



# PEIRCE, SEMEIOTIC, AND PRAGMATISM

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*Essays by MAX H. FISCH*

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#### PEIRCE: OTHER WRITINGS (1890-1908)

What I promised at the beginning was not a comparison but the outline of an approach to a comparison—an outline which should bring into relief some of the features likely to lend themselves to fruitful comparison. For lack of space, I have omitted what is not deliberately anti-Cartesian; I have omitted pragmatists other than Peirce;<sup>16</sup> I have come only halfway with Peirce; and even within those limits I have omitted many relevant considerations. I conclude now with a few anti-Cartesian themes from Peirce's later writings which have not appeared, or have not been prominent, in the three series of papers so far considered.

*Mind as non-substantial, non-resident, and mostly non-conscious.* In his Harvard Lectures on Pragmatism in 1903 Peirce said that the normative sciences—logic, ethics, aesthetics—are in the truest sense "sciences of mind." "Only, modern philosophy has never been able quite to shake off the Cartesian idea of the mind, as something that 'resides'—such is the term—in the pineal gland. Everybody laughs at this nowadays, and yet everybody continues to think of mind in this same general way, as something within this person or that,

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but a single-minded absorption in the *search* for it for its own sake" (MS 1269:1).<sup>17</sup>

*History as Science.* The Greek name for science as knowledge was *episteme* which Peirce anglicized as epistemy (1.232, 279). The Greek name for science as inquiry was *historia*, which was already anglicized as history. Though Peirce was less sure than Vico was of history's being science in the former sense, he was perfectly sure of its being science in the latter sense. He was himself a historian, more particularly of science, and several of the quotations in the preceding paragraph are from drafts of his unfinished "History of Science." He had given a course of twelve Lowell Institute lectures in Boston in 1892–93 on "The History of Science from Copernicus to Newton." One of the problems that concerned him was the logic of Kepler's search for the orbit of Mars. Another was the shift from the moral to the physical sense of "law of nature"—from its meaning something that can but ought not to be broken, to its meaning something that cannot be broken. He found the chief source of this scientific superstition in Descartes: "Moreover, from this same immutability of God, certain rules, or laws of nature, can be known, which are secondary and particular causes of the different movements which we observe in bodies" (MS 870:42).<sup>18</sup> Peirce was even more critical of German historical criticism, higher and lower, than Vico was of the historical criticism more immediately influenced by Descartes. Peirce, like Vico, gave much thought to the roles of hypothesis and induction in historical inquiry as compared with their roles in natural science. It was no accident that the last major revision of Peirce's general logic of science was to take better account of history, and was presented to the National Academy of Sciences in 1901 in a monograph "On the Logic of Drawing History from Ancient Documents especially from Testimonies" (7.162–255).<sup>19</sup> So there were two principal movements in Peirce's anti-Cartesianism as there were in Vico's, the first in a broad sense metaphysical, the second historical. And, as it was by way of history that Vico moved from nominalism to realism, so it was by way of evolution and history that Peirce did so.

## EPILOGUE

If we imagine that an approach like the one outlined above has been taken, and that the comparison has then been worked out in detail, and if we try to predict its conclusions, we may imagine them beginning somewhat as follows.

Vico and the pragmatists are among those philosophers who, for various reasons, have rejected the spectator theory of knowledge. Plato's "contemplation of all time and all existence" is a misconcep-

tion of philosophy and science, of knowledge divine or human. The world is not given as an object for contemplation, a world we have not made, waiting to be known. If it may be said to be given at all, it is given as known and misknown from of old, with our past knowings and misknowings inextricably, unidentifiably ingrown, a world already construed and more or less misconstrued, a world in part constructed out of our doings and makings—our languages and other institutions, our domestications, our tools, machines, instruments, our experiments of all kinds—and the rest construed by imagined extensions of our doings and makings and by anticipations of their results. Our misconstruings are detected, explained, and rejected, for the most part one by one, with great difficulty, even painfully, in ways on which historians of science have begun to shed light; and the place of error is often taken by more ingenious error. The world is not cognitively innocent, any more than we are who desire its better acquaintance. A cognitively innocent world would be a world of incognizable things-in-themselves, such as Peirce discerned in Descartes. The mind is no more given for introspection than the world is for extrospection. Nor does it shine out through human faces, least of all from our own in the glass. It is known by hypothesis and induction from human doings and makings, in large part the same as those from which the world is known. The doings and makings by which world and mind are known enter into the making of both mind and world. If the human mind could be given at all, it would be in nothing short of the history of human institutions; but that history, like the history of the natural world, is a laborious, secular, incompletable construction.

The fact that Vico and the pragmatists should have held views approximating these is interesting enough. Much more interesting will be the conclusions precisely detailing the agreements and disagreements in these and other respects. For those conclusions we must await the actual comparison. I hope some reader may be moved to undertake it, and also, for good measure, to determine at what points, if at all, Vico and the pragmatists mistook Descartes, and how far he may be defended against their criticisms.<sup>20</sup>

A last suggestion. What if Peirce, toward the end of his life, had heard of Vico's *verum = factum*? He would have said: "The way to take that is to turn it first into Greek, the native language of philosophy, and then from Greek into English. The Greek for it is *τὸ ἀληθές = τὸ πρᾶγμα*. The English unpacking is that the true in the transcendental sense—the unconcealed, that which hides nothing, that which is intelligible without remainder—is the deed, action, behavior, practice, affair, pursuit, occupation, business, going concern. The Greek formula has several advantages over the Latin. The Latin *factum* emphasizes the completed actuality, the pastness, of

the deed; the Greek *πρᾶγμα* covers also an action still in course or not yet begun, and even a line of conduct that *would* be adopted under circumstances that may never arise. The Latin is retrospective; the Greek is, or may be, prospective. The Latin is, on the face of it, individual, and it took Vico's genius and years of struggle to make it social in the *New Science*. The Greek would have offered no such resistance. The Greek leaves room for possibility and for generality, and so for Scholastic realism; the Latin, while perhaps not excluding realism, favors nominalism. Further, the transcendental sense of 'true' is more obvious in the Greek *ἀληθές* than in the Latin *verum*. Now the doctrine of transcendentals, though metaphysical, includes a theory of knowledge, and the theory of knowledge includes, at least by implication, a theory of meaning. The Greek formula lends itself better than the Latin to the disengaging of the theory of knowledge from the metaphysics, and of the theory of meaning from the theory of knowledge. Vico disengaged the theory of knowledge but not that of meaning. He saw that the question of truth in the transcendental sense is logically prior to that of truth in the non-transcendental sense; he did not see that the question of meaning is also prior to that of truth in the non-transcendental sense. If he had thought in Greek instead of Latin, he might have taken that final step of disengaging the theory of meaning. If he had taken it, the result would have been pragmatism. *Πρᾶγμα* prompts us, as *factum* does not, to find the meaning of probability (for example) in (for example) the insurance business. And the meaning it prompts us to find is not so much how that business *has been*, *has come to be*, or *is* conducted, as how it *would be* conducted in a rational society."

## Notes

1. See, for examples, James K. Feibleman, "Toward the Recovery of Giambattista Vico," *Social Science* 14 (1939):31-40, esp. 36-37, and *An Introduction to Peirce's Philosophy* (New York, 1956), pp. 69-70; Bertrand Russell, *Wisdom of the West*, ed. Paul Foulkes (London, 1959), pp. 207, 277, 296.
2. Arthur Child, "Making and Knowing in Hobbes, Vico, and Dewey," *University of California Publications in Philosophy* 16 (1953):271-310; Descartes appears only on p. 301.
3. Questions in large part, it might now be said, of the theory of knowledge; but this was not a separate discipline in Vico's time, and was not recognized as such by the pragmatists.

4. Cicero, in his *Topics*, in a passage Vico liked to cite (1.2.6), said that the Stoics gave the name of "dialectic" to their logic that was only half a logic, all critic and no topic.
5. *De augmentis* III.iv; Robert McRae, *The Problem of the Unity of the Sciences: Bacon to Kant* (Toronto, 1961), pp. 27-28, 114-15; James F. Anderson, *An Introduction to the Metaphysics of St. Thomas Aquinas* (Chicago, 1953); Allan B. Wolter, *The Transcendentals and Their Function in the Philosophy of Duns Scotus* (St. Bonaventure, NY, 1946).
6. *Novum organum* I.iii, II.iv. For a few other hints, see Rodolfo Mondolfo, "'Verum ipsum factum' dall' antichità a Galileo e Vico," *Il Ponte* 22 (1966):492-506.
7. Gottfried Martin, *Leibniz: Logic and Metaphysics*, trans. K. J. Northcott and P. G. Lucas (Manchester, 1964).
8. References to Vico's *Study Methods and Ancient Wisdom* are to the pages of volume I of Nicolini's edition of the *Opere* (Bari, 1914); and in the former case, after the semicolon, to the pages of the translation by Elio Gianturco (Indianapolis, Ind., 1965). References to Vico's *New Science* are to the numbered paragraphs of volume IV of Nicolini's edition of the *Opere* (Bari, 1928) and of the English translation by Thomas G. Bergin and Max H. Fisch, new ed. (Ithaca, N.Y.: Cornell University Press, 1968).
9. For the thesis of the three articles of this series, see "Hegel and Peirce," pp. 278-79 below.
10. Sir William Hamilton, *Lectures on Metaphysics*, lecture 35; John Stuart Mill, *An Examination of Sir William Hamilton's Philosophy* (London, 1865), chs. 17-19.
11. See "Peirce's Progress," pp. 184-97 above.
12. A book under the same title was announced as in preparation for the International Scientific Series but never appeared. There is no accurate reprint of these papers. The only accurate account of them is in a master's thesis by Donald R. Koehn, "Charles S. Peirce's 'Illustrations of the Logic of Science'" (University of Illinois, Urbana, 1966); see also his doctor's thesis on the same subject, "Peirce's Explanation of the Validity of Synthetic Inference in the 'Illustrations of the Logic of Science'" (Illinois, 1969). His criticisms of a draft of the present essay have led to extensive revisions. See also "A Chronicle," pp. 114-34 above.
13. Draft of letter to Howes Norris, Jr., 28 May 1912 (L 321).
14. *CP* 6.7-65, 102-63, 238-71, 287-317; see 5.436 for an intended sixth article that never appeared.
15. Peirce concerned himself with atomic theory until late in life. His first published professional paper, of 1863, was on "The Chemical Theory of Interpenetration." This aspect of his scientific work has not been studied.
16. James, Dewey, Mead, and Lewis, for examples. Whitehead in his *Science and the Modern World* (New York, 1925) took James's "Does Consciousness Exist?" (1904) as marking the end of the Cartesian age in philosophy. For Dewey, see note 2 above. Chapters 1 and 12 of C. I. Lewis's *Analysis of Knowledge and Valuation* (La Salle, Ill., 1946) read like a pragmatic version of the transcendentals with Vico's *factum* firmly placed in the center: *verum = factum = bonum*.
17. *Selected Writings*, ed. Philip P. Wiener (New York: Dover Publications, 1966), pp. 227-28.
18. *Ibid.*, p. 298.
19. The fullest and best account of this is Willard Marshall Miller's master's thesis, "History as Science in the Philosophy of Charles Sanders Peirce"

(University of Illinois, Urbana, 1968); see also his doctor's thesis on the same subject, "C. S. Peirce on the Philosophy of History" (Illinois, 1970).

20. For an interpretation that finds in him some part of what his critics have failed to find, see Gerd Buchdahl, "The Relevance of Descartes's Philosophy for Modern Philosophy of Science," *British Journal for the History of Science* 1 (1963):227-49.



## T W E L V E

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### Peirce's Arisbe: The Greek Influence in His Later Philosophy

We are meeting not far from the west bank of the Delaware River. If we were to follow that bank upstream, through and beyond the Water Gap, we should come at last to Pike County, in the northeast corner of Pennsylvania, and to Milford, its county seat, where Peirce and his second wife, Juliette, settled in 1887. Two and a half miles beyond Milford, and four below the bridge to Port Jervis, New York, we should be on land which Peirce bought a year later, in 1888, in Juliette's name. There was a farmhouse on it which they soon set about enlarging and remodeling. That was their residence for the last twenty-six years of his life, and it was hers for the twenty further years that she survived him. They called it "Arisbe."

Peirce's philosophic activity may be divided into three periods.<sup>1</sup>

- (1) His Cambridge period, say from his reading of Whately's *Logic* in 1851 to his memoir on the logic of relatives in 1870.
- (2) His cosmopolitan period, from 1870 to 1887, in which he traveled extensively, resided in Paris, New York City, Washington, and Baltimore, was stationed more briefly in many other cities at home, in England, and on the continent, and did his most important scientific work.
- (3) His Arisbe period, from 1887 until his death in 1914, the longest of the three, and the most productive philosophically.

I shall offer an explanation of the name "Arisbe." My approach to the explanation will be by way of reasons for describing Peirce's cosmopolitan period as that in which he came to take the Greeks seriously, and his Arisbe period as that in which he revised and tried to complete his philosophy with their help. But I begin with evidence tending to show that Peirce himself divided his philosophic life into three periods nearly coinciding with those I have marked off.

Late in life he exchanged several letters with an Atlanta actuary named Samuel Barnett.<sup>2</sup> Barnett had taught mathematics and physics, was a student of probability, and a great admirer of Hobbes. Peirce protested:

In my opinion your admiration of Hobbes is a great mistake. I thought as you did<sup>3</sup> until my years of study of scholasticism brought me first half way to the truth. But it was not until about 20 years from my complete devotion to Logic, i.e. not until near 1889, that I was able to see its<sup>4</sup> total falsity. That is, I utterly deny that the only Reals are definite individual objects. Under the name of "generals," two totally different things are confounded. One of these classes is that of *Universal Facts*, or *Would-bes*, such as Laws of Nature . . . The other class . . . ought to be called *indefinites*, or *can-bes*. For instance, it is a Real fact, I suppose, that the centre of mass of a body is *capable* of being moved along a straight line, even though, as a matter of Actuality, it never is so moved.

What Peirce is saying may be paraphrased in terms of his categories: In respect of nominalism, my philosophic life falls into three parts. (1) From the time I read Whately in 1851, I was, like him, a Hobbesian nominalist, holding only Seconds to be real, until study of the scholastics, and particularly of the British logicians Duns Scotus and William Ockham, enabled me (2) in 1868 to see the half of the falsity of nominalism that consists in its denial of the reality of Thirds. But it took me another twenty years of devotion to logic to see (3) toward 1889 the other half of its falsity, which consists in its denial of the reality of Firsts.<sup>5</sup>

Now Hobbes, "who carried the nominalistic spirit into everything" (CP 8.22), was a necessitarian, denied the freedom of the will,<sup>6</sup> was an egoist, worked up the theory of motives (5.339n1, 7.329, 1.380), denied the validity of induction (6.100), held that chance and probability were names for our ignorance (6.94), and, by reviving the doctrine of the association of ideas, started "that most widely spread of philosophical blunders, the notion that associationalism belongs intrinsically to the materialistic family of doctrines" (6.36).

Peirce in his Arisbe period attacked the doctrine of necessity (6.35–65), advertised "a mathematical demonstration of free will" and a "refutation of the theory of motives" (CP 8, p. 285), espoused a doctrine of objective or real probability as well as of absolute chance, and opposed the other views of Hobbes above mentioned. Had Peirce's views in his Cambridge period—at least in the earlier part of it—been those of Hobbes in these respects also, and had they passed through intermediate stages in his cosmopolitan period? Yes, in most of these respects, perhaps in all.

After his reading of Whately's nominalistic *Logic* in 1851, Peirce says, "Next, some old treatise on rhetoric set me thinking for myself on psychology; and I remember I wrote a small treatise called 'The Mechanics of Volition.' I was a young necessitarian of the most odious type" (MS 958).<sup>7</sup> When he later spoke of egoism as "the theory of Hobbes, La Rochefoucauld, and other thinkers in the boyhood of modern philosophy" (7.602n5), he was glancing back at his own

boyhood too. By the end of his Cambridge period, he was questioning Hobbes's egoism and theory of motives (5.339n1; cf. 7.329). He had also committed himself to an objective theory of probability and of the validity of induction, which he at first called nominalistic (8.2). But he did not yet assert real chance, nor did he assert the freedom of the will. Until well past the middle of his cosmopolitan period, he remained a necessitarian, though no longer of the most odious type. His earliest published statement of his case against the doctrine of necessity was in 1887, at the beginning of his *Arisbe* period (6.553ff); and even that contained no hint of tychism, though he had already reached it.

In his passage from necessitarianism to tychism, there were two decisive episodes I have not yet mentioned: his arrival at his categories toward the end of his Cambridge period, and his "one bold saltus" (1.364), past the middle of his cosmopolitan period. Of the first of these he says in 1908, "my work became self-controlled early in the year 1867, when I already had in my mind the substance of my central achievement, the paper of May 14 of that year, 'On a New List Of Categories.'" And he explains that by "self-controlled" he means "controlled by a 'self,' or person who deliberates, and makes *resolves* which make or denote 'determinations' or real dispositions causing conduct to agree with the resolves."<sup>8</sup>

Once he had found his categories, the now self-controlled development of his philosophy, in the last years of his Cambridge period and on through his cosmopolitan period, was a matter of following them out, as he says in his *Guess at the Riddle*, "in a sort of game of 'follow my leader' from one field of thought into another"—logic, psychology, the physiology of the nervous system, the theory of protoplasm in general.

I had no difficulty in following the lead into the domain of natural selection; and once arrived at that point, I was irresistibly carried on to speculations concerning physics. One bold saltus landed me in a garden of fruitful and beautiful suggestions, the exploration of which long prevented my looking further. (CP 1.364)

Prevented his proceeding, that is, from evolutionary biology and physics into sociology and theology (1.364; cf. 354). That was the way the book had grown in his mind during his cosmopolitan period, and it was also the order in which he had written it, early in his *Arisbe* period. The striking thing about the order is that a physicist should have taken so long to get to physics, which proved to be "the germinal chapter" of his *Guess* (1.354).

What was the "garden of fruitful and beautiful suggestions," and what was the "one bold saltus" that landed him in it? The Garden

of Epicurus, I suggest; and the Epicurean swerve from the second to the third of Peirce's three theories of chance.<sup>9</sup> Having long since given up Hobbes's view of chance as a name for our ignorance, and having more recently held that chance is "that diversity in the universe which laws leave room for, instead of a violation of law, or lawlessness" (6.602), he now took the leap to absolute chance. Why had he not taken it sooner, and how did he come to take it when he did—and when was that? "About 1880," he says in another place (MS 674). I follow that clue.

After being first considered for its chair of physics, Peirce was Lecturer in Logic at The Johns Hopkins University from 1879 to 1884, while retaining his position in the Coast and Geodetic Survey. For the first time, he became responsible for the *history* of logic.<sup>10</sup> Since it was the logic of science that most concerned him, he assumed responsibility for the history of science also. In his first year, he directed his only Ph.D. thesis, that of Allan Marquand. Marquand was well trained in Greek and Latin, and had studied philosophy at Princeton under McCosh, at Berlin under Harms, Paulsen, Pflleiderer and Zeller, and at The Johns Hopkins under George Sylvester Morris. At Princeton he had written a sympathetic and able paper on "The Ethics of the Epicureans."<sup>11</sup> In an appendix on prolepses or pre-notions, he had argued for their empirical character against McCosh who took them to be innate. In the body of the paper he had twice referred to Philodemus, the author of various Epicurean works found among the papyri of Herculaneum. Theodor Gomperz in 1865 had edited one of these under the title *Peri sêmeiôn kai sêmeiôseôn*, on signs and on inferences from signs. Marquand undertook for his thesis to translate the Greek text and to elucidate it in an introductory essay on "The Logic of the Epicureans." Peirce worked through Philodemus along with Marquand. In the spring of 1880, while writing the essay, Marquand was also teaching an advanced course on Mill's *Logic*. He and Peirce concluded that Philodemus's treatise contained a well-developed theory of induction, and that it was about on a level with that of Mill.<sup>12</sup> Until then, Peirce had supposed, on good authority, that the Greeks had no theory of induction, just as they had no theory of probability; that these were modern inventions. If Prantl and the other historians of logic and of philosophy could be so far wrong, the only thing for it was to be one's own philologist and historian of Greek philosophy, as Peirce already was of medieval logic. He was not unprepared; his teachers of Greek, as of Latin—Sophocles, Felton, Goodwin, Chase, Lane—had been of the best.

As Marquand had re-examined the ethics of the Epicureans, and he and Peirce together had re-examined their logic, it was natural

that Peirce the physicist should re-examine their physics also. And what would strike him most would be its differences from that of Democritus. Chief of these was the swerve (6.36). Philodemus used it to illustrate one of the canons of inference from signs. When the inference is from phenomena taken as signs to an explanatory hypothesis about the unobservable atoms, not only must it explain the phenomena in question but it must remain uncontradicted by other phenomena. When from the phenomena of chance and free-will we infer the swerve of the atoms, this canon is satisfied.<sup>13</sup>

Peirce the mathematical physicist must have sought to give the hypothesis a precision lacking in the sources. Here is a way he may have tried. The hypothesis is that any atom can at any time swerve without cause from its rectilinear course into another. Now the necessitarian physics of Democritus and of the Stoics was fairly represented by Diodorus's definition of the possible as that which either is or will be. If we supply a time variable and take "possible" to mean "possible at time  $t$ ," it will follow that there are no unactualized possibilities. But an Epicurean atom leaves a trail of unactualized possibilities behind it. Not only so, but its direction of motion at any point-instant actualizes only one of *infinite* possibilities. For even if we suppose that all swerves are instantaneous and rectilinear, and further that the new rectilinear path is always at the same angle to the old one, it will be but one of an infinite number of such paths, all lying in a continuous cone with its origin at the point of the swerve, and all equally possible at the point-instant of the swerve. And so long as an atom neither swerves nor collides, its path is the axis of a continuous series of such cones of possibility. So, when an atom swerves, the path into which it swerves, and when it does not swerve, the path it continues, alike actualize but one of infinite possibilities, each no less possible than the one it actualizes.<sup>14</sup>

Not that Peirce believed in Epicurus's atoms, any more than in those of Democritus. In atomic theory, he was a Boscovichian (6.242). What mattered was that here at last was a physical model of an absolute chance, beside which the chance of the calculus of probabilities, of the statistical theory of gases, or of Darwin's fortuitous variations, was but quasi-chance (6.613; cf. 602, 611). Add that in Epicurus's physics the order of a *kosmos* derives from the chance of the swerve,<sup>15</sup> add further that Epicurus connects the freedom of the will with mind-atom swerves; and the swerve becomes a physical paradigm of Peirce's category of Firstness, such as he has hitherto lacked (6.201). Substitute atoms of feeling for atoms of matter, and continua of feeling-possibilities for continua of motion-possibilities, and you have hints enough toward such a Cosmogonic Philosophy (6.33) as he will soon begin elaborating. The Garden of Epicurus

has proved indeed a "garden of beautiful and fruitful suggestions" (1.364), and physics, not biology, has become "the germinal chapter" of Peirce's *Guess at the Riddle* (1.354).

At The Johns Hopkins in Peirce's third year (1881–1882) there was a graduate assistant named Benjamin Eli Smith, who had been trained in philosophy by J. H. Seelye at Amherst, had taught mathematics there, and had then, like Marquand, studied in Germany. Before the year was out, Smith joined the staff of the *Century Dictionary*, and he soon became its managing editor and Peirce a principal contributor, responsible for logic and philosophy, mathematics, mechanics and astronomy, weights and measures, and all words relating to universities. As a preparatory step, in his last year at The Johns Hopkins (1883–1884), Peirce added a course in Philosophical Terminology, in which his chief resource, and that of his students Dewey and Jastrow, was the Berlin Academy edition of Aristotle, with its Greek texts, Latin translations, and Bonitz's monumental index.<sup>16</sup> From Epicurus's chance, for example, Peirce moved to the chance and spontaneity of Aristotle, and in general to Aristotle's logical and physical modalities in relation to his own categories.

Of Aristotle until then Peirce had read only the *Organon* and *Metaphysics*, "no doubt too early thoroughly to profit by the reading" (MS 606:25). (Until his study of scholasticism in 1867–1869 he had not taken seriously any other philosopher before Machiavelli and Bacon.) He had of course been struck by "the sea-fight tomorrow" in *On Interpretation* chapter 9: It is a logical truth that there will either be a sea-fight tomorrow or not be one, but, if it has not yet been determined whether there is to be one, it is neither true that there will be nor true that there won't be. As he later said, Peirce had shared the general nominalistic (6.368) opinion of Aristotle's "childish naïveté" in this and other passages on "the great difference in the logical status of the future and the past"—"until the further progress of my own studies forced me to the very substance of what Aristotle says" (6.96). Now he was reading the *Physics* and had got to the chapters in Book II on chance and spontaneity in relation to the four causes; and by January 17, 1884, he was ready to ask: "may it not be that *chance*, in the Aristotelian sense, mere absence of cause, has to be admitted as having some slight place in the universe?" (MS 875). And shortly afterwards, in defining "absolute chance" for the *Century Dictionary* (p. 918), he wrote: "According to Aristotle, events may come about in three ways: first, by necessity or an external compulsion; second, by nature, or the development of an inward germinal tendency; and third, by chance, without any determining cause or principle whatever, by lawless, sporadic originality." To which he would later add: "and this doctrine is of the inmost essence of Aristotelianism" (6.36).

Obligated for the first time to define "continuity," Peirce jotted down on April 1, 1884, a note of despair. "Continuity has never yet been defined. Kant's definition, to which I am ashamed to say I have hitherto given my adhesion, is ridiculous when you come to think of it. And without a definition of course all the reasoning about it is fallacious."<sup>17</sup> Apparently he had not yet come to Aristotle's definition of it in the *Physics*, or had not yet understood it; and he had not yet made the acquaintance of Cantor. He very soon got to both; but it was only after his article was in print that he saw how to put Aristotle and Kant together (6.120–124). Even that synthesis he still later referred to as "my blundering treatment of continuity" (6.174). But it was Aristotle who opened the way toward his maturer views.<sup>18</sup>

Since Smith had made him responsible for the history of ethics and aesthetics as well as of logic and metaphysics, Peirce in 1883 began the study of ethics (5.111, 129) and began with the Greeks. He read Aristotle's *Nicomachean Ethics* and *Politics* for the first time, a good deal of Plato, who had hitherto bored him,<sup>19</sup> and of the other post-Aristotelian schools besides the Epicureans. He was still not sure that ethics was or could be a science, normative or otherwise, and he had graver doubts about aesthetics; but, whatever ethics and aesthetics were, it was evident that here the Greeks were supreme; and it was their characteristic tendency to rest their ethics on aesthetics, as Peirce himself, in his *Arisbe* period, would eventually do.

Nearly all the Greek philosophers were cosmologists, and most of them, as far back as the Milesians, were evolutionary cosmologists of one sort or another. And it was by way of the Greeks, and especially by way of Empedocles, Aristotle, and Epicurus, but in reverse order, that Peirce arrived at his own evolutionary cosmology. Every cosmology involves a theory of the absolute; of these there are three kinds; and the only one of the three that Peirce ever names after a representative of it is the Epicurean (1.362; 6.27). (This is not the kind he calls evolutionary, because for Epicurus and for Empedocles there is evolution not *through* their infinite worlds but only *within* single worlds.)

Nothing in Peirce's philosophic development is so astonishing as the fact that, although the *Origin of Species* appeared in the year he graduated from Harvard; although Cambridge was a chief center of the ensuing debates during the last decade of his Cambridge period and on into his cosmopolitan period; and although the pragmatism of his "Illustrations of the Logic of Science" (1877–1878) may be read as the lesson in logic taught by those debates (5.363f); nevertheless, for a quarter of a century, he did not commit himself to the Darwinian theory of evolution or to any other, or even to evolution as a fact awaiting its theory.

But there were three good reasons for this abstention. In the first place, he was not a biologist, and had therefore no occasion to commit himself. In the second place, as a connoisseur of the reasonings of biologists, as of other scientists, he thought that, within the confines of biology itself, the reasoning of Agassiz was much more cogent than that of any of the evolutionists (*MS 957*).<sup>20</sup> In the third place, as a philosopher he sought to generalize the conception of evolution, and to generalize each of the competing theories. That meant extending it and them to the physical universe on the one hand and to the history of civilization on the other, but in such fashion as to find all three of his categories everywhere exemplified. For long years he saw no way to do this. "Now philosophy requires thorough-going evolutionism *or none*" (6.14). The result, until 1884, was—*none*.

By January 17, 1884, in the twenty-fifth year from the *Origin*, and in his own forty-fifth year, Peirce had finally found his way. That evening he read to the Metaphysical Club an anniversary address on "Design and Chance" (*MS 875*), beginning: "The epoch of intellectual history at which the world is now arrived finds thought still strongly under the influence imparted to it in 1859 by Darwin's great work." Evolution is now the postulate of logic itself. The postulate extends to laws as well as to states of things. We want a theory of the evolution of physical law. Absolute chance—not the ordinary chance which is merely relative to the causes that are taken into account—is "the one essential agency upon which the whole process depends." But the operation of relative chance in instances of Bernoulli's law or laws of large numbers shows how the agency of absolute chance is to be understood in a philosophic evolutionism in which the antithesis of design and chance—Agassiz and Darwin—is *aufgehoben*.

As the editors of the *Collected Papers* observe, the last two chapters of *A Guess at the Riddle*, on sociology (or pneumatology) and theology, seem not to have been written. The Plan of the Work gives helpful indications for the former, but is enigmatic on the latter: "Chapter 9. The triad in theology. Faith requires us to be materialists without flinching" (1.354). The clue is in the address on "Design and Chance," where he chides even Epicurus for flinching, by exempting his gods from the absolute chance that gives rise to his infinite worlds. For he places his gods in the spaces between the worlds and rests their divinity on the fineness of the atoms that compose them. "Thus, divineness comes from a special cause & does not originate by chance from elements not containing it. Darwin's view is nearer to mine. Indeed my opinion is only Darwinism analyzed, generalized, and brought into the realm of Ontology."



Brought in, we take him to mean, by making the absolute chance of Epicurus and Aristotle prior to the relative chance of Darwin's fortuitous variations. But there are gaps in the manuscript of the address both before and after this point, and we must look elsewhere for further light. We find it next year in his review of Royce's *Religious Aspect of Philosophy*. There he says that he holds a theory different from Royce's, which he intends to take an early opportunity of putting into print (8.44). That is, the *Guess* is already projected; and Peirce goes on to indicate how the sociology and the theology are to be connected. (We are reminded of his earlier sympathy with Vacherot's conception of God as the being whose essence implies non-existence [6.396].)

I think that the existence of God, as well as we can conceive it, consists in this, that a tendency toward ends is so necessary a constituent of the universe that the mere action of chance upon innumerable atoms has an inevitable teleological result. One of the ends so brought about is the development of intelligence and of knowledge; and therefore I should say that God's omniscience, humanly conceived, consists in the fact that knowledge in its development leaves no question unanswered.

Still to be accounted for is the last of the "fruitful and beautiful suggestions" that came to Peirce from the Garden in which his "one bold saltus" had landed him (1.364); namely, the role of habit-taking in the evolution of the laws of nature, which is just where the *Guess* comes in (1.409f). The suggestion could not have come directly from Epicurus or from any of his ancient followers. And in spite of the prominence of "habit" in the philosophy of Aristotle and of his scholastic followers, it could scarcely have come directly from him or from them. Exactly how it came cannot be made out from manuscripts prior to Peirce's *Arisbe* period. So far as I know, it first becomes evident in a manuscript of 1901 on "The Laws of Nature."<sup>21</sup> Three preliminary observations will help us find it there.

1. Nothing is more characteristic of Peirce's interpretations of Greek philosophy, as reflected first in his work for the *Century Dictionary*, than his assimilation of Epicurus and Aristotle. For example, as we have seen, he assimilates Aristotle to Epicurus when he ascribes to Aristotle the doctrine of absolute chance (p. 918). He assimilates Epicurus to Aristotle when, in the article "Epicurean" (pp. 1966f), he speaks of the swerve as "the very life" of the atomic theory; or, as he later puts it, the "life and entelechy" (6.35). Soul or life is habit or first entelechy of organic body (p. 1946); energy or activity of soul is second entelechy. Swerve-ability, then, would be soul or first entelechy of atomic body, and actual swerve would be

second entelechy. And he later associates Epicurus and Aristotle as upholders of the freedom of the will, against Democritus and the Stoa (6.36). As between the two, however, it is Epicurus who bears the palm: "His views were thus more like those of a modern scientist than were those of any other philosopher of antiquity" (p. 1967).

2. In the absence of such great compilations as Usener's *Epicurea* (1887), Arnim's *Stoicorum veterum fragmenta* (1905–1924), and Diels's *Fragmente der Vorsokratiker* (1903), Peirce's foremost guide to Greek philosophy in general was Cudworth, who regularly quoted the sources both in Greek or Latin and in his own vivid translations.<sup>22</sup> In college, when he had been intent on Kant and had read all of Hobbes, Peirce had also read "the most readable part of Cudworth,"<sup>23</sup> Hobbes's ablest philosophic opponent and Kant's ablest forerunner. Peirce liked later to say of Kant that there was "perhaps no very valuable philosophical conception in his works that might not have been suggested to him by some one of half a dozen English writers, Hobbes, Cudworth, Locke, Berkeley, Hume, and Reid" (MS 1454); and that "Even where he appears least English, he is following Cudworth."<sup>24</sup> Cudworth was the source, still unconsidered, of much of Peirce's early idealism. And he was a favorite source for illustrative quotations in Peirce's contributions to the *Century Dictionary*.<sup>25</sup>

3. But for Epicurus in particular Peirce relied heavily on the collections, interpretations, and elaborate defenses of Gassendi, the seventeenth-century Epicurus Redivivus, whom Cudworth criticized almost as severely as he did Hobbes. So closely does Peirce associate Epicurus with Gassendi that it is as if he had found them together in the Garden. He assimilates Gassendi as well as Epicurus to Aristotle, and he describes his own cosmology as in important respects reviving that of Gassendi, when we expect him to say Epicurus.

With these three observations in mind, we are prepared to entertain the possibility that it may have been Cudworth's mocking caricature of Epicurus's physics, as revived by Gassendi and given currency in England by Charlton,<sup>26</sup> that inspired Peirce's *Guess*.

So far as concerns the laws of nature, Peirce writes, whatever in the philosophies of our day is not nominalism is evolutionism of one kind or another; and every evolutionism must in *its* evolution eventually restore "that rejected idea of law as a reasonableness energizing in the world . . . which belonged to the essentially evolutionary metaphysics of Aristotle, as well as to the scholastic modifications of it by Aquinas and Scotus."

To this wing of philosophy belongs, too, that theory of Gassendi which the present writer endeavored, a few years ago,<sup>27</sup> to reawaken (in a perfected form), and of which, for the sake of the evolutionary con-

ception of law which it illustrates, may here be inserted a description by an opponent of it, which was published in 1678:

"But because men may yet be puzzled with the universality and constancy of this regularity, and its long continuance through so many ages that there are no records at all of the contrary anywhere to be found, the atomic atheist further adds that the senseless atoms, playing and toying up and down, without any care or thought, and from eternity trying all manner of tricks, conclusions and experiments, were at length (they know not how) taught, and by the necessity of things themselves, as it were, driven, to a certain kind of trade of artificialness and methodicalness: so that, though their motions were at first all casual and fortuitous, yet in length of time they became orderly and artificial, and governed by a certain *law*, they contracting as it were upon themselves, by long practice and experience, a kind of *habit* of moving regularly." Cudworth's *True Intellectual System of the Universe*.<sup>28</sup>

The "one bold saltus" into the "garden of fruitful and beautiful suggestions" took place, I conclude, not earlier than 1879–1880, when Peirce was working with Marquand on Philodemus; the "exploration" of these suggestions occupied the remaining years of his cosmopolitan period (1880–1887); it was accelerated by his work on the *Century Dictionary* (1883–1887); but by 1884 he had taken Cudworth's hint and fixed the main outlines of his theory of the evolution of the laws of nature out of absolute chance by habit-taking; and was already, in his Darwin anniversary paper on "Design and Chance" (1884) and in his Royce review (1885), "looking further" (1.364); that is, into "sociology or, shall I say [with Cudworth], pneumatology" and into "theology" (1.354); and by the beginning of his *Arisbe* period in 1887 he was ready to start composing his *Guess at the Riddle*.

By that time, the Coast and Geodetic Survey had entered a period of enforced retrenchment, and could no longer sustain the wide-ranging and expensive field work of Peirce's gravity researches, or even afford the improved instruments he required. His duties were now confined to "reducing" the results of his previous experiments, and preparing reports for publication. This he could do at home. It was time, thought he and his wife, to find a permanent residence; both for her health and for his leisure for study and writing. They quickly narrowed the search to "the wildest county of the Northern States, south of the Adirondacks and east of the Alleghenies" (MS 842),<sup>29</sup> yet within reach of the Erie Railroad station in Port Jervis, from which a ride of two and a half hours would take them to Jersey City and the Manhattan ferry. During the months of inquiry and looking, Peirce's mother and his father's sister died in Cambridge, and the slow settlement of their estates would bring him modest inheritances; so that it did not seem imprudent to buy the farm and enlarge the house that became *Arisbe*.

Making the architect's drawings and supervising construction to body forth Juliette's dream-house went to Peirce's head a bit, so that in drafting his *Guess at the Riddle* he began thinking of it as the ground-plan of "a philosophic edifice that shall outlast the vicissitudes of time," of "a philosophy like that of Aristotle . . . so comprehensive that, for a long time to come, the entire work of human reason . . . shall appear as the filling up of its details" (1.1). Before the *Guess* was finished, he was invited in 1890 to contribute to *The Monist*, and he began with an article on "The Architecture of Theories" (6.7-34). Since the Darwin anniversary paper, the Royce review, and the *Guess* remained unpublished, it was in this *Monist* series of 1891-1893 that his evolutionary cosmology was broached in print. The second and fifth papers took off from the Greeks whose company Peirce had joined (6.36, 287). When that series was broken off incomplete, he invited subscriptions for a twelve-volume *Principles of Philosophy* (CP 8, pp. 282-86). "This philosophy," he said, "is of the nature of a Working Hypothesis for use in all branches of experiential inquiry" (CP 8, p. 282); its "entelechy and soul" is "the principle of continuity," which "leads directly to Evolutionism" (p. 283). He has begun to think better of Plato, however, and in a gesture of homage Volume IV is to be entitled *Plato's World: An Elucidation of the Ideas of Modern Mathematics* (p. 284). But the subscriptions proved insufficient, and Peirce set about turning volumes II and III into a separate *Logic*.<sup>30</sup>

Further alterations and additions to the house kept the architectural metaphor alive for a few years, with some help from "that celebrated and splendid chapter of Kant upon the architectonical method" (6.604). But even at the beginning of 1894 Peirce could say that "systematic completeness . . . is about the idlest decoration that can be attached to a philosophy"; the "great desideratum" is that "it must lead to unmistakable consequences comparable in great detail with observation" (N 2:20).

He had lost his Coast Survey position at the end of 1891; nearly all his income-producing efforts failed; the 1890s became a decade of adversities from which he never recovered; and his system-building ambitions were reduced to more modest proportions. He was above all a logician. He was now a recluse for logic's sake, a "bucolic logician" (MS 296:11). His lifelong concern was with the validity of synthetic inference, the logic of science, the logic of hypothesis and induction. For the sake of the logic of science he had become a historian of science. He gave a series of Lowell Lectures on the History of Science in 1892-1893 (MSS 1274-1287), and he began a book on the history of science for Putnam's in 1898 (MSS 1269, 1273, 1290-91). His great lifelong ambition was to establish hypothesis and induction firmly and permanently along with deduction, each

clearly distinguished from and yet positively related to the other two, in the very conception of logic and in the continuing researches of logicians. It was this ambition that had made the discovery of Philodemus's theory of inductive inference loom so large for him. Difficult as the problem of induction was, however, and long as Peirce wrestled with it, "the bottom question of logical Critic" (6.475) was for him that of hypothesis, abduction, or retroduction. It was hard to persuade logicians or scientists that this was inference at all. He hoped that a proper history of science would help to show that it was.

He had from the beginning appealed to history against a narrow positivism. Not only the history of logic and of science, but all history whatever, including paleontology, geology, and the history of the physical universe, "is entirely hypothetical, and is absolutely incapable of verification by direct observation" (2.511n1, cf. 642). The logic of historical investigation, perhaps even better than atomic theory, should bring the nature of hypothetical inference into clear relief. Ancient history would do better than modern because the documents and monuments were relatively few and fragmentary. He was particularly impressed by the way in which the archaeologists, and above all Schliemann at Troy (5.597), had proved the higher critics wrong. But his own competence was in philosophy, and since he was now fully at home with the Greeks, and the Greeks were fully at home in *Arisbe*, he renewed and intensified his study of them from this fresh point of view. He worked out a new interpretation of the life of Thales, the first of the Milesians (MS 1604). He tackled the hardest case in the history of Greek philosophy, the life of Pythagoras, "the sublimest of all human biographies,"<sup>31</sup> and worked up a lecture on him as a specimen of his new logic of history (MSS 1277, 1582).

When Lutoslawski's book on the logic of Plato came out in 1897, Peirce took up the problem of the chronology of the dialogues, applied mathematical methods to the working up of Lutoslawski's stylistic data, modified his conclusions in certain respects, copied the Greek texts of certain dialogues into notebooks with generous spacing between the lines and made his own interlinear English translations, realized that he had previously quite failed to appreciate the logical importance of the dialogues,<sup>32</sup> came to regard the *Theaetetus* and *Parmenides* as the greatest of Plato's productions,<sup>33</sup> tried his own hand at composing dialogues in Plato's later manner (6.349-352), and decided that Aristotelianism was a variant form of Platonism, and that his own philosophy was a variant form of Aristotelianism (5.77n1). Having come to conceive logic as a normative science subordinate to ethics, and ethics as subordinate to aesthetics, Peirce in his *Minute Logic* about 1902 wrote three partial drafts

of a chapter on ethics (MSS 432–434), the third of which contains his longest consecutive discussion of Greek philosophy. After briefly reviewing earlier theories of the good, he devotes two hundred pages to Plato, critically reexamining the dialogues in chronological order from this point of view.<sup>34</sup> It is not by accident, then, that it is in this work that “the *summum bonum*” first appears as a technical term in Peirce’s own philosophy (2.116).

By 1894 he had “read and thought more about Aristotle than about any other man” (MS 1604), but his really intensive study was still to come. It struck him toward 1900 that his new logic of history might be tried on Strabo’s story that Aristotle’s manuscripts lay hid for a century and a half in a damp cellar at Scepsis in the Troad. Not only were many of the known facts explained by the story, and none of them contradicted, but further testable consequences could be drawn from it. For example, calculating that Aristotle had written the equivalent of about 70 lines of the Berlin edition to a sheet of papyrus, and assuming that the sheets had not been pasted together but rolled one after another onto a stick, we should expect damage from dampness and insects to the first and last sheets of a roll, and to the tops and bottoms of intervening sheets. The incompetent and unscrupulous first editor, Apellicon, would hence have found short passages missing or unreadable at intervals of about 70 lines, and longer ones at longer intervals. He would have filled them out by guessing what Aristotle had written, and would have guessed wrongly more often than rightly. A modern student of Aristotle could improve on Apellicon’s guesses, and those of subsequent editors, particularly in passages coming within his special competence. Peirce was such a student of the *Organon*, and he detected what he thought were “two blunders” (7.248) in Book II of the *Prior Analytics*. When these blunders are corrected, Aristotle’s theory of induction (*epagôgê*) in Chapter XXIII, of analogy (*paradeigma*) in XXIV, and of abduction (*apagôgê*) in XXV, becomes a coherent and intelligible body of doctrine, and the otherwise immense superiority of the Epicurean logic in respect of synthetic inference is somewhat reduced.<sup>35</sup>

Late in 1901 he completed a long paper “On the Logic of drawing History from Ancient Documents, especially from Testimonies” (MS 690), in the latter part of which he treated at great length three of the examples mentioned above: the Strabo story, the chronology of Plato’s dialogues, and the life of Pythagoras. He presented an abstract of the paper to the National Academy of Sciences at its meeting here in Philadelphia in November of that year (7.162f). The paper itself contained the last extensive revision brought to completion by Peirce of his general theory of logic; its purpose was to strengthen his theory of hypothesis or abduction; and it was by long mediation

upon the Greeks, and by detailed study of the surviving texts, that he achieved it.

I cannot here even enumerate the further steps taken by Peirce at *Arisbe* toward the revision and the completion of his philosophy. Still less can I connect them, step by step, with the Greeks. But the most important single large-scale effort toward completion was the elaboration of his semiotic or general theory of signs, looking toward a "system of logic considered as semiotic" (8.302,377); and the three most important revisions were those of his categories, his pragmatism, and his metaphysics, to bring them into harmony with his semiotic.

The revised categories appear under the head of "high philosophy" at first (7.526); later under that of phenomenology, phaneroscopy, or phenoscopy. In homage to Pythagoras and on account of their connection with numbers, he calls them *Käinopythagorean* (7.528) or *Cenopythagorean* (1.351; 2.87, 116; 8.328f), in spite of finding no approach to them among the Pythagoreans; and he sometimes calls the discipline *Cenopythagorean Phenomenology* to distinguish it from Hegel's.<sup>36</sup> And his revised pragmatism he at least once calls "*Cenopythagorean Pragmaticism*" (5.555\*).

It is a puzzling fact that, although he had argued for a sign-theory of cognition in his Cambridge period, in the *Journal of Speculative Philosophy* series of 1868–1869, there is no mention of it in the pragmatism series in the *Popular Science Monthly* in 1877–1878 in his cosmopolitan period,<sup>37</sup> nor even in the metaphysical series in *The Monist* in 1891–1893, early in his *Arisbe* period. Not only so, but in the latter he seems even to substitute for it the psychological doctrine of the association of ideas. That was a strange aberration from the point of view of the ordering of the sciences in his mature philosophy (1.180ff). Since it is a process- rather than a substance-philosophy, its key distinction, after the revision of the categories, must be that between two kinds of process, dyadic or dynamical, and triadic or semiotical; or, as he usually phrases it, between dynamical action and sign-action (5.469,472f). And the very conception of sign-action, as well as the technical term for it, *semiosis* or *semeiosis* (5.473,484), is adapted from Philodemus. The Greek term *sêmeiôsis* scarcely occurs before Philodemus, but is frequent and technical in his *On Methods of Inference*.<sup>38</sup> To that extent, then, the revision and completion of Peirce's philosophy depended upon the study of Epicurean logic in which he had been assisted by his student Allan Marquand.

The connections between Peirce's mature philosophy and that of Aristotle await a monograph. Lacking time for any part of that, or for his less sympathetic study of the Stoics, or for the influence, largely indirect, of Plotinus and other Neoplatonists on his later

metaphysics, or even for the evidences of his continuing high esteem of Epicurus himself, I break off the narrative at this point and state the conclusion toward which I have been moving: that the revisions of his philosophy during his Arisbe period, and his approaches toward completing it, were prompted and aided by study of Aristotle, Epicurus and Philodemus, Plato, and the earlier cosmologists, in that order of importance, and in ways of which little or no account has so far been taken.

I return now to the question with which I began: Why did the Peirces give the name "Arisbe" to the estate on the west bank of the Delaware, in Pike County, Pennsylvania, in which he lived with the Greeks for the last third of his life?

In search of an answer, I go back a century to the year 1870. In April of that year, Schliemann made a preliminary excavation at Hissarlik. At about the same time, the *Greek Lexicon of the Roman and Byzantine Periods*, by Peirce's teacher, friend and mentor, Evangelinus Apostolides Sophocles, was published in Boston. In reviewing it on July 21, *The Nation* said: "Here is a scholar whose view comprehends the entire Greek language, in its unbroken course, from Homer to the newspapers of modern Athens."

There was to be a total eclipse of the sun on December 22, and the path of totality was to run through Thessaly, Sicily, northernmost Africa, and southernmost Spain. At the end of its session, in mid-July, the United States Congress passed an appropriation bill for sending observation parties under the direction of the Superintendent of the Coast Survey. Peirce, an Assistant in the Survey, was already in Europe to visit possible sites and make recommendations. In London, he had called on Augustus De Morgan and presented a copy of his paper on the logic of relatives, the culminating achievement of his Cambridge period. From London, after the Vatican Council had declared the conditions of papal infallibility, and as the Franco-Prussian War began, he journeyed eastward by way of Rotterdam, Berlin, Dresden, Prague, Vienna, Pest, the Danube and the Black Sea, to Constantinople. After a week there in the exciting company of Edward H. Palmer (4.48n1) and Charles Drake, he began moving westward along the expected path of totality in search of eligible sites for the observation parties.

On Sunday morning, September 4, 1870, Peirce passed through the Hellespont in the steamer *Naptun*. It stopped at Gallipoli on the European side and at Dardanelles on the Asiatic side. Between the two, shortly before reaching the Narrows, it passed on its left the mouth of the river Selleis. Not far inland had stood Homer's Arisbe. Centuries later, Alexander's army encamped at Arisbe after making the crossing, and was rejoined there by Alexander after his visit to Troy. Fifteen miles by road to the northeast of Arisbe was Lamp-



sachus, where Epicurus had lived and taught for the last several years before his return to Athens, and where he had won his ablest disciples. Some thirty crowflight miles to the south of Arisbe was Scepsis, where, according to Strabo, the manuscripts of Aristotle from which our corpus derives had lain hid in a damp cellar for a century and a half.

The *Naptun* continued, past Schliemann's digs, to Lagos, Kavalla, Saloniki, and Volo. At Gallipoli Peirce had heard of the surrender of McMahon and the capture of the Emperor. At Kavalla he heard that the Republic had been proclaimed. On the way up to Saloniki, he wrote:

When I got up this morning it had been raining & was rather moist & misty & cloudy & there was to be seen Mount Olympus looking very grand and well as if it might be the home of the gods. Its base was hidden in mist. Its top hardly distinguished itself in colour from the light cloud that floated about it & it seemed almost doubtful whether it belonged to earth or to heaven.

At Volo he took leave of the *Naptun* (2.625), spent his thirty-first birthday, and presented letters of introduction from Sophocles, who had been born near Volo and had made a return visit not long since. With new young Greek friends Peirce drove "in a braganza over a road in Phthiotis in the night" (6.182) on which Zeno's Achilles might have raced the tortoise. He explored Larissa as a possible site for an eclipse party. Then he continued by another steamer to Messina and visited sites near the eastern coast of Sicily. The eventual decision was in favor of sites in Sicily and in southern Spain. But the Troad and Thessaly had seized Peirce's imagination as no other locality had ever done, or would ever do.<sup>39</sup>

Thirteen years earlier, as a junior at Harvard, Peirce had read the *Iliad* with Sophocles and Felton, using Felton's edition. Before that, as a lifelong elocutionist, he had competed for a Boylston Prize by reciting Byron's "Isles of Greece," and the memory still lingered of his high-school recitation of Halleck's vigorous poem on the Greek patriot Marco Bozzaris. From college on, he was a geyser of Homeric Greek and Horatian Latin. Felton had urged carrying the *Iliad* to the Troad and reading it on the spot. If Peirce did not do this in fact, he surely did so in imagination. Passing near Arisbe, he would recall the great lines, admired by Felton, on the slaying of Axylos by Diomedes—"Axylos, son of Teuthras, from well-built Arisbe, a man of substance and loved by all men, for his home was on the high-road there, and he welcomed all who came by." Felton had a note on Axylos as the genius of hospitality. And Peirce would remember also the grander passages on Asios of Arisbe, the leader of

the Trojan allies from Perkote and Praktios, Sestos and Abydos, as well as from Arisbe. It was Asios with whom William Everett, his Harvard classmate, associated Peirce's Arisbe when writing to him in 1893 (MS L 136): "I admire so much the name of your home. Asios of Arisbe, the fierce driver of horses, was always a great favorite of mine in the *Iliad*."

Arisbe the town had been named for Arisbe the woman, and about her there were conflicting legends. Peirce's Arisbe was bought in the name of his wife, and about her also there were growing up conflicting legends, because she and he guarded well the secret of her identity and her European origins.

But more important than any of these considerations, I think, was the fact that Arisbe was a colony of Miletus, the home of the first philosophers of Greece—Thales, Anaximander, and Anaximenes—who first had sought the *Archê*, the Principle, the First of things (MS 905:22–26). Of Peirce's three categories, it was Firstness that had given him the greatest difficulties, and it was only when Epicurus had helped him to a partial solution of them that he was ready to join the Greek cosmologists, and that his Arisbe too became a colony of Miletus.

The high-road through Peirce's Arisbe ran from Port Jervis to Milford and on past the Water Gap to Philadelphia, where we sit. The high-road through Homer's Arisbe ran from Lampsachus where Epicurus taught, on past the Narrows to Troy where Schliemann had just been digging, and farther on, up the Scamander, to Scepsis where Aristotle's manuscripts lay hid. And that was roughly the order of some of Peirce's chief dealings with the Greeks: (1) Philodemus and Epicurus; (2) the earlier cosmologists; (3) Schliemann's Trojan digs as a symbol of the logic of hypothesis; and (4) Strabo's story about the manuscripts of Aristotle, as an hypothesis as momentous as any in the history of philosophy, the testing of which would illustrate the logic of hypothesis in full detail, and bring Peirce to still closer grips with the man of whom he had read and thought more than of any other.<sup>40</sup>

## APPENDIX

In reviewing his life's devotion to logic, Peirce nearly always ascribes decisive importance to his reading of Whately and retirement to Arisbe. My three periods are therefore open to question only as dating the second period from 1870. My warrant is an episode recalled in a letter draft of June 1909 (MS L 482). In April of 1870, Peirce's younger brother, Benjamin Mills Peirce, a mining engineer, died in northern Michigan.

When my father and I went out to Marquette together and brought back my brother Ben's body, my father talked to me very earnestly, representing that I was sacrificing all hopes of success in life by devoting myself in logic, and that people would never think I amounted to much if I did so. I told him that I fully realized the truth of that, but that my bent of mind was so strong in that direction that it would be a very hard struggle to give up logic. That I intended, however, to try to do so and to take a good long time to come to any conclusion.

He reached his conclusion within the year. Robert Harley's very favorable discussion of his memoir on the logic of relatives at the Liverpool meeting of the British Association in September was encouraging. Meeting De Morgan and making the friendship of W. K. Clifford helped. Papal infallibility may have given him a push toward the logic of fallibilism. Soon after his return from the eclipse, the Metaphysical Club began, in which pragmatism was born.

## Notes

1. Other divisions have other merits. For Peirce's biography the most important is into two periods, divided by the death of his father in 1880: (1) Father and Son, 1839–1880; (2) Son Alone, 1880–1914. On the three periods of the present essay, see further the Appendix.
2. Peirce's letters to Barnett are in the Emory University Library. I quote from a letter dated 20 December 1909. See notes 23 and 32 below.
3. A slip of the pen for "do"?
4. Hobbes's nominalisms.
5. The argument of "Peirce's Progress" (pp. 184–97 above) has been examined by Don D. Roberts (*Transactions* 6 [1970]:67–83). His searching, trenchant, and helpful criticisms call for direct and separate reply. The present essay is not that reply, but anticipates it at this point.
6. *Century Dictionary*, p. 3873, s.v. Motive, II.n.1.
7. In another manuscript, the reference to which I have lost, Peirce remembers the title of his boyhood treatise as "The Dynamics of Persuasion."
8. From a long letter of 10 July 1908 to Francis C. Russell (*MS L 387*), in the part that was not sent.
9. Peter Turley, "Peirce on Chance," *Transactions* 5 (1969):243–54.
10. In the first half of his first year, he gave a course in medieval logic, for which he was well prepared by previous study and by a series of University Lectures on "British Logicians" he had given at Harvard in 1869–70. See "Peirce at The Johns Hopkins," Appendix III (not included here).
11. Marquand's papers, including this one, and including his detailed and intelligent notes on Peirce's Hopkins courses, are in the Princeton University Library.
12. The thesis has been lost. There is a draft of the translation among the Marquand papers, entitled "Philodemus on Inductive signs and infer-

ences." The essay, no doubt abridged, was published in *Studies in Logic by Members of The Johns Hopkins University* (1883), pp. 1–11. So far as I know, this was the earliest recognition in English of the importance of Philodemus's work, and the earliest competent recognition anywhere of the merits of the Epicurean logic. The translation had been presented to the Metaphysical Club, of which Peirce was president and Marquand secretary, in January 1880, and the essay in April; see "Peirce at The Johns Hopkins," Appendix IV (not included here). Peirce speaks of Philodemus in *CP* 7.60 (1882), 2.741 (1883), 2.38 and 6.98 (1902), 8.379 (1908), and 2.761 (c. 1908), and in unpublished manuscripts and letters. In *MS* 1604 he says he devoted months to the study of this small treatise and gave a good deal of time to editions of other Epicurean papyri from Herculaneum. "This philosophy is my particular pet, or one of my pets."

13. Col. 36, lines 7–17. See *Philodemus: On Methods of Inference, A Study in Ancient Empiricism*, ed. Phillip Howard De Lacy and Estelle Allen De Lacy (Philadelphia, 1941), pp. 106–7.

14. Even the changes of direction of motion resulting from collisions are not absolutely determined, since either atom may swerve at the instant of impact from the rectilinear path into which the collision would otherwise redirect it. The laws of atomic motion can therefore only be statistical in nature. An atom-tracking computer that should predict future positions of single atoms is not only practically but theoretically impossible (even if some atoms are hidebound by habits both of swerve-frequency and of swerve-orientation).

15. Besides the "laws<sub>1</sub>" that govern the motions of single atoms, which may be supposed to hold in all worlds (as well as outside them), we may call "laws<sub>2</sub>" those more or less regular ways in which gross phenomena such as eclipses are caused. Since "laws<sub>2</sub>" vary from world to world, we may perhaps conceive them, if not also "laws<sub>1</sub>," as acquired habits. But this is getting ahead of our story.

16. "Peirce at The Johns Hopkins," Appendix III (not included here); and correspondence of October and November 1883 in the Peirce file in the Gilman Papers at The Johns Hopkins University.

17. On a sheet in *MS* 278 with two rubber stamp marks: C. S. Peirce/1884 FEB 7, and C. S. Peirce/1884 APR 1. (It may be added that in *MS* 238 Peirce writes as if his *Century Dictionary* article on the *Method or doctrine of limits* [p. 3458] had been written in 1883.)

18. In 1905 Peirce distinguished "five grades of original work in logic" (*MS* 816). "The first and highest consists in showing for the first time that some element, however vaguely characterized, is an element that must be recognized as distinct from others. It is in such achievements that Aristotle is peerless. Examples from his works could be given by scores. I will mention only his definitions; his definition of continuity would be enough were it alone." The order of development of Peirce's own theory of continuity has been confused by editorial notes in 6.164–68. The term defined is "continuity," not "continuous." 165–168 are not a marginal note, but four separate notes on the facing interleaf page, only the last of which, 168, is dated "1903 Sep 18." The order of the earlier notes should be 167, 165, 166. The reference in 166 should be to 165, not 164. 168 should contain a reference indicating that the wrong definition is that in 166.

19. Even as late as 1894 (in *MS* 1604) Peirce wrote: "Have read Plato only in translation; only a dialogue or two in Greek. Never was intensely interested in Plato. . . . My description of Platonism [*Century Dictionary*, p. 4540, *Platonic*] was written at Niagara Falls [in November 1885] without a single

book to refer to. It was subsequently revised but not much changed." His intensive study of Plato was still to come.

20. Peirce had studied botany with Gray in college and was intimately associated with Chauncey Wright, and he had studied zoology with Agassiz privately. These were the chief Cambridge protagonists.

21. Published in *Values in a Universe of Chance: Selected Writings of Charles S. Peirce*, ed. Philip P. Wiener (Doubleday Anchor Books, 1958), pp. 289–321.

22. In *MS 1604* Peirce puts him at the head of his list of Pre-Socratics.

23. *SS 114*. Peirce to Samuel Barnett, 20 December 1909 (see note 2 above): "In College . . . I was also made to study Hobbes and Jouffroy, and for myself read *in Cudworth*."

24. In a review of Berkeley's works (*N3:37*), preceded by the sentence: "Indeed, in Kant's thought, generally, there is hardly anything but his architectonic method that is not more in the line of English tradition and development than it is in the German line."

25. See for example the quotations under *nature* (pp. 3943f) from Cudworth himself and from Cudworth's rendering of Proclus, and see the reference forward from *entelechy* (p. 1946). In drafts of his review of Paulsen's *Kant* (*MS 1454*), he quotes passages in Cudworth "from which Kant and a more recent philosopher [i.e. Peirce himself] may have profited."

26. Walter Charlton, *Physiologia Epicuro-Gassendo-Charltoniana: or a Fabric of Science Natural, upon the Hypothesis of Atoms* (London, 1654). Johnson Reprint Corporation, 1966.

27. In the *Monist* series of 1891–93.

28. 1678 ed., pp. 674f; 1845 ed. (used by Peirce), 2:599. Wiener's *Values*, p. 300f. I have brought the Cudworth passage slightly closer to the 1678 edition.

29. *MS 843*: "in order to escape distractions from my study of logic, I retired to the wildest county that I could easily reach."

30. The order of development was: *Search for a Method*, *Principles*, *Grand Logic*. The last was composed in the years 1894–95.

31. *Open Court* 6 (1892):3375.

32. Letter of 20 December 1909 to Samuel Barnett (notes 2 and 23 above).

33. Marginal note in his copy of Lutoslawski in the Harvard University Library, at p. 415.

34. In 1905 he reread the *Theaetetus* in Greek and drafted a long letter to Lady Welby about it (*MS L 463*, 16 July 1905).

35. In 1906 he resumed this investigation, concentrating on the seventy or so scattered passages in which Aristotle either distinguishes the senses of "prior" and "posterior" or makes important use of the distinction in some unspecified sense. It had long seemed to him that there were incoherences and confusions within and among these passages, and that some of them might be chargeable to Apellicon. This time, he assumed that Aristotle wrote 64 Berlin lines to a sheet. See *MS 992* and the draft letter of 30 July 1906 to Edward S. Holden in *MS L 200*.

36. Earlier he had seemed to find an approach. In his "Pythagorics" (*Open Court* 6 [1892]:3376) he had written: "The Pythagoreans attached significance to numbers. . . . *One* was the origin; *two*, stalwart resistance; *three*, mediation and beauty." But they had not stopped at three, and that made all the difference. (In 1898 Peirce said, in *MS 438*, that the connection of his categories with the numbers 1, 2, 3 was one of their least important features, and he even guessed that the Pythagorean doctrine of the significance of numbers was exoteric only.) For Peirce's definitions of Cenopythagorean

Phenomenology and of phenoscopy see the *Century Dictionary* supplement of 1909, 2:978, 981.

37. See however *CP* 7.355ff.

38. See the index of Greek philosophical terms in the De Lacy edition (note 13 above) at p. 192.

39. The nearest approach was an interior scene later on the same trip, in Pisa Cathedral (6:578). Peirce at Arisbe later worked up his adventures in Thessaly into his major work of fiction, "A Tale of Thessaly" (*MSS* 1561, 1582, where "Topology" should be "Topography").

40. The last eight paragraphs have been pieced together from sources too numerous to cite—letters home, Coast Survey reports, Harvard catalogues, newspaper and journal articles, Walter Leaf's *Troy* and *Strabo on the Troad*, Schliemann's *Troja*, and scores of other works of reference. My explanation of the name of Peirce's Arisbe remains, however, pure hypothesis. It might at any time be shaken by the discovery of a letter in which he says, for example: "We call it Arisbe because Juliette is so fond of the butterfly of that name. Do you remember that lovely enameled butterfly brooch she wore when you were here? It's an Arisbe." I expect no such shock, but, if it comes, it may not affect the rest of my essay, and may not be fatal to the hypothesis.

# THIRTEEN

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## Peirce and Leibniz

The best account of Peirce's life is still that of 1934 by Paul Weiss in the *Dictionary of American Biography*. In it he says that "Peirce placed himself somewhere near the rank of Leibniz."<sup>1</sup> Part I of the present essay documents and qualifies that statement. Part II suggests a relationship more intimate than that of sharing a rank.

### I

Weiss's authority, I believe, was a letter Peirce drafted, but apparently did not send, to his Chicago friend and admirer, Francis C. Russell, on November 15, 1904 (MS L 387). Nearly six weeks earlier, Peirce had received the September 29 issue of the *Journal of Philosophy*, which contained the first instalment of James's "A World of Pure Experience." Peirce had been struck by the sentence: "In Taine's brilliant book on 'Intelligence,' substitution was for the first time named as a cardinal logical function, though of course the facts had always been familiar enough."<sup>2</sup> Taine's *De l'intelligence* had appeared in 1870. Peirce remembered having sent Taine in 1867 a copy of his *Three Papers on Logic*, in one of which he had held that substitution was not only *a* but *the* cardinal logical function. In any case, his priority was clear. It was not a question of originality, for earlier nominalists—Ockham, Hobbes, Leibniz—had held much the same view. Nor had he said that substitution was an elementary operation. More recently, he had analyzed it into two, insertion and omission. How could he bring all this to the attention of students of logic, without offending James or dispraising Taine? He could write a letter to the editor and ask him to have it fathered by somebody else. He was not free to write such a letter to Woodbridge, the editor of the *Journal*, so he had written it instead to Paul Carus, the editor of *The Monist*. Carus had had no difficulty in persuading Russell to let it appear over his name.<sup>3</sup> Russell had written Peirce to this effect in a letter Peirce had just received, but which has not been preserved.

As to what you say about me [Peirce wrote in reply], partly seriously, strictly *sub rosa* I hold that a man of 65 well read in philosophy & a

thinker himself must be a precious fool or be able to place himself better than anybody else can do, and I place myself somewhere about the real rank of Leibniz. Of course, Leibniz had the advantage of coming to a field into which no reapers had come.

Observe that: (1) This is a draft, not a letter actually mailed. (2) What Peirce says is "strictly *sub rosa*." (3) He ranks himself near Leibniz only in logic; perhaps more precisely, only in symbolic logic; not in mathematics or in metaphysics, not in philosophy or in science generally. (4) Even this he does only "partly seriously." If I seem to you to be suffering from a delusion of grandeur, he says in effect, that may be because you have taken us at our apparent ranks, and because in symbolic logic I followed hard upon Boole and De Morgan, but before Leibniz there was nobody, so that his apparent rank is much higher, and mine much lower, than our real ranks, which are not far apart.<sup>4</sup>

Besides this partly serious ranking of himself in relation to Leibniz, there is, however, a later and wholly serious ranking of himself in relation to Aristotle, Duns Scotus, and Leibniz. It also is in a letter draft—a draft sequence of sixteen pages, without beginning or ending, whose only date is that of a resumption on "June 19" after an interruption. My guess is that the person addressed was Abbott Lawrence Lowell, and the date June 18, 1909, a few months after Lowell had succeeded Eliot as president of Harvard University.<sup>5</sup> Peirce says that it has been a [and here the sequence begins]

matter of so much concern to me to know just what my comparative powers in logic are that I have taken the utmost pains to estimate them correctly, and neither too high nor too low. Now I am well acquainted & deeply read in the whole literature of the subject in the widest sense & have so carefully studied the question that personally concerns me, that I feel sure I can have made no great mistake about it; and the only writers known to me who are in the same rank as I are Aristotle, Duns Scotus, and Leibniz, the three greatest logicians in my estimation, although some of the most important points escaped each. Aristotle was a marvellous man in many other directions; a great writer, a great zoologist, a great psychologist, a profound sociologist, and a very able practical politician. I only compare myself to him in respect to logical powers. Leibniz, too, was a sublime mathematician, as well as very able in all that concerns politics and jurisprudence. But I consider him only as a logician. (MS L 482)

Observe that: (1) This also is only a draft. No such letter has been found among the Lowell papers or elsewhere. (2) Again the ranking is only in logic, though clearly without any limitation to symbolic logic. (3) It is with a view to a question that concerns him personally that he has taken "the utmost pains" to estimate his comparative



powers in logic "neither too high nor too low." The question, as appears from later pages of the draft sequence, is whether he has a continuing duty to devote himself so wholly to logic, with so little encouragement, and whether he is justified in asking for needed financial help, when scarcely anybody thinks him or his work worth helping along. More particularly, is he now justified in asking for a thousand dollars for the books he needs to complete his *System of Logic, considered as Semiotic*?

So far as the known evidence goes, it is only in these two passages in letter drafts, late in life, in respect to logic, and as bearing on a practical question, that Peirce places himself in or near the real rank of Leibniz.

Nearly a decade before he first placed himself there, however, he had been so placed by another logician, Ernst Schröder. The third volume of Schröder's lectures on the algebra of logic, that on the algebra and logic of relatives, had appeared early in 1895. Paul Carus wanted it adequately reviewed in *The Monist*. He could not ask Peirce to review it, because he was under instructions from Edward C. Hegeler, the publisher, to accept nothing further by Peirce. In September he asked Francis Russell to try it. Russell corresponded with Peirce about it, but even with Peirce's help it was too much for him. At the end of January 1896, Carus appealed to Schröder himself, whom he knew personally. Schröder wrote Peirce on February 16:

In a six-pages letter I exhausted my eloquence trying to dissuade him from undertaking such a criticism himself, and to reconcile him (if possible) with you. I most seriously assured him, that however ungrateful your countrymen and contemporaneans might prove, your fame would shine like that of Leibniz or Aristoteles into all the thousands of years to come, and that he could do no better than openly to join your banner (however: difference of opinion as to necessitarianism allowed). (MS L.392)<sup>6</sup>

Observe that: (1) Schröder too was facing a practical problem: how to get his book competently reviewed in *The Monist*, given that by far the most competent reviewer was *persona non grata* to that quarterly's publisher and editor. (2) He therefore gave his ranking the form of an anticipation of the verdict of history. (3) But he too was careful to limit the ranking to logic. The question, as he put it in his letter to Carus, is Peirce's merits in the fields of his real work—*auf seinen eigentlichen Arbeitsgebieten*—and you mustn't be blinded to those merits by your quarrel with him off his beat, over the doctrine of necessity, as to which I am on your side.<sup>7</sup>

So much by way of evidence for Weiss's statement and by way of contexts and circumstances restricting its interpretation. The result leaves much to be desired. On the one hand, if we limit ourselves

to logic, and if we remember that Schröder had reviewed the *Begriffsschrift* and had sent Peirce a copy of his review,<sup>8</sup> we wonder at their taking no account of Frege. On the other hand, if we remember that Peirce and Leibniz have often been compared without limitation to logic or regard to rank,<sup>9</sup> we wonder if Peirce himself felt the affinity or kinship; if he acknowledged any debt to Leibniz; if he had any sense of Leibniz as a continuing presence in his own philosophical development. A leading Leibniz scholar says that Peirce "knew Leibniz better than any other American of his time"<sup>10</sup>—but how well was that? How much of Leibniz's work was accessible to him, early or late? What were his opportunities and occasions for study of it? How accurate was his understanding of it? With which of Leibniz's views did he express agreement or sympathy, which did he reject—and did he change his mind about any of them? Did he take up any of Leibniz's unfinished projects and carry them forward?

These are questions for a monograph, not for a short essay. Part II ignores the Frege question, and concerning the others it offers only such brief indications, in an approximately chronological order, as may encourage somebody competent in logic and mathematics to undertake the monograph.

## II

The name of Leibniz was familiar in the Peirce household and in the Cambridge of his youth. His father and older brother were mathematicians before him. His father was a leading member of the Cambridge Scientific Club, which had several meetings on Leibniz. His teacher, Francis Bowen, another member, liked to find in Leibniz *a priori* anticipations of nineteenth-century experimental discoveries.<sup>11</sup> Leibniz's *vis viva* was a topic of conversation in Cambridge and Boston intellectual circles.<sup>12</sup> The first two hundred pages of his father's great treatise on *Analytic Mechanics* appeared in 1855, just before he entered Harvard College, and the complete volume in 1857, in the middle of his college career. It contained an appendix arguing for a return to Leibniz's position on the force of moving bodies. At the end of his junior year, in June 1858, the *Atlantic Monthly* had a masterly review article on Leibniz by Frederic H. Hedge.<sup>13</sup> Leibniz's principle of continuity was brought into the debates over evolution that began soon after his graduation.<sup>14</sup>

In his sophomore, junior, and senior years, to the neglect of some of his courses, Peirce concentrated his studies on Kant's first critique and on the literature in the light of which it was to be understood; especially on Leibniz and Wolff on the one hand, and on Hobbes, Cudworth, Newton, Locke, Berkeley, and Hume on the other.<sup>15</sup>

In the mid-1860's Peirce began compiling references for a Philosophical Vocabulary. He used a large "Universal Index" blankbook which his father had used for terms and references in mathematics, astronomy, and mechanics, and which Charles in the earlier 1860's had used for chemistry (MS 1156). For Leibnizian terms his primary source was Erdmann's edition of 1840, and his secondary sources were Hamilton's *Lectures on Logic and on Metaphysics* and Hamilton's edition of the works of Thomas Reid. Among the terms for which he referred directly to the pages of Erdmann's edition were: clear and obscure; distinct and indistinct or confused; adequate and inadequate; intuitive and symbolic or blind or suppositive; primitive; nominal and real definition; true and false; necessary and contingent truth; the principle of logical continuity; the principle of individuation; haecceity; reality; infinite virtue; practical discipline.<sup>16</sup> Besides his lifelong private use of this Vocabulary, Peirce drew upon it for his contributions to the *Century Dictionary* (1889–91) and its supplementary volumes (1909) and to Baldwin's *Dictionary of Philosophy and Psychology* (1901–02).

As Peirce remembered it late in life, "my work became self-controlled early in the year 1867, when I already had in my mind the substance of my central achievement, the paper of May 14 of that year, 'On a New List of Categories.'"<sup>17</sup> His three categories provided the rationale for the division of signs into icons (at first called likenesses), indices, and symbols; of symbols into terms, propositions, and arguments; and of arguments into hypotheses, inductions, and deductions (CP 1.558–59). In a draft of the "New List" he explained his choice of the name "symbol" for the third kind of sign by quoting Leibniz's "celebrated passage" on the chiliogon or polygon of a thousand equal sides as an example of the use of signs in the kind of thinking Leibniz calls "blind or symbolic" (MS 720).<sup>18</sup>

In his 1867 paper "Upon Logical Comprehension and Extension" Peirce described the "allied . . . distinction of clear and distinct" as "very much more clear with Leibniz than with Descartes" and said the nearest earlier approach had been made by Duns Scotus. "A philosophical distinction emerges gradually into consciousness; there is no moment in history before which it is altogether unrecognized, and after which it is perfectly luminous" (CP 2.392). That may be read as Peirce's first application of Leibniz's principle of continuity; his three papers of 1868 on the validity of the laws of logic as his second; and his six of 1891–93 on the evolution of the laws of nature as his third.

When in 1871 in his review of Fraser's edition of Berkeley Peirce called Hobbes "the *plusquam nominalis*" (W2:475; CP 8.22) he was echoing Leibniz's preface to Nizolius (1670).<sup>19</sup> Peirce had been a nominalist for seventeen years (1851–68),<sup>20</sup> and though he was now

declaring for realism, it was the realism of Scotus, the great virtue of which was that it was "separated from nominalism only by the division of a hair" (W2:467; CP 8.11). Leibniz had been a declared nominalist for seven years (1663–70), and was still a nominalist, but was now receding from Hobbes's extreme of making truth arbitrary and dependent on the human will, and was also receding from his earlier rejection of Scotus's principle of individuation. Peirce repeats Leibniz's point about Hobbes. Perhaps Leibniz assisted Peirce's first steps from nominalism toward realism.<sup>21</sup>

In 1876 appeared one of the last contributions to mathematics by Peirce's father Benjamin, "A New System of Binary Arithmetic," compared step by step with Leibniz's system.<sup>22</sup>

Darwin's *Origin of Species*, following upon the mechanical theory of heat, had inaugurated "the greatest mental awakening since Newton and Leibniz."<sup>23</sup> Peirce's pragmatism, born in 1871 of that awakening, was presented in 1877–78 as the lesson in logic taught by these recent advances in science (CP 5.363f). But it was essentially a maxim or precept for attaining a third and higher grade of clarity of ideas, above and beyond Descartes's two grades as amended by Leibniz (CP 5.388–402).<sup>24</sup> In that respect, it was a matter of going on from where Leibniz had left off.

In 1879, at the beginning of his quinquennium as lecturer in logic at The Johns Hopkins University, Peirce founded a Metaphysical Club. At its second meeting his pupil B. I. Gilman presented a translation of Leibniz's *Meditationes de cognitione, veritate et ideis*, the chief source for the pre-pragmatic grades of clarity, and Peirce resumed the attack on intuitive cognition begun in his papers of 1868. At the first meeting Gilman had read a paper on the doctrine of limits and there had been other papers on the differences between Leibniz's calculus and Newton's, on Zeno's paradoxes, and on the non-Euclidean conception of space.<sup>25</sup>

In January 1882 Peirce had a *Brief Description of the Algebra of Relatives* privately printed (CP 3.306–22); then discovered that his point pairs had been anticipated by Cayley in 1858; but "took a copy of it to the great algebraist Sylvester. He read it and said very disdainfully—Why it is nothing but my *umbral notation*." In 1890 *The Nation* sent Muir's *Theory of Determinants* to Peirce for review,<sup>26</sup> and

I was a little comforted . . . by finding that what Sylvester called "my umbral notation" had first been published in 1693 by another man of some talent, named Godfrey William Leibniz. He himself speaks of it as "une ouverture assez extraordinaire". . . . The mathematics which results from following out this idea of Leibniz which I rediscovered for myself and applied to dichotomic mathematics is, in mathematics taken generally, now most usually called the theory of matrices. (MS 302)<sup>27</sup>

In 1884 Peirce presented to the National Academy of Sciences a memoir (in collaboration with his student Joseph Jastrow) reporting experiments which he later described as showing

that there is no *Differenz-Schwelle* in sensation, or that if there be it is almost incredibly small. The philosophical interest of this consists in part in its bearing upon *synechism*, or the principle of universal continuity, which does not mean that there is no discontinuity, which is involved in all existence. It was also shown by these experiments that a perception might be so slight (*petite*, Leibniz) that the greatest effort of attention under the most exceptionally favorable circumstances would fail to make the subject aware of it, so that he could answer the question which of two alternative characters it had, and yet if the subject was required to answer at random, in 60 per cent of the cases his answer agreed with the objective fact. (*MS L 107*)<sup>28</sup>

So Peirce's chief contribution to experimental psychology, as well as his mathematics, logic, and metaphysics, had Leibnizian affiliations.

From about 1890 onwards Peirce was engaged in a long series of interrelated projects with similar affiliations: elaborating and testing his synechistic metaphysics; writing a history of science; detailing and illustrating the logic of historical inquiry; studying non-Euclidean and especially hyperbolic geometry; reforming mathematical education; reconstructing geometry so as to move from the constitution of real space through topical and projective into metrical geometry; constructing a topical geometry (or general topics or topology or, as he preferred to call it, *synectics*) that should be adequate to true continuity as distinguished from the pseudo-continuity represented by Cantorian set theory; developing graphical logics, entitative and existential, as alternatives to the algebras of logic in which he had previously pioneered; defending infinitesimals against the doctrine of limits, as his father had before him; devising, like his father before him, a new system of binary or, as he preferred to call it, *secundal arithmetic*; revising his pragmatism to extirpate its "principal positive error," its nominalism (*CP* 8.216); proving it in its revised form by the aid of his existential graphs; backing it up with a phenomenology and a theory of the normative sciences, and rounding it out with a critical common-sensism (carrying his evolutionary version of innate ideas), a complete logic of vagueness, and a logic of religious belief consonant with the logic of science; sketching a triadic logic; and—his last ambition—writing a system of logic considered as semiotic.<sup>29</sup>

It is not surprising, then, that beginning in the 1890s there are characterizations of Leibniz that read like projections, and accounts of Leibniz's philosophy that make his own seem its legitimate issue.

In 1899 he reviewed for *The Nation* the translation and exposition of the *Monadology* by Latta and *La nouvelle monadologie* by Renouvier and Prat.<sup>30</sup> In the first review he lists the collected editions of Leibniz then available, and gives prominence to Gerhardt's seven volumes of the mathematical works, "which furnish the only key to Leibniz's thought." Of Latta's commentaries he complains that "it is a pity that the logic of so eminent and original a logician—life and soul, as it is, of his whole philosophy—should not have been more completely illustrated." Before examining "weaknesses of the logic of Leibniz" unnoticed by Latta, he says "the reasoning of Leibniz was nearly, if not quite, of the highest order, being far more accurate than that of Kant or almost any metaphysician that can be named, and abounding in luminous, simplifying, and fecund methods." Since Leibniz was "a writer of papers and not of books," we meet his philosophy always in process, even in its most systematic formulations.

The Columbus of the subconscious mind, the discoverer of mechanical energy, the joint inventor of the differential calculus, and, more than all these, the great promulgator of the law of continuity (understood by himself to include historical continuity, and, as he was dimly aware, supposing an evolution of all things and all laws from a primal chaos), is a figure to excite the curiosity of thinking men of the present day.

In the second review, concerning the claim of Renouvier's "new monadology" to be regarded as "the natural perfecting of the philosophy of Leibniz," Peirce concludes:

Leibniz had more sides than one. If we consider him as above all else an extreme nominalist, and expunge from his celebrated paper all that tends in the opposite direction, the development of what would remain might not be very different from the *nouvelle monadologie* minus its free-will doctrine. But if we deem a man to be best represented by that one of his ideas which shows most prepotency, it is in the direction of the differential calculus that we must look for the genuine Leibniz, and in philosophy we must regard the law of continuity as most Leibnizian. This principle would at once do away with the isolated monads, and render the extravagant and unverifiable hypothesis of preëstablished harmony superfluous by directly solving the riddle of the transitivity of causation, while it would form the basis of a philosophy in deepest unison with the ideas of the last half of the nineteenth century.

In drafting an exposition of his topology for the *Popular Science Monthly* in 1904, Peirce introduced his binary arithmetic, and remarked with humorous filial affection:

This system of secundals, like one or two other of the gimcracks of Leibniz, such as the differential calculus, determinants, the umbral

notation, the principle of continuity, the principle of indiscernibles, the principle of sufficient reason, and so on, is of no little utility in reasoning, and I shall define it more precisely below. (MS 137:17)

The revision of his pragmatism involved, among other things, recognizing a fourth grade of clarity (CP 5.3), above and beyond the two of Descartes and Leibniz and the pragmatic third (which he now sometimes called "pragmatistic adequacy" [MS 649:3]); removing the false suggestion that each grade of clarity left its predecessors behind; withdrawing the criticism of Leibniz in "How to Make Our Ideas Clear" for attaching so much importance to formal definitions; and showing, as he had not previously done, how he had originally derived his pragmatism "from a logical and non-psychological study of the essential nature of signs" (MS 137:20).

In a draft of what was to have been the third article of his 1905 series on pragmatism,<sup>31</sup> before entering upon his most extended and careful criticism of Leibniz's *Meditationes* and locating the point at which its nominalism comes in, Peirce describes it as "that writing which earliest marked the glorious logical strength of Leibniz, when he was only 38 $\frac{1}{3}$  years old, an age at which no strong logician can have attained maturity" (MS 284:14). The sensitive reader does a bit of arithmetic here. Peirce, he finds, was 38 when "How to Make Our Ideas Clear" came out in the *Popular Science Monthly* in January 1878. It is the doctrine of that paper which Peirce is now revising—a doctrine of which "the principal positive error is its nominalism" (CP 8.216). So Peirce conceives that paper as occupying the same place in his own philosophical development that the *Meditationes* occupied in Leibniz's.

One more indication. Late in September of 1908, drafting a small *Logic* while waiting for copies of the October *Hibbert Journal* containing "A Neglected Argument for the Reality of God," Peirce again contrasted Leibniz with Kant, whose first critique was

the very *chimaera* of the history of philosophy, according to the tongues of fame . . . but in reality nothing more portentous than a sickly little nanny-goat masquerading as a world-shatterer. Kant had been constituted by nature a great logician,—not, indeed, to be compared with Leibniz, who in his later years, in his infinitesimal calculus, in his law of continuity, even in his *Théodicée*, and still lesser flights, soared high above his earlier nominalism,—yet nevertheless a great logician. . . . [who by maladies here diagnosed] was prevented from ever thoroughly outgrowing his nominalism. (MS 609:10)

The sensitive reader readily substitutes: not, indeed, to be compared with Peirce, who in his later years, in his tychism and synechism, his synectics or topology of true continuity, his pragmatism, his

critical common-sensism, even in his "Neglected Argument," and still lesser flights, soared high above *his* earlier nominalism.

In assembling the foregoing indications, I have omitted nearly everything that can readily be found by consulting the indexes of the *Collected Papers*.<sup>32</sup> I have also omitted nearly all the details of Peirce's analyses, reconstructions, criticisms, and arguments. I have said nothing about Boscovich and his followers as intermediaries between Leibniz and Peirce, and nothing directly about panpsychism. And I have completely passed over many matters of such recurrent concern and importance for Peirce as Leibniz's theory of space.

Conclusions would therefore not be in order. They must await the monograph. But I hope its author will try out the hypothesis these indications suggest: that, while accepting without change scarcely any of his positive doctrines, Peirce identified himself more closely with Leibniz than with any other thinker; that among the many grounds for the identification was that Leibniz alone of the great philosophers was mathematician, logician, historian, and physical scientist as well as metaphysician; and that not the least ground was that Peirce saw prefigured in Leibniz, as in no other philosopher, his own progress from nominalism toward realism.<sup>33</sup>

## Notes

1. 14:403.
2. 1:541.
3. 15 (April 1905):294-95.
4. The humor becomes more obvious when he goes on to say that he is "by nature most inaccurate," that he is "quite exceptional for almost complete deficiency of imaginative power," and that whatever he amounts to is due to two things, first, "a perseverance like that of a wasp in a bottle," and second, "the happy accident" that he "early lit upon a METHOD of thinking, which any intelligent person could master." (The reference, I think, is to his discovery of his categories early in 1867. It was only then, as he later wrote Russell, that his work "became self-controlled" [10 July 1908, MS L 387]. See note 17 below.) In a postscript he adds a third thing, that he has "always unceasingly exercised" his "power of learning new tricks"—to keep himself "in possession of the childish trait as long as possible. That is an immense thing."
5. See "Peirce's Place in American Thought," p. 318 below (where I date the letter "about 1907" and conjecture that it was addressed to George A. Plimpton).
6. The English is Schröder's.
7. Schröder's letter to Carus, dated 12 February 1896, is in the Archives of The Open Court Publishing Company at Southern Illinois University. The



relevant passage reads in part: "Sie können sich darauf verlassen, dass wie undankbar auch die Zeitgenossen und Landsleute desselben sein mögen, der Ruhm von *Charles S. Peirce* gleich dem eines *Leibniz* oder *Aristoteles* in alle künftigen Jahrtausende strahlen wird. Und Sie können sich kein besseres Denkmal setzen, als wenn Sie möglichst bald und mit vollen Segeln oder fliegenden Fahnen zu ihm übergehen. [Ich meine hierbei *nicht* die Frage des Determinismus oder Peirce's Anti-necessitarianism, in der ich auch zu seiner Opposition gehöre.]" For the sake of completeness, it should perhaps be added that, two decades earlier, in 1877, when most of his work in logic was still before him, Peirce had been ranked by W. K. Clifford nearly as high as he was by Schröder, and that Peirce associated the two judgments. On 29 October 1877, Edward L. Youmans, editor of the *Popular Science Monthly*, in which the first of Peirce's "Illustrations of the Logic of Science" was about to appear, wrote from London to his sister in the United States: "Charles Peirce isn't read much on this side. Clifford, however, says he is the greatest living logician, and the second man since Aristotle who has added to the subject something material, the other man being George Boole, author of *The Laws of Thought*." (This was two years before the *Begriffsschrift*.) The letter was published by John Fiske in his life of Youmans in 1894 (on pp. 338-40). Writing to his cousin Francis Blake in December 1896, Peirce mentioned Carus's search for a reviewer of Schröder, the appeal to Schröder himself, and Schröder's reply "that nobody but Peirce ought to be thought of for the criticism, and that, let his countrymen think what they would, history would rank him as a logician by the side of Aristotle, as a mind of the first order. Clifford told Youmans substantially the same thing. Be that an overestimate or not" (MS L 421). Peirce was appealing to his cousin for help in a financial crisis, so there was a practical occasion for linking the two judgments. Observe again the limitation to logic.

8. Peirce's copy of the review is in a bound volume of reprints from his library in the Harvard University Library, call number Phil 5005.4. It is marked in his hand: Formal Logic. Christine Ladd, one of his pupils, listed the *Begriffsschrift* and this review in the bibliography appended to her essay "On the Algebra of Logic" in *Studies in Logic* by members of the Johns Hopkins University (Boston, 1883), edited by Peirce, 70-71, item 17.

9. For example, by Philip Wiener in *Proceedings of the American Philosophical Society* 91 (1947):202.

10. Leroy E. Loemker in the second edition of his translation of Leibniz's *Philosophical Papers and Letters* (Dordrecht, 1969), p. 57.

11. The records of the Club are in the Harvard University Archives.

12. Philip Wiener, *Evolution and the Founders of Pragmatism* (Cambridge, MA, 1949), pp. 173f.

13. 2:14-32.

14. A. Hunter Dupree, *Asa Gray* (Cambridge, MA, 1959), p. 285.

15. The perspective in which he viewed Leibniz for the next five or six years appears from the three references to him in Peirce's oration of 1863. Philip Wiener, ed., *Values in a Universe of Chance: Selected Writings of Charles S. Peirce* (Garden City, 1958), p. 7; WI:105-6.

16. The particular works referred to, in the order in which they appear in Erdmann's edition: I. Disputatio metaphysica de principio individui (1663), 1-5; II. Dissertatio de arte combinatoria (1666) and the appendix thereto, 6-44; IX. Meditationes de cognitione, veritate et ideis (1684), 79-81; XI. De scientia universali seu calculo philosophico (n.d.), 82-85; LIX. Nouveaux essais (1703), 194-418; LXIII. De modo distinguendi phaenomena realia ab imaginariis (n.d.), 443-45.

17. From a long letter of 10 July 1908 to Francis C. Russell (MS L 387), in the part not sent. See note 4 above.

18. Murray Murphey, *The Development of Peirce's Philosophy* (Cambridge, MA, 1961), pp. 411–14, published the earlier part of MS 720 as draft 2. If he had found the continuation, the name of Leibniz would have appeared once in the best book on Peirce. The chiliogon passage is on p. 285 of Philip Wiener's *Leibniz Selections* (New York, 1951).

19. Erdmann edition, 69; Loemker translation, 128 (see note 10 above).

20. See "Peirce's Arisbe," p. 228 above.

21. See "Peirce's Progress," pp. 184–97 above. The criticisms of Don D. Roberts, in *Transactions* 6 (1970):67–83, are still to be answered; see "Peirce's Arisbe," note 5.

22. *U.S. Coast Survey Report for 1876*, Appendix No. 6, 81–82.

23. MS 620, published on pp. 24–29 of "Was there a Metaphysical Club in Cambridge?" where the quoted phrase is on 24.

24. H. S. Thayer, *Meaning and Action* (Indianapolis, 1968), p. 85, sees an application of Leibniz's identity of indiscernibles in the pragmatic criterion according to which beliefs differ if and only if some of their practical consequences differ.

25. See "Peirce at The Johns Hopkins," Appendix IV (not included here). Gilman's translation of the *Meditationes* was not published. There is a translation in Wiener's *Leibniz Selections*, pp. 283–90.

26. *N* 1:90.

27. See the whole context, and for an account of Peirce's contributions thereto, see Henry Taber, "On the Theory of Matrices," *American Journal of Mathematics* 12 (1890):338, 340n, 346n, 349n, 352–54, 386n.

28. For the memoir itself see *CP* 7.21–35.

29. The literature on these projects is too extensive to be cited here. Further progress will be possible now that Carolyn Eisele's edition of Peirce's mathematical writings has appeared (*NEM*).

30. *N* 2:186, 206.

31. The one promised at *CP* 5.440.

32. Trackers of Leibniz in the *Collected Papers* may like to know that John Dewey, not Peirce, wrote *CP* 6.364–366.

33. See note 21 above.