also mentions a connection between continuity and fallibilism. Fallibilism cannot be fully appreciated apart from continuity. Similarly when pointing out the nexus between continuity and thirdness, he asserts that “no conception yet discovered is higher [than True Continuity]” (5.67).

63. Another indication of the importance of continuity for Peirce is the lengthy section on “Synechism and Agapism,” as the editors entitle it, in the sixth volume of the Collected Papers. This section, as well as many others, makes repeated reference to continuity. Fairbanks, in opposition to writers like Russell, Reichenbach, and others who praise Peirce and damn Hegel, offers documentary proof of Peirce’s debt to Hegel in the area of continuity (Matthew J. Fairbanks, “Peirce’s Debt to Hegel,” The New Scholasticism, XXXVI [1962], 219–224).

64. In the context of this selection, Peirce speaks of the world as evolving from Platonic forms. This interesting aspect of Peirce is somewhat beyond the scope of this work. See 6.189–209.

65. Not only this paragraph but the whole section from which we have been working is set forth as a hypothesis. This is evident from the frequent repetition of certain words: suppose, assume, if, presumably.

66. Peirce does not seem to have examined the problem of the efficient causality operative in the universe. His interest in the evolution of the cosmos seems to have been limited to a conjectured description of what chance and regularity were like in the early days of the world.

67. For further study on these topics, see 1.163; 1.171f; 1.409; 5.4; 5.436; 6.13; 6.610; Wiener, Values, pp. 300f. The doctrine of continuity is also closely related to other prominent themes in Peirce. "This doctrine [of continuity] gives room for explanations of many facts which without it are absolutely and hopelessly inexplicable; and further . . . it carries along with it the following doctrines: first, a logical realism of the most pronounced type; second, objective idealism; third, tychism, with its consequent thorough-going evolutionism. We also notice that the doctrine presents no hindrances to spiritual influences, such as some philosophies are felt to do” (6.163).

68. See Murphey, Development, pp. 163 and 324.

69. This is an aspect of the social character of scientific inquiry.

70. See Thompson, Pragmatic Philosophy, p. 241.

72. In the second chapter I mentioned that the inquiry has a question-answer format. The evolutionary character of this format is brought out in a brief paragraph on logic, sc. the theory of scientific knowing. "Looking upon the course of logic as a whole we see that it proceeds from the question to the answer—from the vague to the definite. And so likewise all the evolution we know of proceeds from the vague to the definite" (6.19).

73. Peirce repeatedly emphasizes this theme of the growth of science. As a pursuit of living men, rather than as a systematized knowledge, it must live its own life, and hence grow (1.232). The desire to learn must be a permanent character of the scientist's life. Such a desire will direct him to the best method, and will assure the continual self-corrective growth of his pursuit of nature, as noted above (5.582).

74. See also 6.173.

75. It is worth noting here that the hypothesis of spontaneous chance was adopted by Peirce in order to save the universe from inexplicability. To classify an irregular occurrence as a member of a general class of irregularities is in a sense to render it open to understanding (1.156-166).

76. However, even the synechist must admit an element of the ultimate and inexplicable. Experience forces this on him. But clearly this admission must not be allowed as an explanation for anything (6.172).

77. "Continuity is shown by the logic of relations to be nothing but a higher type of that which we know as generality. It is relational generality" (6.190). "Continuity is simply what generality becomes in the logic of relatives" (5.436). "True generality is, in fact, nothing but a rudimentary form of true continuity. Continuity is nothing but perfect generality of a law of relationship" (6.172).

78. Peirce gives the credit to Augustus De Morgan for his first interest in the logic of relatives (1.562, 564). Furthermore, he states elsewhere that it is impossible to understand continuity apart from a knowledge of the logic of relations (Wiener, *Values*, p. 261).

79. The basis of our treatment of the logic of relatives is found in Thompson, and in the citations from Peirce which he lists: *Pragmatic Philosophy*, pp. 15 and 273.

80. The breadth of a term is its "extension," sc., the objects to which it can be applied; its depth is its "comprehension," sc., what the term attributes to the objects.

81. With regard to the cotary propositions, see Chapter III, note 59.

82. All necessary reasoning, Peirce says, is mathematical, and therefore diagrammatic. Although the diagram is a special case, it is still a representation of something general and the reasoner is supposed to see that what is true of this particular diagram "will be so in any case" (5.148).

83. In 1905 Peirce wrote to William James congratulating him for the clarity achieved in a paper written in French. James replied immediately with a warm "tu quoque" letter: "Your encouragement to me to become a French classic both
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85. This doctrine of immediate perception, Peirce says, is defended by Kant and Reid, and denied by Descartes, Leibniz, and other idealists, all of whom have cut themselves off from the possibility of ever knowing a relation (5.56).

86. Boler, Peirce and Scholastic Realism, pp. 109-112.

87. The heart of Peircean realism is brought out again toward the end of "Some Consequences of Four Incapacities," where he affirms the real existence of generals; what is represented in a true representation is real. What the word "man" means is real. The nominalist, on the other hand, although he admits that "man" is applicable to something, still holds that there is a hidden incognizable reality beneath that something (5.312).

88. Peirce's review of Fraser's Berkeley is, among other things, a decided commitment to realism. The following is a sample: "If, therefore, it is asked whether the universal is in things, the answer is, that the nature which in the mind is universal, and is not in itself singular, exists in things. It is the very same nature which in the mind is universal and in re is singular; for if it were not, in knowing anything of a universal we should be knowing nothing of things, but only of our own thoughts, and our opinion would not be converted from true to false by a change in things. This nature is actually indeterminate only so far as it is in the mind. But to say that an object is in the mind is only a metaphorical way of saying that it stands to the intellect in the relation of known to knower. The truth is, therefore, that that real nature which exists in re, apart from all action of the intellect, though in itself, apart from its relations, it be singular, yet is actually universal as it exists in relation to the mind. But this universal only differs from the singular in the manner of its being conceived (formaliter), but not in the manner of its existence (realiter)" (8.18).

89. Eugene Freeman expresses the link between pragmatism and thirdness when he writes that pragmatism "is a theory of meaning developed from the logical implications of the category of thirdness. As a matter of fact, it is the category of thirdness, expanded into logic" (The Categories of Charles Peirce, p. 41).

Somewhat similarly, John J. Fitzgerald has linked Peirce's theory of signs with his pragmatism. Neither theory was originally constructed with the other explicitly in view, Fitzgerald maintains, but the emergence of the central role of habit as the ultimate logical interpretant of signs can be taken as a theoretical underpinning of pragmatism. Both are concerned with meaning and both necessarily involve the category of thirdness. In scientific inquiry pragmatic meaning establishes a habit of expectation in the inquirer, which is the logical interpretant of the signs involved (John J. Fitzgerald, Peirce's Theory of Signs as Foundation for Pragmatism [The Hague: Mouton, 1966], especially pp. 158-176).


92. The pragmatic theory of meaning is for Peirce the criterion of admissibility of hypotheses preliminary to their verification, but their proposal is clearly intended as a step toward a knowledge of the truth of things to be expressed in statements which may also be pragmatically formed. See p. 20.

93. Madden, too, takes issue explicitly with Burks in this matter, asserting that Burks's conclusion seems impetuous (Edward H. Madden, "Chance and Counterfactuals in Wright and Peirce," The Review of Metaphysics, IX [1956], 431).

Morton White, too, although he does not mention Burks, presents a "counterfactual" interpretation of Peirce's pragmatism, i.e., an "if—would" criterion of meaning (hypotheticalism). The "if" clause expresses a human action (operationalism), and the "then—would" clause expresses something subject to experience (experientialism) (Morton White, The Age of Analysis, 20th Century Philosophers [New York: New American Library, 1955], p. 141).

Weiss, too, points out that "the heart of the pragmatic maxim lies in its interpretation of the meaning of concepts as involving a reference . . . to the rational or general," using 5.3 and 5.491 as evidence (Paul Weiss, "The Essence of Peirce's System," The Journal of Philosophy, XXXVII [1940], 259).

Finally, Burks would find it difficult to reconcile his interpretation with a work on logic composed around 1873 (7.340 and 341), and with two works published after 1900 (5.3 and 5.457).

94. Boler, Peirce and Scholastic Realism, p. 111. See also Haas, Conception of Law, pp. 89–92, and 135–138.

95. See note 21.

96. Boler, Peirce and Scholastic Realism, p. 101. See also Potter, Charles S. Peirce on Norms and Ideals, pp. 94–102.


98. Thompson, Pragmatic Philosophy, p. 207. Peirce considers himself an "Aristotelian of the scholastic wing, approaching Scotism, but going much further in the direction of scholastic realism" (5.77n).

99. Murphey brings this out when he writes that the law of habit formation in the universe is "essentially a form of ampliative inference, and illustrates Peirce's thesis that the universe creates order by the use of the same logical processes which we employ to discover that order" (Development, p. 405).

100. Peirce infers the existence of such an instinct by a process of abduction. Instinct explains the obvious success which scientists have had in tracking down the laws of nature. Science has been successful in selecting the right hypothesis, in numerous instances. However, as we have seen above, science is still very middle-sized in relation to the vastness of nature. It is only a handful of pebbles, while the cosmos is a vast ocean. If the mind were not somehow in tune with nature, there would be nothing like the progress which science has actually
made. Hence, the existence of instinct is proposed as a hypothesis to explain the notable success that science has enjoyed in selecting the correct explanatory hypotheses.

Peirce cautions his reader, however, that instinct cannot adequately account for the success which science has enjoyed. It is a partial explanation, but there is most likely some other element, still unknown. "Such an hypothesis naturally suggests itself, but it must be admitted that it does not seem sufficient to account for the extraordinary accuracy with which these conceptions apply to the phenomena of Nature, and it is probable that there is some secret here which remains to be discovered" (6.418).

101. A similar view is brought out in "The Laws of Nature and Hume's Argument Against Miracles," in a section in which Peirce explains the foreknowledge involved in a law of nature. The mind of man can attain such foreknowledge, he says, because "there is an energizing reasonableness that shapes phenomena in some sense, and . . . this same working reasonableness has molded the reason of man into something like its own image." The fact that man has achieved a "foreknowing generalization of observation," as Peirce defines a law of nature in this context, proves, he says, that there is such an energizing reasonableness as he describes (Wiener, Values, p. 291).

102. In a later work, intended as part of the proposed "Minute Logic," Peirce again points out the parallel between the evolution of nature and the growth of scientific knowledge. Both experience and the explanatory guess have their equivalents in the development of nature. We come to a knowledge of the laws of nature, Peirce says, by guessing them out bit by bit, and checking our guess by experimentation, and revising them to accord with the experience gained (2.86). And according to the theory of natural selection, nature performs similar experiments on a stock of plants or animals, to adapt it to its slowly changing environment. Furthermore, "a stock in some degree out of adjustment to its environment immediately begins to sport, and that not wildly but in ways having some sort of relation to the change needed. Still more remarkable is the fact that a man before whom a scientific problem is placed immediately begins to make guesses, not wildly remote from the true guess" (2.86). See also Wiener, Evolution, pp. 91f, and "Peirce's Evolutionary Interpretations of the History of Science," Studies (first series), pp. 151f.

NOTES—CHAPTER VI

1. The review was published in the Popular Science Monthly, LVIII (1901), 296–306.

2. The same is also expressed in another short piece of writing, presumably a partial draft of the review, which the editor has placed as a footnote to the above-quoted paragraph.

4. In 5.111, 5.129, and 2.197f he mentions the late development of his interest in ethics and aesthetics.

5. See also 1.578f.

6. The relation between logic and ethics is also brought out in a book review published in The Nation in 1901 (8.158 with note), and in a letter dated 1902 to Mrs. Christine Ladd-Franklin, quoted in the Journal of Philosophy, Psychology and Scientific Methods, XIII (1916), 717.

7. For a similar understanding of the three normative sciences, logic, ethics, and aesthetics, and of pre-normative phenomenology, see 5.34–37 and 5.120–136. Both of these works were written in 1903. On aesthetics as the study of the admirable in itself, see Potter, Charles S. Peirce on Norms and Ideals, pp. 34–51.

8. John J. Fitzgerald thinks that even the rather early essay “How to Make Our Ideas Clear” is not as stoical in its defense of phenomenalism as it seems at first sight (“Peirce’s ‘How to Make Our Ideas Clear,’” The New Scholasticism, XXXIX [1965], 53–68). There is, of course, in Peirce’s later writings much more ample evidence of the openness of the pragmatic method to transempirical meaning, as Fitzgerald indicates throughout his book, Peirce’s Theory of Signs as Foundation for Pragmatism, especially pp. 94–105.

9. As Goudge explains, “the sumnum bonum . . . pronounced by esthetics to be most admirable in itself, and further accepted by ethics as the ultimate goal for action, is the promotion of ‘concrete reasonableness’” (The Thought of C. S. Peirce, p. 305).

Richard J. Bernstein has explained well the centrality of the theme of the growth of concrete reasonableness in Peirce’s philosophy. “We have come to the very coping stone of Peirce’s thought—the ultimate ideal of self-control—the complete commitment to the growth of concrete reasonableness as the sumnum bonum. We have tried to show one path that weaves through an apparent disarray of ideas and themes to this culmination. What initially appears to be confused, chaotic, and even inconsistent, turns out upon analysis systematic, coherent, and powerful. . . . In delineating the connections between the concepts of action, conduct, habit, criticism, community, and control, we have come to the central theme of rationality as self-control, a self-control manifested in a hierarchy of normative sciences where our ultimate ideal, our final end, the sumnum bonum, is the continued growth of concrete reasonableness” (“Action, Conduct, and Self-Control,” in Perspectives on Peirce: Critical Essays on Charles Sanders Peirce, p. 89).

10. Thompson develops the theme, found in Peirce, of the evolution from primitive man via self-control to the modern scientist, paralleling the evolution from knowledge for use to knowledge for itself (Pragmatic Philosophy, pp. 223–227).

11. Idus Murphree, commenting on Peirce’s insistence that science is theoretical rather than practical, writes: “Peirce’s theme here is the old and familiar one of opposition to restrictions placed on inquiry, restrictions that would block inquiry at the outset if the topics to be investigated had to be those set for the sciences by engineers and deans of men” (“Peirce: The Experimental Nature of Belief,” The Journal of Philosophy, LX [1963], 314).

12. A philosopher of the 1960s and 1970s can, however, rightfully insist that
the human problems of our contemporaries must influence the choice of questions to be pursued theoretically.

13. These are themes developed by Maritain, Gilson, Pieper, Lonergan, and others.


W. Donald Oliver also asserts that the roles of continuity and chance do not account for *this* world. He sees a possibility of accounting for this world through the medium of agapasm advocated by Peirce, but not quite in the same way that Peirce proposed it ("The Final Cause and Agapasm in Peirce's Philosophy," *Studies* [second series], pp. 289-303).


Robert J. Roth, s.j., has also pointed to a significant area of Peirce's thought which is outside the scientific tradition: "Is Peirce's Pragmatism Anti-Jamesian?" in *International Philosophical Quarterly*, V (1965), 541-563.

19. In 1905 Peirce explicitly dissociated pragmatism from any denial of the Absolute, or from an interpretation that would make action the *summum bonum.* He wrote: "... I am one of those who say 'We believe in God, the Father Almighty, Maker of heaven and earth and of all things visible and *invisible* where the invisible things, I take it, are Love, Beauty, Truth, the Principle of Contradiction, Time, etc. Clearly I can have but the vaguest analogical notion of the Maker of such things, and Pragmaticism, I am sure, does not require that all my beliefs should be definite" (Charles S. Peirce Papers, # 284).

20. Nynfa Bosco has shown that though Peirce rejected a type of dogmatic metaphysics, he was altogether in favor of developing a "scientific" metaphysics, i.e., one that was public, capable of verification and progress, and guided by those who were well trained in its method. It must not be scientific or positivistic in intent ("Peirce and Metaphysics," *Studies* [second series], pp. 345-358).

