# Introduction

The period from the spring of 1890 into the summer of 1892 was a time of emotional turmoil for Peirce, a time of rash ventures and dashed hopes that would culminate in a transforming experience and a new sense of purpose.[1] In the decade following the death of his father in 1880, Peirce suffered a number of life-changing defeats, including the loss of his teaching appointment at Johns Hopkins University and the stripping away of his leadership in gravity determinations for the U.S. Coast & Geodetic Survey. Peirce's marriage in 1883 to his reputed mistress, the mysterious Juliette Froissy Pourtalais, and his ill-considered attempt to introduce her openly into his social circles, brought a rude end to his way of life up to that time. In April 1887, Charles and Juliette left New York for Milford, Pennsylvania, where they hoped to find acceptance in Milford's small but thriving French community. In the spring of 1890, as the period of the present volume was about to begin, Peirce helped organize a debate in the pages of *The New York Times* on the soundness of Herbert Spencer's evolutionary philosophy and he signed his contributions with the pseudonym "Outsider," reflecting his increasing estrangement from mainstream society. At the age of fifty, Peirce had been pushed from center stage and his native sense of entitlement had been crushed. Peirce's feeling of exclusion and disadvantage intensified during these years so that by May 1892, writing again as the Outsider, he would rail against the "politico-economical deification of selfishness" and its anti-Christian corrupting influence on society (see sel. 52).

Peirce had lived most of his adult life in America's "gilded age," the period of reconstruction and economic expansion following the Civil War when unregulated capitalism gained the upper hand. This was the age of the so-called robber barons. It was a time of grandeur, of conspicuous, even ostentatious, wealth; yet, as the saying goes, while the rich got richer, the poor got poorer. In 1889, Andrew Carnegie, reflecting on "the contrast between the palace of the millionaire and the cottage of the laborer," wrote confidently that this contrast "measures the change which has come with civilization" and "is not to be deplored, but welcomed as highly beneficial."[2] Carnegie invoked Darwin's theory of evolution in support of his belief that "the law of competition" yields the most desirable results in the long run: "while the law may be sometimes hard for the individual, it is best for the race, because it insures the survival of the fittest in every department." The gospel of wealth that Carnegie went on to expound was based on his conviction that "men of Wealth," the fittest of specimens, should consider their surplus revenues as trust funds "which he is called upon to administer, and strictly bound as a matter of duty to administer in a manner which, in his judgment, is best calculated to produce the most beneficial results for the community." Men of wealth should not live extravagantly and they should not bequeath their fortunes to their heirs; they should "return their surplus wealth to the mass of their fellows in the forms best calculated to do them lasting good. . . . The man who dies . . . rich dies disgraced." Thus Carnegie sought

1. This is the unabridged final draft of the introduction which was abridged for publication in W8. It has been published online because it includes information additional to what could be included in the print version. It has been retrofitted to correspond as closely as possible to the print version but some inconsistencies remain. In writing this introduction, I have made heavy use of the Max H. Fisch files and data collections at the Peirce Edition Project. Footnote references are not given for items that can be easily located by keeping the following in mind: all references to manuscripts and Peirce's letters, unless otherwise indicated, are to the Peirce papers in the Houghton Library at Harvard University or in the Open Court collection; correspondence with members of the Open Court is in the Open Court collection in the Morris Library at Southern Illinois University; letters used are also from these collections or from the Coast Survey collection in the National Archives. Readers should consult the annotations and the textual notes at the back of the volume for additional information about circumstances related to the composition of the volume's selections.

2 "Wealth." *North American Review,* 148, no. 391 (June 1889): 653–64.

to end the worst excesses of "the gilded age" and help solve "the problem of the Rich and the Poor," though not by regulation or social programs but through the philanthropy of the captains of industry.

Peirce had no illusions that unbridled capitalism was the path to a better world and he must have found cold comfort in Carnegie's idea that the well-being of the poor and of society at large should be left to the super rich—although in a few years he would apply to the Carnegie Foundation for urgently needed support—but Carnegie's "gospel" came too late for his own time. The U.S. economy was in serious trouble and in 1893 it would take the nation into one of its most severe depressions. Labor unrest was rapidly increasing; in 1892 workers would strike at one of Carnegie's Pennsylvania steel mills and Carnegie's unyielding response would lead to a number of violent deaths.[3] In 1888, Republican Benjamin Harrison defeated incumbent Democrat Grover Cleveland to become the 23rd president of the United States. Harrison's election was tainted by fraudulent balloting but even "buying votes" was not quite enough to deliver the election outright and Harrison was awarded the presidency by the Electoral College without having won the popular vote. Harrison and Cleveland opposed each other again in 1892 and Cleveland was returned to office for a second though non-consecutive term. Harrison's loss is usually attributed to his support for an unpopular tariff bill and the increasing labor unrest. Cleveland's second term would be dominated by the economic depression and also by labor unrest. The Gilded Age was in its death throes and the U.S. was in a state of turmoil—as Peirce was on a human scale.

Peirce never quite fit the time he was born into and Joseph Brent has suggested that Peirce may himself have been a casualty of the Gilded Age. Brent points to Lewis Mumford's examination of this period of American life and Mumford's observation that being left out was a common plight of some of the greatest and most revolutionary minds of the period: "the procession of American civilization divided and walked around these men" and they were relinquished to the future. Peirce's name was first on Mumford's list of neglected revolutionary thinkers.[4] As Peirce moved into the final decade of the 19th century, surely it was true that he felt that American civilization was passing him by without much notice and this feeling would only grow stronger.

A bittersweet vestige of the prominence of the Peirce family remained to remind Peirce of what was slipping away. When *The Nation* announced a Phi Beta Kappa Society prize for a review of American contributions to science (6 Nov. 1890), Benjamin Peirce was mentioned as the only American who had made a notable contribution to mathematics. Six months earlier (15 May 1890), *The Nation* had reported on scientific work conducted on the Island of Saint Helena, where U.S. Coast & Geodetic Survey Assistant E. D. Preston had swung two Peirce Pendulums (Meter No. 2 and Yard No. 3) in a station set up in Napoleon's New House, the house built for Napoleon in his exile. Research journals and publications continued to cite the work of Peirce and his father. Many of Peirce's students from Johns Hopkins had joined university faculties and they made frequent references in their publications to Peirce's work in mathematics, logic, psychology, and in other disciplines. In July 1890, former student Henry Taber published a long article, "On the Theory of Matrices," in the *American Journal of Mathematics* in which he

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[3] The Homestead Strike was a labor dispute that occurred in Homestead, Pennsylvania, near Pittsburgh. It was one of the bitterest labor disputes in U.S. history. The strike began on 29 June 1892, when workers belonging to the Amalgamated Association of Iron and Steel Workers (the AA) struck the Carnegie Steel Company to protest proposed wage cuts. After some vicious battles between the striking workers and Carnegie's three hundred Pinkerton detectives, the Pennsylvania State Militia was called in ending the strike on 20 November and leaving non-union workers on the job. The Homestead Strike weakened unionism in the U.S. steel industry for forty years. (*The New Columbia Encyclopedia.*)

[4] Mumford, Lewis. *The Brown Decades. A Study of the Arts in America, I865–1895,* New York: Harcourt, Brace and Co. I931; see Joseph Brent's *Charles Sanders Peirce: A Life,* p. 2.

recounted many contributions of Peirce and his father, including, for example, their identification of quaternions with the algebra of dual matrices and Charles Peirce's discovery that every dual relation can be represented by a matrix. In January 1892, another former student, Christine Ladd Franklin, published a review of the first volume of Ernst Schröder's *Algebra der Logik* in *Mind* and reminded *Mind's* readers, who it is fair to assume constituted an overwhelming majority of the philosophers and logicians of the world, that the "present state of development" of symbolic logic was due to Mr. Charles S. Peirce. But such recognition must have rung hollow for Peirce as he watched his opportunities wither and had to scramble to make ends meet.

In May 1889, Juliette had been diagnosed with tuberculosis so in November she went abroad to escape the cold Northeastern Pennsylvania winter. During most of the winter and spring of 1890, while Juliette convalesced in Cairo and in various Mediterranean port cities, Peirce stayed in New York City where he looked for opportunities to supplement his income. Peirce's relations with Juliette had never recovered from the blow of his termination from Johns Hopkins in 1884 which had plunged the newly married couple into the first of many financial crises and had forced them to give up their elegantly furnished Baltimore home. For a while after their move to Milford things looked up, especially after their finances were augmented with inheritances from the estates of Peirce's mother and his Aunt Lizzie. But Charles and Juliette had been accepted into the high society of Milford, in particular the social circle that revolved around the prominent Pinchot family, and they were determined to live accordingly. By November 1889, when Juliette set sail for Naples, the Peirces had invested nearly all of their assets in the old John T. Quick homestead, "Wanda Farm," and in surrounding woodland, altogether amounting to nearly 2000 acres. They had risked everything on the prospect of generating a good income from their new estate, from farming and from harvesting the timber and other natural resources, and perhaps from turning the old Wanda Farm, on the banks of the Delaware River, into a grand resort. This would have been a good plan had a projected bridge been built at Port Jervis to bring through a rail line from New York, but the bridge project failed and the Peirces ran out of reserves too soon to have any chance of success. With their money spent and Peirce's income inadequate to cover the cost of Juliette's European convalescence, Juliette's letters home became increasingly bitter and Peirce tried hopelessly to restore her faith in him.

After his separation from Johns Hopkins in 1884, Peirce's principal source of income was the Coast & Geodetic Survey, but he also drew significant supplemental pay for his work on *The Century Dictionary and Cyclopedia* as the contributing editor in charge of definitions in the fields of logic, metaphysics, mathematics, mechanics, astronomy, and weights and measures. But Peirce's income from the Century Company did not make up for the loss of his salary from Johns Hopkins and even without the added cost of Juliette's convalescence would not have provided what the Peirces needed to make ends meet. To make matters worse, Peirce was well aware that his position with the Survey, and thus his primary income, was at risk.

During the difficult months in the winter and spring of 1889–90, while Juliette was away, Peirce did his best to add to his income. He convinced Wendell Phillips Garrison, son of the famous abolitionist, William Lloyd Garrison, and the editor of *The Nation,* to give him more books for review and, during the period covered in this volume, over three dozen reviews or notes by Peirce appeared in *The Nation* (many duplicated in *The New York Evening Post*). Garrison paid Peirce well for his contributions and proved to be a crucial source for supplementing Peirce's income for several years to come.

Peirce tried to form dependable connections of this kind with other periodical publishers but with less success. He did persuade Charles R. Miller, Editor-in-Chief of *The New York Times,* to let him organize a

newspaper debate on Herbert Spencer's philosophy and it ran successfully for six consecutive Sundays from 23 March to 27 April 1890. Hoping to continue his arrangement with *The Times,* Peirce sought a contract for a series of fifty articles on evolution, but Miller declined. At about the same time, Peirce arranged with L. S. Metcalf, editor of *The Forum,* to contribute a critical article for a series on spiritualism that Metcalf had started in December 1889. Only two years earlier, Peirce had engaged in a lively exchange on spiritualism with Edmund Gurney in the pages of the *Proceedings of the American Society for Psychical Research,* so he was well prepared for the assignment which he probably hoped would open *The Forum* to him. But it turned out that Peirce and Metcalf could not come to terms on the length of Peirce's article, which, after being set in galleys, was finally rejected when Peirce would not yield to Metcalf's final demand not to exceed 5000 words.[5]

Desperate for additional funds, Peirce sought loans from friends and acquaintances and he tried his hand at inventions and various investment schemes, but without success.[6] Peirce was constantly on the lookout for opportunities to market his expertise. He was a regular patron of the Astor Library, New York's largest reference library (in 1895 it would consolidate with the Lenox Library and the Tilden Trust to form the New York Public Library). Privileged as an "alcove reader," as he probably was, Peirce would have had full access to the alcoves devoted to the special topics related to his research—probably at least to all the areas he was in charge of for the *Century Dictionary*. Apparently Peirce noticed deficiencies in the Astor Library's collections and sometime in May 1890 he presented the library with a detailed list of missing "works on mathematical subjects" which he thought especially important and he offered to continue his efforts, probably hoping to become a paid consultant. His offer was declined; on 4 June 1890, he received a letter from Trustee Thomas M. Markoe, who the following year would become the President of Astor Library, thanking Peirce for his "very full & valuable list" but letting him know that he "need give [him]self no further trouble about the matter." Markoe did, however, assure Peirce that the library would be glad for further suggestions and the library's annual report for 1891 records that "The most notable accession has been a large number of mathematical works kindly suggested by Professor Charles S. Peirce after a careful examination of our collection."[7]

There is no doubt that the winter and spring of 1889-90, while Juliette was away, was a dreadful time for Peirce, a time of high anxiety that left its scars, but sometime in May or in early June Juliette arrived back in New York and the Peirces returned to their Pennsylvania home. Their return to Wanda Farm, or Quicktown, as their estate was known, marks the beginning of the period covered in this volume. Although money concerns would continue to plague Peirce for the remainder of his days, with Juliette's return from Europe and their return to Milford, Peirce was freed for a time from the daily hustle and could refocus his priorities. His work for the Coast Survey and the Century Company was the most pressing.

The *Century Dictionary,* hailed as the "most conspicuous literary monument of the nineteenth century,"[8] was not only a dictionary of historical and common English usage but was distinguished by its comprehensive inclusion of scientific terms and was said to embody "the scientific spirit and work" of its

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5 These episodes are described in the introduction to W6. See W6: sel. 44 for the article rejected by Metcalf.

6 See the Introduction to W6 for a more detailed account of Peirce's life in New York during the winter and spring, 1889–90. See Joseph Brent's *Charles Sanders Peirce: A Life,* ch. 4, for helpful information about Peirce's life during the years covered in W8.

7 Forty-third Annual Report of the Astor Library for the year 1891, p. 18. Also see "A Year at the Astor Library; Additions to the Collections –Visitors and Their Work," *NYT,* 11 February 1893, p. 9.

8 Quoted by H. W. Henshaw, book notice, *American Anthropologist* 5.2 (Apr. 1892): 184–85.

time.[9] Peirce had been recruited for the dictionary project while still teaching at Johns Hopkins and had begun drafting definitions as early as 1883, but his most intensive and sustained work began around 1888, when he began receiving proofs, and ran at least until the fall of 1891, when the first printing of the dictionary was completed. Even after the *Century Dictionary* was published, Peirce continued with his lexicographical work, writing corrections and new definitions in his interleaved copy and hoping to be paid on a per-word basis for a supplement already being projected.[10]

The initial publication of the *Century Dictionary* was piecemeal; the dictionary first became available serially in twenty-four bound segments, or fascicles, of about three hundred pages as the typesetting and proofreading process worked toward its conclusion. The fascicles were issued approximately one per month beginning in early 1889 and were available by subscription. For a more traditional publication, the fascicles were gathered four at a time and bound into six substantial volumes of about 1200 pages each and were published sequentially from October 1889 through the latter part of 1891. In the spring of 1890, at the beginning of the period of the present volume, about half of the dictionary was in print with Volume III, G to L, appearing sometime in May. The fourteenth fascicle, with the N's, had been released by June 13th when Peirce's brother, James Mills (Jem), wrote to Charles about his entry for "Neptune" to say how glad he was that he had used the occasion "to make this clear statement of Father's position" on the discovery of that planet. Volume IV, M to P, was published in November. The final two volumes appeared the following year, Volume V (Q to Stro-) in May and Volume VI in October. The completed first edition ran to 7,046 large quarto pages, included nearly half-a-million definitions for over 215,000 words, and as a measure of its encyclopedic scope was reported to contain "from a printer's point of view" two-thirds as much information as the *Encyclopedia Britannica*.

When Peirce finished with fascicle 24 in the fall of 1891, he had been working on the *Century Dictionary* for eight years.[11] His intensive focus on his definitions continued for at least another year and he would periodically return to this work, to reconsider and revise his definitions, until the *Century Dictionary Supplement* appeared in 1909. Peirce would also look for other dictionary work and would propose various lexicographical projects. In 1891, as the *Century* was nearing completion, Peirce tried for a position with Funk & Wagnalls to help with their famous single-volume *Standard Dictionary,* which would appear in 1894, and in 1892 he would draw up a "Plan for a Scientific Dictionary" that in 1500 pages would provide a summary of human knowledge (sel. 50). It is hard to overstate the importance of Peirce's lexicographical work, not only for the income it produced but especially for its impact on his intellectual development.

Peirce's principal employment since 1861 had been as a scientist for the U.S. Coast Survey (renamed U.S. Coast and Geodetic Survey in 1878) where for much of his career he was in charge of gravity determinations. A scandal in 1885 over Superintendent Julius E. Hilgard's administration of the Survey led to a massive reorganization of its operations and brought Peirce's program of gravity research into question.[12] U.S. President Grover Cleveland dismissed Hilgard and on 6 July 1885 appointed the chief

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9 *Science* 13:314 (8 Feb. 1889): 103.

10 See the introduction to W6, pp. lvii–lix, for a fuller treatment of Peirce's *Century Dictionary* work. W7, a special volume featuring Peirce's contributions to the *Century Dictionary,* is in preparation at the University of Quebec at Montreal (PEP UQAM) under the direction of François Latraverse. Professor Latraverse will write the historical introduction for that special volume.

11 In the introduction to W6, p. lviii, it was mistakenly represented that the *Century Dictionary* was completed and published early in 1891.

12 See the introduction to W5: xxix–xxx for an account of this scandal.

clerk of the Internal Revenue Bureau, Frank M. Thorn, a lawyer and not a man of science, as the new acting superintendent with the mission of reforming the Survey. Disillusioned by these events, and knowing that his own position with the Survey might be in jeopardy, Peirce and Juliette left Washington and in March 1886 moved to New York City. Peirce hoped to continue his pendulum-based gravity research for the Survey but knew that New York would provide more opportunities in case his position became a causality of Thorn's reforms. Less than six months after the Peirces moved to New York, Thorn suspended gravity field operations and ordered Peirce to concentrate his energies on preparing unfinished reports for publication.

In July 1889, to the relief of many government scientists, Thomas Corwin Mendenhall was appointed to succeed Thorn as Superintendent. Mendenhall was a trained scientist and was expected to restore the Survey's leadership in scientific research; certainly that was Peirce's hope. But the turn away from pure research that the Survey had taken under Thorn could not be reversed in the political and economic climate of times and Peirce and Mendenhall soon reached an impasse. Peirce's career had been dedicated to advancing the theoretical foundations of geodetic science and his field work had always been conducted with the greatest care, using the most refined instruments, so that his results could contribute not only to the immediate practical needs of economic and social life but also to the growth of the science. Under Peirce's leadership, American gravity research took its place alongside the best gravity research in Europe. But with Thorn's administration, the era of first class scientific research in the Survey came to an end and however much Mendenhall may have wanted to restore it, he could not.

Peirce had good reasons for being discontented with the Survey's administration, especially under Thorn, but his unveiled discontent got him off to a bad start with Mendenhall, who regarded Peirce as uncooperative and set in his ways at a time when changes Peirce disliked could not be avoided. It did not help that Peirce had been working for over three years to prepare the results of extensive field operations conducted from 1882 through 1886 for publication in what was expected to be his second major gravity report (although he had published many interim reports).[13] This report had been a major source of conflict between Peirce and Thorn and it is certain that Thorn told Mendenhall that it was long overdue. Mendenhall would have understood better than Thorn the complexity of the calculations Peirce faced with the mass of data his work involved, but he would also have been aware that Peirce was working as a major contributor to the acclaimed *Century Dictionary* project, then in its most demanding production phase, and that Peirce may have had too many irons in the fire. Of course Mendenhall also had access to the correspondence between Peirce and Thorn and would have noticed some reservations on Thorn's part about the quality of the overdue report, much of which Thorn had seen in draft form, and he would have read about Peirce's decision to reverse "the usual order of presentation in a scientific memoir by stating the conclusions before the premises." So when Peirce finally submitted his completed report on 20 November 1889, Mendenhall decided to have it reviewed for "form, matter, meaning and suitability for publication" and when Peirce and Juliette returned to Milford in the spring of 1890, Peirce had still heard nothing back from Mendenhall about plans for publication.

An exchange of letters between Mendenhall and Peirce in July illustrates the impasse they had reached. On 30 June, Mendenhall wrote to Peirce asking him for a definite value for "the force of gravity" for Ithaca, the place of one of the four main gravity stations dealt with in the report that was under review. Physics students at Cornell needed this figure as a constant for their laboratory work. All of relevance that

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[13] Peirce's first major gravity report was his 1879 "Measurements of Gravity at Initial Stations in America and Europe" (W4: sel. 13), the first substantial American contribution to gravity research. See the introductions to W4–W6 for more on Peirce's interim reports and for details of the field operations Peirce was writing up.

Mendenhall could find in Peirce's submitted report was a "nearly unintelligible use of the so-called 'logarithmic second' which . . . renders the discussion uselessly and unnecessarily obscure." Peirce replied quickly to explain how to derive the desired value from the data in his report; he lamented that the result would be at least one ten thousandth too small because he had not received the new pendulums he had requested for flexure corrections (3 July 90), and wrote later to criticize Mendenhall's conception of gravity as a force "calling for expression in dynes" (22 July 1890). Peirce argued that gravity should really be understood as a measure of acceleration and strongly defended his use of logarithmic seconds. Mendenhall replied that his disagreement with Peirce was not one that could be easily settled and gave Peirce what amounted to a warning, one that was revealing of Mendenhall's understanding of Peirce's character: "When acting for the public . . . one must be guided by the general consensus of opinion of those generally admitted to be the highest authorities; personal preferences and especially any weakness towards 'eccentricity' must often give way" (24 July 90). In the coming months, Mendenhall would weigh Peirce's obvious strengths as a physical scientist against his "weakness toward eccentricity."

One of Peirce's first compositions after returning to Milford, possibly finished just prior to his return, was "Familiar Letters about The Art of Reasoning" (sel. 1). It is not certain what Peirce had in mind for this paper, dated 15 May 1890, but it might have been intended as a lesson for his correspondence course in logic, a course in the "art of reasoning," which he planned to resume after his return to Milford. But he may have had something else in mind, perhaps a textbook project or a series of letters on logic for a newspaper or magazine. His reference to Thomas Murner, who was famous for his success in teaching logic to weak students through the use of playing cards, suggests that Peirce intended this paper for teaching purposes. This is an example of a writing that can hardly be appreciated unless the reader performs the operations he is called on to perform. Even though Peirce was teaching card tricks, he intended to be teaching something more general about reasoning and a modern reader is likely to notice that the mechanical operations of multiplying and adding with cards are suggestive of early computing operations. Peirce's admonition that "one secret of the art of reasoning is to *think*" where he seems clearly to regard "thinking" as an activity, like manipulating cards according to general rules, is reminiscent of the "new conception of reasoning" expressed in his 1877 "Fixation of Belief" as "something which was to be done with one's eyes open, by manipulating real things instead of words and fancies" (W3: 243-44).

Some other writings from this period seem clearly to have been intended as lessons for Peirce's correspondence course; sels. 17 and 18 derive from lessons Peirce used in his course three years earlier (see especially W6: sels. 1 and 6). Precisely when Peirce resumed this work is not certain but we know that he had not given up the idea that he could make the course pay and within a few months he would again advertise for students. There are a number of related manuscripts, at least two of which, with sel. 18, were composed as opening chapters for a book on logic, probably intended as a text for Peirce's course but perhaps as a general logic text to parallel for teaching logic what his "Primary Arithmetic" would be for teaching arithmetic.[14] In "Boolian Algebra. First Lection" (sel. 18), Peirce gives Boole a rare compliment, namely, that Boole's idea for the algebra of logic "sprang from the brain of genius, motherless" so far "as any mental product may." Before taking up the elements and rules of his algebra of logic, Peirce reviewed some of the deficiencies of ordinary language for exact reasoning: its "deficiency of pronouns," its "feeble marks of punctuation," and its inadequacy for diagrammatic reasoning. Peirce's modification of "the Boolian calculus," what he here calls a "propositional algebra," was intended to

[14] See the textual commentary for sels. 17 and 18, pp. 553–56. Sometime in 1890, Peirce had decided to turn his correspondence course lessons into a textbook entitled "Light of Logic."

overcome these deficiencies of ordinary language. Although this writing is likely to have been composed for Peirce's correspondence course, there is a hint that it may have been intended for publication in a newspaper. It is noteworthy that Peirce has the idea of expressing the truth of propositions in degrees "as temperatures are expressed by degrees of the thermometer scale," although he goes on to say that there are only two points on this scale, true and false.

In Peirce's 19 June "Review of Théodule Ribot's *Psychology of Attention*" (sel. 2), his third book review of 1890 to appear in *The Nation* and the first during the period covered by this volume, Peirce drew together ideas that would tie several lines of thought from his philosophical work of the W6 period to the systematic philosophy he was about to take up for *The Monist.* In this review Peirce previews a number of important ideas that will be developed especially in his third *Monist* paper, "The Law of Mind" (sel. 27, written two years later). He says, in his review, that it is the "welding together of feelings" that "seems to be the only law of mental action" and he argues that "attention," (an "unscientific word" according to Peirce) is not principally inhibitory, as Ribot claims, but is mainly positive involving "conscious purpose" and is generally an "emotional association, aided in certain cases by acts of inhibition." Peirce rejects Ribot's monism, the monism of the "physiological psychologists" which is put forward as a psycho-physical double-aspect theory, "a happy compromise between materialism and spiritualism," though it is really a materialism, according to Peirce, which makes mind "a specialization of matter." Peirce objects that "common sense will never admit that feeling can result from any mechanical contrivance" and he says that "sound logic refuses to accept the makeshift hypothesis that consciousness is an 'ultimate' property of matter in general or of any chemical substance." The school of physiological psychologists "is forever exaggerating the resemblances of psychical and physical phenomena, forever extenuating their differences." Peirce distinguishes between the "law of mechanics" and the law of mind ("force of association"), as he will in "The Law of Mind," and claims that the "trains of causation" typical of the physical and the psychical worlds are distinct: in the psychical world causal relations with the past and the future are different whereas in the physical world the past and the future have "precisely similar" relations to the present. Peirce acknowledges that, as with psychical phenomena, "there are physical phenomena in which gentle forces seem to act, and others which seem to violate the principle of energy," but these are appearances due "to the action of probability" not to a law of motion. He further acknowledges that "there is analogy between spreading of motion through a gas by viscosity and association of ideas."

Sometime in the spring of 1890, Peirce composed the short paper (possibly a fragment), "The Non-Euclidean Geometry made Easy" (sel. 6), likely in connection with his plan to produce textbooks in logic and mathematics as a source of income. As with Peirce's review of Ribot, much of the substance of this paper would soon find its way into his *Monist* articles, especially, in this case, the first one, "Architecture of Theories" (sels. 22 and 23). Peirce had noticed early in his career that philosophical logic tends to be modeled after the example of geometry and by 1865 he had pointed out that a functioning geometry requires the introduction of a "purely arbitrary element," a "point of view," and that although one point of view may be "more *natural* than another," given human capacities, that is not the case for pure mathematics (W1: 268) where, as he would say later, "the great democracy of may-bes" holds sway (W6: 251). By 1870, Peirce would appeal to non-Euclidean geometry in support of his revolutionary logic of relatives (W2: 416–17). While teaching at Johns Hopkins, Peirce lectured on non-Euclidean geometry (W4: 486), and in his pivotal JHU Metaphysical Club lecture, "Design and Chance" (17 Jan. 1884), he announced that the Darwinian turn had started a new "epoch of intellectual history" marked by a "tendency to question the exact truth of axioms"—there is an indication that he had already begun to

consider the possibility that non-Euclidean geometry might in fact be the best geometry for interstellar measurements (W4: 544-46).

During the decade following his Metaphysical Club lecture, Peirce became increasingly interested in the theory of space. In 1885, in his review of William Kingdon Clifford's *The Common Sense of the Exact Sciences*, Peirce wrote that to form "clear ideas concerning the non-Euclidean geometry" we must understand that "the geometrical conception of space itself is a fiction"—that there is no definite meaning to the conceptions "absolute position" and "absolute velocity" and that "space only exists under the form of general laws of position" (W5: 255). In another expression of this idea, Peirce wrote that "[w]hat is true is that there are certain general laws of position, but not that there is a receptacle which accounts for those laws. This is a fiction of geometry" (W5: 293). It was up to the philosophers of science to question why our "natural idea" of space came to be what it is and to consider whether observations could be made that were better explained by alternative geometries. In April of 1890, in "Logic and Spiritualism," written just at the outset of the period of this volume, Peirce recounted how our "marvelously clear and beautiful" common sense conception of space came about and posed the question: "Can the whole history of science show any discovery whatever half so practically important, half so intrinsically difficult, half so intellectually interesting?" If some of the principles of the geometry defining this common sense space could be shown to be measurably erroneous, Peirce believed that it "would be the most remarkable [discovery] ever made by science" (W6: 388).

So we find Peirce, in sel. 6, entertaining doubts about the exact correctness of our "*a priori* or natural idea of space," and of any other natural ideas, and emphasizing the need for correction "by comparison with observations." This fallibilistic stance gives warrant to non-Euclidean approaches to geometry, of which Peirce considers two: that space is immeasurable, or infinite, but limited (hyperbolic) or that it is measurable, or finite, but unlimited (spherical or elliptic). These two alternatives, along with Euclidean geometry—that space is both immeasurable and unlimited (parabolic)—will be taken up again in "Architecture of Theories" (sels. 22 & 23) as conceptual "materials" for the construction of systematic philosophy.

Two other short working pieces included in this volume were probably composed in the spring of 1890: "Notes on the Question of the Existence of an External World" (sel. 19) and "Note on Kant's Refutation of Idealism" (sel. 20). Both of these selections revisit Kant's famous "refutation of idealism,"[15] and sel. 20, which serves as a gloss on Kant's claim that "his argument beats idealism at its own game," suggests a more direct and simpler method of refutation. In sel. 19, Peirce states that if idealists were right to assume that only the inner present can be immediately perceived, then the impossibility of perceiving the external immediately would indeed entail, "as a matter of logic," that the existence of anything external was inadmissible. The problem, however, is that the idea that we can *only* immediately perceive what is present in the mind is "a vulgar prejudice" parallel to the idea that "a thing cannot act where it is not." For Peirce, this idea, by appealing to a naïve view of space and time, helps underscore how misleading inductions from ordinary experience can be. In sel. 20, he adds that we can only apprehend our own ideas as flowing in time, and since neither the past nor the future are immediately present, our perception of the internal can be no more immediate than our perception of the external. If idealism is so easily beaten at its own game, then, it is because its conception of the present fails to grasp the continuity of experience. In sel. 19, Peirce remarked that "there is a world of difference between fallible knowledge and no knowledge," thus implicitly contrasting fallibilism and skepticism. He

[15] See annotations, p. 380.

makes the further point that "as a matter of logic" there is no reason to suppose something external unless there is immediate perception of a non-ego. This is an argument for secondness.

Why Peirce took up Kant's refutation of idealism at this time can only be guessed, but just a year or two earlier Peirce had been very engaged with related theories of Kant's for his "Guess at the Riddle" and had concluded that Kant was mistaken in supposing that "ideas are presented separated and then thought together by the mind" (W6: 449, n.188.1). These considerations were relevant for Peirce's reflections on space and time which had been invigorated by William James's 1887 paper in *Mind* on "The Perception of Space," and by correspondence with James afterwards (see W6: xliv), and probably also by James's 1886 paper in the *Journal of Speculative Philosophy*, "The Perception of Time," in which James had developed E. R. Clay's idea of "the specious present." Perhaps also of relevance is that in 1889 Edward Caird published in Glasgow his two-volume work on *The Critical Philosophy of Immanuel Kant,* which included a thorough treatment of Kant's refutation of idealism that would likely have caught Peirce's eye. Caird's book was reviewed by A. Seth in *Mind* in April 1890 with specific mention of Kant's refutation—discussions of Kant's refutation of idealism were not uncommon in the literature of the day. Any of the above could have rekindled Peirce's interest in Kant's ideas about the present and his refutation of idealism. Soon after composing these notes, Peirce would again take up his Kant-inspired cosmology project, and the nature of the present would again play an important role.

On 1 July 1890, Francis C. Russell, a Chicago judge and an admirer of Peirce, wrote a letter to Peirce that was more consequential for the remaining course of his life than anyone could have foreseen. Russell wrote at the request of Paul Carus to invite Peirce to contribute an article on logic for Edward C. Hegeler's new philosophy journal, *The Monist:* "It is the intention of the management of the journal to make it the vehicle of such utterances only as shall be competent to the topics treated and they expect to pay for their articles after a measure in some degree fitted to the dignity of the writers and the customary recognition of the value of their productions." Hegeler was a wealthy industrialist with a zeal for reconciling religion with science. He was an evolutionist who rejected what he regarded as Spencer's hedonism and who embraced a quasi-Platonic idea that the process of growth is a teleological movement toward the fulfillment of higher forms. He was a fervent monist who believed that "God and the universe are one . . . the continuous ALL of which man is a limited part and phenomenon."[16] Hegeler supported religiously radical groups, including the Free Religious Association that Francis Ellingwood Abbot had helped found in Boston in 1867, but he objected to the agnosticism of many secular freethinkers regarding it "as a form of defeatism and an obstacle to scientific progress."[17] In 1886, Hegeler reached an agreement with Benjamin Franklin Underwood, the editor of the Free Religious Association's periodical, *The Index,* to join with him to start a new monthly magazine to advance his monistic philosophy; Hegeler would be the publisher and Underwood the editor. The Free Religious Association agreed to cease publication of *The Index,* which Abbot had founded and had edited for ten years before Underwood, and sign over its subscriber base to Hegeler and Underwood for their new monthly to be called *The Open Court.* The premier issue appeared on 17 February 1887, ten days before Paul Carus, an advocate of free religion and a contributor to *The Index,* arrived in Chicago to serve as Hegeler's secretary and to tutor his children, but with a vague understanding that he would play some part in editing *The Open Court*. By the end of 1887, Underwood was gone and Carus was editor. In the fall of 1890, Hegeler and Carus launched

16 Hegeler, "The Basis of Ethics," *Open Court* 1: 18–22; quoted in Harold Henderson, *Paul Carus of Open Court; Catalyst for Controversy* (Southern Illinois University Press, 1993), from which other biographical information in this paragraph was taken.

17 Henderson, p. 24.

their new quarterly journal, *The Monist,* to be "devoted to the establishment and illustration of the principles of monism in philosophy, exact science, religion, and sociology."[18] The Open Court Publishing Company now published the monthly magazine, *The Open Court,* the quarterly journal, *The Monist,* and a line of books.

Russell had written to Peirce the previous year (22 Jan. 1889) to tell him about Hegeler's and Carus's plans to launch *The Monist* and to let him know that he had given a bound set of Peirce's "Illustrations of the Logic of Science" to Carus, whose intellect he admired and who he supposed could do Peirce some good. He said that after giving Carus Peirce's papers he thought he could "discern the influence its perusal and study has had upon him." That Carus had seen fit to ask Russell to ask Peirce to contribute to his new journal was perhaps influence enough for Peirce, especially given Russell's intimation that Carus paid well. Russell suggested that Peirce consider contributing an article "on the lines of your introductory lecture at Johns Hopkins University" (W4: 378–82) and he complimented Peirce by noting that "Everybody is talking about scientific method and yet outside of yourself no one so far as I can see has any definite conception as to what that scientific method consists in." The following day, Carus himself wrote to assure Peirce of the quality of his new quarterly: "I wish that . . . our most prominent American authors should be represented and shall be greatly indebted to you for an article from your pen on 'Modern Logic' or some similar topic—perhaps 'Logic and Ethics.' You may choose any theme with which you are engaged at present" (2 July 1890).

Peirce replied to Russell at once, thanking him and agreeing to contribute but he wrote that "[o]ne can profitably put but very little into a single article" and he said he would prefer to write "a number" of articles: "I would write in a general way about the ways in which great ideas become developed, *not* about verification and assurance, to which my Johns Hopkins lectures used chiefly to be directed. . . . A philosophy is not a thing to be compiled item by item, promiscuously. It should be constructed architectonically" (3 July 1890). Peirce told Russell that he had studied this subject out "in my minute way" and that he would like to give "some general notion of my results." Peirce was hoping to turn this offer into an opportunity to publish the general substance of his "Guess at the Riddle" (W6: sels. 22–28). He wrote that he usually was paid "$25 a thousand words." On 19 July, Peirce replied directly to Carus agreeing to write an article of 4000 words entitled "The Architecture of Theories."

This was the beginning of an association rivaled in importance for income only by the Peirce-Garrison connection and it would become by far the most important outlet for Peirce's mature philosophy. Carus took a special interest in Peirce and for twenty years, notwithstanding some periods of acrimony, he did more to promote Peirce's philosophy than anyone. Between 1891 and 1910, Carus persuaded Hegeler to publish nineteen of Peirce's articles (thirteen in *The Monist* and six in *The Open Court*) and many of Peirce's unpublished writings were written for Carus. The important role played by Carus in Peirce's later life, in particular the fact that after 1890 Peirce wrote most of his best work for the *Monist,* is what led Max Fisch to call that time Peirce's *Monist* period.

From the time of Peirce's return to Milford with Juliette, in the spring, and throughout most of 1891, work on his definitions for the *Century Dictionary* demanded Peirce's most sustained effort. Had he not had his "Guess at the Riddle" (W6: 166–210) already so well advanced toward a publishable treatment of his maturing cosmology, he might not have been prepared to accept Carus's offer. His unpublished "Guess" was the fruit of years of deep reflection and study and that is surely what Peirce had in mind when he agreed to produce an article, entitled "The Architecture of Theories," on how one should go

[18] *Science* 6.398 (19 September 1890): 166–67.

about the business of constructing a philosophy. In Chapter 1 of his "Guess," Peirce had begun with a discussion of how to "erect a philosophical edifice" that would "outlast the vicissitudes of time" and he posited his three categories as the core conceptions to follow out "in a sort of game of follow my leader from one field of thought into another" (W6: 168, 174–75). "The Architecture of Theories" would express in summary form much of Peirce's "Guess."

Peirce must have gone to work on his first *Monist* contribution right away because he would finish it within two months during a time when he would have been very busy with the proofs of his definitions for the fourth volume (M–P) of the *Century Dictionary*. Peirce was responsible for hundreds of definitions in this letter range including such complex ones as the definitions of *matter, mean, measure, mechanical, method, mind, motion, natural, necessity, negative, notation, number, object, objective, oblique, observation, operation, order, parallel, part, particular, pendulum, perception, perfect, philosophy, plane, point, position, primary, principal, principle, probability, problem, projection, proof,* and *proposition*. For some of these words, as with others not listed, Peirce's definitions exhibit an encyclopedic scope. It is likely that it was the demanding proof-correcting phase of Peirce's *Century Dictionary* work, which began early in 1888, that had diverted him from his "Guess at the Riddle," then well on its way toward becoming a book. But Peirce had not abandoned his "cosmology project"; as he wrote to Christine Ladd Franklin in August 1891, "my chief avocation in the last ten years has been to develop my cosmology."[19] This was the intellectual work that continued to excite him and it provided the conceptual link for many seemingly detached writings, both earlier and later. For example, in Peirce's spring 1890 article, "Logic and Spiritualism," intended for *The Forum* (W6, sel. 44), he championed a "hyperbolic philosophy" that briefly recapitulates the cosmology of his "Guess," and, as mentioned above, in his review of the Open Court's translation of Ribot's *Psychology of Attention* (sel. 2),[20] he included key ideas from his "Guess" which figure substantially in his *Monist* papers.

Three of the selections included in this volume which help link Peirce's "Guess at the Riddle" with his *Monist* papers, and which are known to have been composed near the time when Peirce was invited to write for *The Monist,* cannot be confidently dated either before or after Russell's letter of 1 July. "Six Lectures of Hints toward a Theory of the Universe" (sel. 3), outlines a set of lectures that incorporate the vision of Peirce's "Guess" and pick up themes from "Logic and Spiritualism." On 12 July, G. Stanley Hall wrote in response to Peirce's request to give a paid course of lectures at Clark University to say that no decision could be made until September but that a positive answer was unlikely. Nevertheless, Hall wrote, "Such a course as you outline . . . would interest & stimulate every man on the ground in a most admirable way." If the course of lectures Peirce wanted to deliver was that outlined in selection 3, and if Peirce's request to Hall was made after Russell and Carus had asked him write for *The Monist,* then the "Six Lectures" may be Peirce's first outline for his *Monist* series. In any case, they provide an outline of his cosmology at about the time he was preparing to take up his *Monist* project.

Another selection written at about this time and closely related both to "Six Lectures" and the *Monist* project is Peirce's "Sketch of a New Philosophy" (sel. 4). It may be that this "Sketch" was written sometime before July and was intended as a reformulation of the ideas of the "Guess" for a lecture, or perhaps for a series of newspaper articles or for a book, but given how many conceptual overlaps there are with the *Monist* papers, it may have been drawn up to help organize the *Monist* project. When Peirce

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[19] See annotation 111.3–5, pp. 386–87. Peirce was slightly under in his count of years, assuming he was referring back to his 1878 "Illustrations" article, "The Order of Nature" (W3: sel. 64), which he usually cited as the beginning of his serious work on cosmology.

[20] This review may have put Peirce in good stead with Hegeler, for whom Ribot was a leading influence (Henderson, p. 23).

replied to Russell on 3 July to accept the offer to write for *The Monist,* and to say he would begin with an article on "The Architecture of Theories," he summarized what he would include and pointed out what would be necessary "even in so much as drawing the general sketch of the structure to be erected." It is likely that selection 4 is the "sketch" Peirce had in mind. One interesting difference between the outline of Peirce's "Six Lectures" and his "Sketch" is that in "Six Lectures," between a treatment of "protoplasm" and "The ideal end of things," Peirce included the topic: "The development of Consciousness, individual, social, macrocosmic." In his "Sketch" this topic became "Consciousness. Development of God," perhaps giving a clue as to Peirce's conception of God at that time. It is also interesting that in the ninth topic in his "Sketch," Peirce refers to the "Darwinian hypothesis" as "a Darwinian skeleton key to philosophy" and points out that "[t]his key opens a theory of evolution applicable to the inorganic world also." Although the "Darwinian hypothesis" plays a key role in Peirce's *Monist* papers, its limitations are made more prominent.

The third selection that is clearly related to Peirce's "Architecture of Theories," either as an independent study or as a preliminary attempt to work out part of his argument, is "On Framing Philosophical Theories" (sel. 5). Here Peirce discussed the logic of philosophical theorizing and the nature of the conceptions to be used in a theory of the universe, a central concern of his "Architecture of Theories." Peirce's brief treatment of logic in this short preliminary work is of considerable interest. He begins by asking if there are not two kinds of logic, an "unphilosophical logic" of which mathematics is a part and which, like mathematics, has not "the least need of philosophy in doing its work" and a more developed logic remodeled "in the light of philosophy." There is an anticipation here both of Peirce's later struggles to disentangle logic from mathematics and of his distinction between *logica utens* and *logica docens*. Later in this selection Peirce considers logic as λογος which "embodies the Greek notion that reasoning cannot be done without language," and as *ratio,* which embodies the Latin idea that "reasoning is an affair of computation, requiring, not words, but some kind of diagram."[21] Peirce claims that "Modern formal logic" takes the Latin view and holds that words, though necessary, "play but a secondary role in the process; while the diagram, or icon, capable of being manipulated and experimented upon, is all-important."

A fourth selection, Peirce's working "Notes on Consciousness" (sel. 21), might also have been drawn up to help him organize some of the thoughts on consciousness from his "Guess" for "Architecture of Theories" or for later papers he had in mind for his *Monist* project, possibly "The Law of Mind." Many of the ideas listed—that consciousness is not a property of a mere mechanism but is a state of nerve matter, that "ultimate facts" are illogical, that feelings spread, and so on—are certainly key ideas Peirce will develop in his *Monist* papers. It is interesting that many of Peirce's notes also relate to topics discussed by William James in the first volume of his *Principles of Psychology,* in particular the chapter on "The Stream of Thought," almost as though they could have been drawn up while reading his book—but James's *Psychology* wouldn't appear until sometime in September.[22]

Peirce spent many hours in July working on his opening article for *The Monist;* several of the manuscript folders from 1890 included in the Chronological Catalog in this volume contain surviving manuscript pages from this preliminary work. He finished an initial version of "The Architecture of

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[21] Peirce made this distinction in his definition of "reason" for the *Century Dictionary* and quoted Hobbes's *Leviathan,* pt. 1, ch. 4, as his source.

[22] See the textual head note for this selection, p. 564. To compare with James's work, see, for example, *Principles of Psychology,* vol. 1, pp. 588ff. Much of "The Stream of Thought" had been published under the title "On Some Omissions of Introspective Psychology" in the January 1884 issue of *Mind.*

Theories" (sel. 22) near the end of the month and he spent the month of August, as time permitted, revising and expanding it. Peirce's plan at this stage was to begin much like he had in his "Guess," with an account of his categories, and then to consider other "maxims of logic" that "require attention in the prolegomena of philosophy." Then he took up mathematics, "the science which, next after logic, may be expected to throw the most light upon philosophy." Among the mathematical conceptions Peirce examined were conceptions of imaginary quantities, the absolute, and space—much from the context of non-Euclidean geometry. He then took up dynamics, remarking that "the natural ideas of the human mind tend to approximate to the truth of nature, because the mind has been formed under the influence of dynamical laws" and that "logical considerations show that if there is no tendency for natural ideas to be true, there can be no hope of ever reaching true inductions and hypotheses." Finally Peirce moved to psychology, where he identified three "elementary phenomena of mind" as feeling (which does not essentially involve consciousness proper), the sensations of reaction, and general conceptions. To have a general conception is to be "conscious that a connection between feelings is determined by a general rule" or, from another point of view, to be "aware of being governed by a habit." Peirce concluded this initial version of his first *Monist* paper with a brief discussion of the law of mind. Sections of the manuscript for this selection are missing so it isn't known if Peirce considered all of the sciences he would take up in the finished version of "The Architecture of Theories"—where he reversed their order of consideration, treating dynamics first and the categories last.

When Peirce replied to Russell on 3 July to accept the offer to write for *The Monist,* he mentioned that he had "just written a little notice" of Carus's *Fundamental Problems* (Open Court, 1889). He was referring to his review for *The Nation* (sel. 8) which, perhaps fortunately for Peirce, did not appear until 7 August, well after his agreement with Carus had been settled.[23] Peirce opened his review condescendingly by claiming that "The questions touched upon are all those which a young person should have turned over in his mind before beginning the serious study of philosophy" and that the "views adopted" are "average opinions of thoughtful men." He then criticized Carus's denial that there has ever been a chaos and he challenged Carus's claim that the highest laws of nature are identical with the formal laws of thought. Peirce even disapproved of Carus's and Hegeler's mission of reconciling religion with science: "to search out [some possible reconciliation, by] dragging religion before the tribunal of free thought, and committing philosophy to finding a given proposition true—is this a wise or necessary proceeding?" Peirce did note with approval that Carus had "correctly rendered" the "views of modern geometers" in holding that "space is not a non-entity, but a real property of things," but, overall, Peirce's review was not favorable. According to Kee Soo Shin, Peirce's review raised doubts about "several important aspects of Carus's monistic philosophy" and it marked the beginning of a famous controversy between Peirce and Carus that would start in earnest with Carus's reply to Peirce's second *Monist* paper, "The Doctrine of Necessity Examined" (sel. 24), and would run throughout 1893.[24]

Peirce was working on several demanding and competing projects at the same time, most importantly, his urgent examination, and in many cases augmentation, of the proofs of his *Century* definitions, his critical Coast Survey report, and now the opening paper for his *Monist* series. Less urgent but still pressing were his mathematics and logic book projects and other schemes underway to increase his income. Earlier in the year, Peirce had persuaded Wendell Garrison, editor of *The Nation,* to send more

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[23] See annotation 33.2, p. 368.

[24] Kee Soo Shin. *Paul Carus's "Positive Monism" and Critique of Other Types of Monism (Mach, Haeckel, Peirce)*. Dissertation, Philosophy Dept., Temple University, 1973, p. 344.

books his way for review and that too made an added, though welcome, demand on his time. In June Peirce reviewed three books, Ribot's *Psychology* (sel. 2), Jevons's *Logic* (sel. 7), and the review of *Carus* just mentioned. In July Peirce wrote a note on an issue of the *American Journal of Mathematics* (Vol. 12, No. 4), which appeared in *The New York Evening Post* on 14 July and in *The Nation* on 17 July, and in August he reviewed Thomas Muir's *The Theory of Determinants* (sel. 9). In September he reviewed Alexander C. Fraser's *Locke* (sel. 10) and in October he reviewed Ralph O. Williams's *Our Dictionaries* (to be included in W7) and published "Notes on the first issue of the *Monist*" (sel.11). After his review of Williams appeared on 31 October, Peirce did not publish again in the *Nation* for over three months having found it urgent to turn his attention much more fully to his work for the Coast Survey and the Century Company.

Peirce's review of William S. Jevons's *Pure Logic, and Other Minor Works* appeared in *The Nation* on 3 July 1890 (sel. 7), two days after Russell wrote to Peirce inviting him to write for *The Monist*. The book was a posthumous edition of some of Jevons's writings edited by his widow, Harriet A. Jevons, and his successor to the chair of logic and philosophy at Owens College, Robert Adamson. Peirce had long been familiar with Jevons's contributions to logic, even having called on Jevons while in England in 1870 to present him with a copy of his memoir, "Description of a Notation for the Logic of Relatives" (W2: sel. 39), but Peirce had always held mixed views about Jevons's work. In 1872, in one of his early reviews for *The Nation,* Peirce expressed respect for Jevons's originality while voicing a general disappointment with his work (W3: sel. 1). Now again, Peirce gave a mixed review, praising Jevons's clearness of thought but questioning its power. Peirce praised Jevons for being the first to employ the inclusive form of logical addition but criticized him for not seeing that the copula of inclusion is logically simpler than the copula of identity, and he challenged Jevons's critique of Mill. Peirce further claimed that Jevons's logical machine is "in every respect inferior to that of Prof. Allan Marquand," Peirce's former student, and went on record with the claim that "the higher kinds of reasoning concerning relative terms cannot (as far as we can yet see) be performed mechanically."[25]

Peirce's short review of Thomas Muir's *The Theory of Determinants* (sel. 9) appeared in the 28 August issue of *The Nation*, two days before Peirce would send Carus his finished first paper for *The Monist*. Peirce did not go deeply into the substance of Muir's book but used about half of his space to comment on history as a genre of scholarship. Only histories of "the human mind," of "the general development of man and his creations" are of much interest. Biography, Peirce noted, was still too "prescientific" to be historically interesting. Histories of mathematics, on the other hand, are interesting, perhaps largely because they do not deal with a record of practical matters. Muir's book was a history of the development of the theory of determinants and Peirce liked the way Muir had organized his volume around an "ingenious table show[ing] the history of forty-four theorems"—perhaps in part because he was himself amassing a large catalogue of theorems for his encyclopedic entry for "theorem" for the *Century Dictionary* (he knew that within a few months he would receive proofs for the letter "T"). Peirce did note, however, that perhaps "Muir attaches a little too much importance to theorems, as contradistinguished from methods and ideas."

On 30 August, Peirce sent Carus his finished manuscript, "The Architecture of Theories" (sel. 23), with apologies for not finishing it sooner and for its length—though he noted that at 5600 words he was

[25] In a paper on "Logical Machines," published in *The American Journal of Psychology* in 1887, Peirce had made an in-depth comparison of Jevons's and Marquand's logical machines and had demonstrated the superiority of Marquand's (W6: sel. 15). Years later, Peirce wrote to C. J. Keyser, complimenting Jevons for seeing the weaknesses of J. S. Mill, but noting that he "produced a poor book with no logic in it, to speak of" (1–7 Oct. 1908).

owed $140. He had not finished sooner because Juliette had been ill. It is not known what Juliette's illness was at this time but in January Peirce would have to take her to New York for an unnamed "surgical operation." Juliette's illness might have been a recurrence of her tuberculosis or it might have been related to her chronic "pelvic trouble" which would reach a crisis point in 1897 requiring the extremely dangerous surgical removal of a large invasive fibroid tumor. Carus sent Peirce his check the following day and said it was doubtful that he could get Peirce's paper into the inaugural issue of *The Monist* (it would become the lead article for the second issue). Carus remarked on Peirce's review of his *Fundamental Problems* (sel. 8), which had appeared in *The Nation* about three weeks earlier, and said that he planned to "make a brief reply" in *The Open Court* and that Hegeler had already published a reply to Peirce's "objection to the conciliation of Religion" (31 Aug. 1890). Peirce replied on 6 September: "You should not attribute anonymous articles to me, as you don't know what editorial liberties may have been taken with them. . . . I have always declined to identify myself with associations for 'conciliating religion with science.' Best let them work out their own roads to truth. It is not likely I shall be drawn into any further discussion of this question [which] being one of wisdom has to be settled by the slow peristalsis of the mind."[26]

In "The Architecture of Theories" Peirce finally managed to work out the speculative vision he had been cultivating since 1878, when he had published some of his ideas "in embrion" in "The Order of Nature" (W3: sel. 64). In a way, "Architecture of Theories" was an outline of, or a prolegomenon to, what Peirce conceived to be the philosophy of the future, a systematic philosophy reconciling metaphysics with the most up-to-date science and rejecting, at least implicitly, armchair philosophy. In this opening paper for his *Monist* series, Peirce undertook to find conceptions that "ought to form the brick and mortar of a philosophical system." He began with a survey of several successful sciences, including dynamics (physics), biology, psychology, cosmology, and mathematics, looking for basic conceptions important for philosophy. His survey recapitulated, to some extent, his review in his "Initial Version" (sel. 22), though in reverse order.

Among the key conceptions Peirce considered were the law of the conservation of energy, the linked conceptions of force and law that had given rise to "the mechanical philosophy," three conceptions of evolution (Darwinian, Lamarckian, and Kingian), three conceptions of space (that it is unlimited and immeasurable, immeasurable but limited, or unlimited but finite), mathematical conceptions of the infinite, the absolute, and continuity, and the fundamental conceptions of one, two, three. Peirce's examination of these and other conceptions, especially the metaphysical conceptions of chance, law, and the tendency to take habits, led him to some of his signature ideas: that "the only possible way of accounting for the laws of nature and for uniformity in general is to suppose them results of evolution," that intellectual power is "facility in taking habits," that "the one primary and fundamental law of mental action [the growth of mind] consists in a tendency to generalization," or the spreading of feeling, and, finally, that of the three kinds of monism, the "one intelligible theory of the universe is that of objective idealism, that matter is effete mind." This complex of conceptions led Peirce to a cosmology that posited an original chaos of feeling from which, by pure chance happenings, a generalizing tendency took hold and habit started to form and the world grew more regular and law governed.

A principal concern of Peirce's, previewed a few months earlier in his review of Ribot's *Psychology* (sel. 2), was to show the limits of mechanical causation and the need for a conception of growth that was

[26] Hegeler's reply appeared in *The Open Court* 4: 2473–4 and Carus replied, notwithstanding Peirce's express wishes, in *The Open Court* 4: 2509–11. Carus published quotations from Peirce's letter in the July 1891 issue of *The Monist.*

non-reversible and not merely the statistical outcome of billions of physical interactions as with the behavior of gases. The cosmological philosophy Peirce was aiming for would not sanction the idea that causal explanation is constrained by the causal closure of the physical. Peirce's growing sense of mission to develop a comprehensive philosophy that could challenge and hopefully supplant the mechanical philosophy led him to look at the history of ideas in new ways. Though Helmholtz's discovery of the law of the conservation of energy may have been the first great achievement of modern science, Peirce now looked back with renewed interest to Galileo, who had taken the first step of modern scientific thought with the inauguration of dynamics, and asked how Galileo could have accomplished such a thing. Peirce concluded that Galileo had depended more on common sense and *il lume natural,* a "natural prompting" of a mind "formed under the influence of phenomena governed by the laws of mechanics," than on experiment.[27] This seemed fully compatible with Peirce's objective idealism and with his ideas about the growth of law and the growth of mind and would frequently be invoked in coming years as he became more and more intrigued with the centrality of abductive cognition. In bringing to a close his survey of the "elementary ideas [that] ought to enter into our view of the universe," Peirce singled out chance and continuity as key conceptions necessary for constructing a philosophy informed by and fully consistent with modern science. These two conceptions would be examined in detail in his next two *Monist* papers (sels. 24–27).

Carus spent some time with Peirce's manuscript before commenting on it. On 23 September he wrote: "Your ideas are new . . . I differ from you as you perhaps may surmise. Nevertheless your propositions have excited not only my keenest interest, but also my admiration. The way you propose them is splendid. I feel tempted myself to write an article on your essay." Carus did, in fact, devote several pages of criticism of Peirce's ideas in his "The Criterion of Truth," published in the January 1890 issue of *The Monist,* along with Peirce's "The Architecture of Theories," but in differing with Peirce, Carus remained respectful of him. Something, though, had happened to raise doubts about Peirce for Hegeler. Responding to a query from Peirce about Hegeler's concerns, Russell replied that he believed that Hegeler had construed a letter from Peirce about pay for a projected review of Mach to mean that "if you got $200 for your review you would make no attack on it but if you had $100 only you would feel at liberty to pitch into it." Russell assured Peirce that he did not believe Peirce had meant this, but that Hegeler now suspected that Peirce was unscrupulous and trying to "play him for a sucker." This was the first of a number of misunderstandings Peirce would have with Hegeler. Russell concluded his letter by thanking Peirce for "the insight" he had given in his "long letter (containing the Syllabus of your Logic)" and assuring Peirce, perhaps partly to relieve the pain his revelations about Hegeler may have caused, that he felt "more than ever that the advent of your methods and systems will mark an epoch in the history of philosophy, in the history of mathematics, in the history of physics, in the history of philology, in the history of morals, religion and politics" (27 Sept. 1890).

After finishing his first paper for *The Monist,* Peirce found time to review Alexander C. Fraser's *Locke* for *The Nation;* the review appeared in the 25 Sept. 1890 issue. Peirce began his review (sel. 10) with a reference to Galton's "eminent persons" and an indirect reference to his own study of great men (W5: 26–106). Peirce discounted the importance of heredity for producing great men but, perhaps in an allusion to his own situation, he acknowledged the importance of "gifts of fortune" and quoted Palissy who held that "the majority of geniuses are crushed under adverse circumstances."[28] Peirce gave Locke as an example

[27] See annotation 99.36 on p. 384.

[28] This quotation was commonly but mistakenly attributed to Palissy: see annotation 38: 13–15, p. 371.

of a man who attained true greatness even though his family did not show distinguished ability. In what could have been a reflection on the effects of the U.S. Civil War on Peirce's generation, Peirce quoted Locke's "I no sooner perceived myself in the world but I found myself in a storm"[29] and noted that the English Civil War which Locke experienced close up, "made food for reflection and doubtless suggested toleration." Beyond his intelligence and other qualities, the key to Locke's greatness, in Peirce's eyes, was his "public spirit," "the benevolent wish to improve the condition of his country and the world." It was that spirit of devotion that inspired all that Locke wrote and that explains the "vast influence" of his philosophy on the development of Europe. To those who would question Locke's merits or seek to reduce him to a "mouthpiece of the ideas which were destined to govern the world," Peirce answers that there is nothing greater "than so to anticipate the vital thought of the coming age as to be mistaken for its master." Locke's grand lesson, for Peirce, was to discount two of the methods of settling belief—that of authority and the a priori method—and to invite men to think independently, critically, and anew. It may interest readers of this volume that Peirce concluded his review by supporting Fraser's plea for a new edition of Locke's works: "this great man, whose utterances still have their lessons for the world, with wholesome influences for all plastic minds, should be studied in a complete, correct, and critical edition."

During the summer of 1890, Mendenhall had weighed his options for resuming gravity operations and had concluded that the Survey could no longer afford the traditional European-style pendulum operations that Peirce had introduced to U.S. science. Under the influence of Robert von Sterneck, a geodesist from Austria-Hungary, Mendenhall decided to reprogram the Survey's gravity operations by basing them on the use of short half-seconds invariable pendulums of his own design that could be easily transported from station to station and operated at a fraction of the cost of Peirce's European-style operations.[30] On October 1st, Mendenhall wrote to Peirce to let him know that he was "contemplating a renewal of activity in Gravitation work with field operations under the direction of Assistant Preston" and that "to reduce greatly the time and expense" he would make use of the new half-seconds pendulums. He asked Peirce to send any suggestions he might have "which may be of service in making the apparatus as perfect as possible."

Peirce was not pleased. Not only was Mendenhall indirectly giving Peirce notice that he did not intend to restore his leadership of gravity research but, also, that the world-class research operation he had built up over the years would be abandoned. Such a radical change of apparatus and technique would inevitably tend to disconnect the results of future research from those of the past—Peirce's for the most part. Peirce might have suspected that this decision would influence Mendenhall's judgment about the value of the long report he had submitted the previous November. In fact, Mendenhall had heard back from at least one of the specialists he had asked to review Peirce's report: Simon Newcomb. Newcomb acknowledged that the report was "a careful and conscientious piece of work" but he advised that Peirce's "inversion of the logical order" of presentation made it impossible to comprehend: "[t]he human mind cannot follow a course of reasoning in this way." He recommended that the report not be published unless Peirce reconstructed it "in logical order" (28 April 1890). But Mendenhall was still waiting for reviews from Hubert A. Newton, a mathematician from Yale, and from mathematician and meteorologist, William Ferrel, a Coast Survey Assistant famous for inventing the Survey's tide predicting machine and, in any case, the report did not seem to be uppermost in Mendenhall's mind. Of course Peirce did not know how

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[29] John Locke, *An Essay Concerning Human Understanding,* vol. 1, p. xviii.

[30] See Victor F. Lenzen, "An Unpublished Scientific Monograph by C. S. Peirce," *Transactions of the Charles S. Peirce Society* 5.1 (1969): 5–24, and W6: lxv–lxix, for more details.

things stood with his report; what he knew was that his leadership and his legacy were being threatened by the changes Mendenhall was making.

Peirce held little back. He replied at once (2 Oct. 1890) that "[t]o go back to a non-reversible bar pendulum would be an unintelligent and ostrich-like policy,—a way of concealing from oneself any source of constant error." He insisted that there were factors more important than time and money relevant to "the economy of the subject": "One of these is *accuracy*; for if this is not attained, the work is useless; and the time and money, however little, are thrown away. The other is assurance of accuracy; for however accurate the work may be, if we do not positively know that it is so, it is little better than if it were not so." Peirce told Mendenhall that he had developed his own plan for conducting pendulum operations quickly and inexpensively—"Over a year ago (about 2 years ago I think) I wrote to the Superintendent to say that I had a plan for occupying three stations a week"—and that plan should be adopted and he should be in charge.[31] Mendenhall replied that he would like to see the details of Peirce's plan but reminded him that it was not accuracy that he wanted to sacrifice but unnecessary refinement.

The inaugural issue of *The Monist* was published in October without Peirce's article, "The Architecture of Theories," but Peirce celebrated the event anyway with a note in *The Nation* (sel. 11): "the establishment of a new philosophical quarterly which may prove a focus for all the agitation of thought that struggles today to illuminate the deepest problems with light from modern science, is an event worthy of particular notice." He wrote that the first number "opens with good promise, in articles by two Americans, one Englishman, three Germans, [and] two Frenchmen." Peirce questioned what the editors meant by "monism." Referencing Carus's explanation in his *Fundamental Problems* where monism was offered in opposition to a two-substance dualism and as an alternative to both idealism and materialism, Peirce maintained that "metaphysicians who call themselves Monists are usually materialists *sans le savoir*." As he had in his August review of Carus's book (sel. 8), Peirce again seemed to be raising cautious doubts about Hegeler's program.

As 1890 drew toward a close, Peirce knew that the coming year would bring an end to his work for the Century Company and that his Coast Survey position was not secure. It was critical to find alternative means for his and Juliette's livelihood. Peirce's writing for The Open Court would help, and so would his increased reviewing for *The Nation,* but the income from these sources would not meet minimum needs, even supposing Peirce's Coast Survey employment were somehow to continue. Peirce was well aware that the potential for making significant income from his estate, either from marketing its produce, timber, and natural resources or from operating a seasonal resort for New Yorkers seeking escape from the summer heat, would be greatly increased if the Erie Railroad would only complete the long-promised extension from Port Jervis, New York, to Milford. Port Jervis had become a regional railroad hub, with several trains transporting passengers and goods to New York City every day, but the trains stopped at the river, and on the Pennsylvania side, horse drawn coaches and wagons were the only available mode of transport. Complications with construction of a railroad bridge over the Delaware River from Port Jervis to Matamoras on the Pennsylvania side, and the inconvenience of some massive rock formations blocking the entry into the river valley between Matamoras and Milford, caused a continuing postponement of the promised rail line. There was wide agreement about the economic benefits of extending the line to Milford; the problem was to find investors who found the project compelling.

Whether it was the hope of getting the rail line through to Milford and, therefore, through his own property, that got Peirce interested in railroad investment ideas, or something else, it appears that he

[31] See Peirce to Thorn, 28 May 1889; Mendenhall to Peirce, c. 4 October 1890; and Peirce to Mendenhall, 15 October 1890.

began to develop an investment scheme that involved rapid transit out of New York City. On 12 November 1890, Samuel Dimmick Mott, an inventor who had worked for Thomas Edison, wrote to say that he was sorry to have missed Peirce when he stopped by his home outside of Milford to discuss the "rapid transit matter." Mott went into some detail about the expected costs and gains for a project to construct a rapid transit rail line between New York and Philadelphia and told Peirce that if he could "succeed in doing anything in my behalf with good parties I will cheerfully make it worth your while, by agreeing to give you 10%." Mott estimated that the cost of getting the line between New York and Philadelphia "ready for business" would run between $400,000 and $700,000.

The railroad scheme was only one of several investment or marketing ideas that Peirce seriously pursued around this time. On 22 November, his brother Herbert wrote: "With regard to your inventions I am immediately in the way of taking them up and doing the best possible with them and should be glad to do so—I have a good patent lawyer . . ." Herbert was sure that Peirce's barrel head was patentable unless, of course, it was found to be already under patent, but he didn't recommend trying to take it to market: "I should advise selling it to a barrelmaker." But Peirce's table of logarithms (see sel. 14), Herbert believed, could be marketed through a publisher and was more likely to yield "immediate returns" than the barrel head. Herbert said that if Peirce wanted to remain anonymous, he could take the patents out in his name. Except for a brief discussion of his experiments with logarithmic scales in a letter from Peirce to Mendenhall (4 Feb. 1891), there is no further record concerning these inventions until 1894 when Peirce unsuccessfully tried to get Ginn and Company to publish his logarithmic table.[32]

During the years of Peirce's most intensive work for the *Century Dictionary,* his research for his definitions would frequently carry over into other writings, so with some of the shorter, often fragmentary, manuscripts of this period it is difficult to determine whether they are preparatory to a definition or are independent studies perhaps stimulated by research related to his dictionary work.[33] "Note on Pythagorean Triangles" (sel. 13) is a good example. This short selection might be a variant form of Peirce's definition of "Pythagorean triangle" for the dictionary or it might be only the beginning of a paper based on the research for that definition.

Peirce's dictionary work also found its way into his general correspondence. Throughout the month of December, Peirce carried on a lively exchange of letters with Simon Newcomb, who had criticized Peirce's definitions of "infinitesimal," "limit," and "doctrine of limits."[34] Also in December, Newcomb joined several other readers of the *New York Daily Tribune* in writing letters to the editor critical of the *Century* definition of "pons asinorum," another of Peirce's. On 2 January, Peirce replied (his letter was published in the 6 January issue of the *Tribune*) ably defending his view that in standard usage the pons asinorum referred to Euclid's fifth proposition, not the 47$^{th}$ proposition (the Pythagorean Theorem) as Newcomb believed.[35]

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[32] See the textual head note for sel. 14, pp. 547–48.

[33] In the Chronological Catalog for this volume, several manuscripts are noted to be possibly related to Peirce's work for the *Century Dictionary*.

[34] For this exchange, see Carolyn Eisele's "The Correspondence with Simon Newcomb" in *Studies in the Scientific and Mathematical Philosophy of Charles S. Peirce,* ed. R. M. Martin (Mouton 1979), ch. 5.

[35] Peirce's letter to the editor of the *New York Daily Tribune* is published in Eisele, HPPLS, Vol. 1, pp. 568–69. Reviews of Peirce's definitions for the *Century Dictionary* and Peirce's replies will be much more fully treated in the introduction for W7.

Sometime in 1888, Peirce started to survey arithmetic textbooks with the idea of writing one of his own and by the end of 1889 he had begun talking with friends about his arithmetic project.[36] As Carolyn Eisele pointed out in the introduction to the second volume of her four volume edition of Peirce's mathematical works, *The New Elements of Mathematics,* Peirce "turned to textbook writing in elementary mathematics as a means of economic survival." While that was a good idea, since authors of mathematics textbooks often "enjoyed great financial success," Peirce's belief that "his new and original approach" would have broad appeal turned out to be ill founded—but Peirce would work diligently on his textbooks for several years before its futility would sink in.[37] During the first half of the 1890's decade, Peirce undertook quite a number of textbooks, with several underway at the same time, but because of lost manuscripts and reorganizations on Peirce's part, with one project subsumed within another, a precise recounting of his textbook projects may no longer be possible. Among the books mentioned by Peirce in his correspondence are a primary arithmetic, a practical arithmetic, a vulgar arithmetic, an arithmetic for young readers, a geometry, a projective geometry, a revision and expansion of his father's 1873 *Elementary Treatise on Plane and Solid Geometry,* a trigonometry, and a topology. Writing to Jem on 2 January 1895, Peirce mentioned that he also had a book on logic and one on the fundamental properties of space, possibly a separate book project related to his extensive work on non-Euclidean geometries. Several of the mathematics book projects seem to overlap and, in 1894–95, after discussions with Ginn and Company, publishers of the famous McGuffey Readers, Peirce appears to have reshaped much of his previous work into two books, *The New Elements of Mathematics* and *The New Elements of Geometry*. As for his logic, by 1895, when Peirce wrote about it to Jem, he was probably referring to "How to Reason," more commonly known to Peirce scholars as "The Grand Logic," or possibly to his "Search for a Method." But, as with his mathematics book projects, Peirce worked on several different logic books during the first half of the 1890's, including "The Light of Logic," "The Short Logic," and volume two of his proposed "Principles of Philosophy" on the "Theory of Demonstrative Reasoning." Also, Peirce's 1892 "The Critic of Argument" series for *The Open Court* (W9: sels. 5–10) might be added to this list, possibly subsuming materials already worked up for "The Light of Logic." And there were other book projects not aimed at the classroom. It is evident that during this period Peirce turned to writing as one of his main hopes for increasing his annual income to a sufficient level and that textbooks fit centrally into his plans.

Several manuscripts listed in the Chronological Catalog for 1890, including two W8 selections, may belong to one or another of these book projects.[38] In "Logical Studies of the Theory of Numbers" (sel. 15), Peirce appears to be opening an investigation into whether a proof procedure can be found for "higher arithmetic, so that we can find out in advance precisely how a given proposition is to be demonstrated." This is equivalent to asking whether there is an algorithm for finding solutions to equations in number theory, and in raising that question Peirce anticipates, in a more general way, David Hilbert's "Tenth Problem," posed in 1900 at the International Congress of Mathematicians in Paris, of determining whether there is an algorithm for solutions to Diophantine equations.[39] Peirce probably aimed to translate such equations into Boolean algebra, but the paper stops a long way short of showing

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[36] See NEM 1: xxix; W6: lxxii.

[37] NEM 2: xiii and passim.

[38] See the following entries in the Chronological Catalog: 1890.41 and c.1890.17–20, 23–25.

[39] Peirce's anticipation of Hilbert's "Tenth Problem" was noticed by Irving Anellis. In 1931, Gödel proved that number theory was incomplete, and in 1970 Yuri Matiyasevich gave a negative answer to Hilbert.

how he would have actually proceeded. This paper, which continues Peirce's earlier work on number theory,[40] might have been intended for presentation or separate publication, possibly stimulated by Peirce's work on the definition of "number" for the *Century Dictionary* where he also said that "numbers are characters of collections," but Peirce might have conceived it as preliminary work toward a foundational chapter for one of his mathematics textbooks. **"**Promptuarium of Analytical Geometry" (sel. 16), on the other hand, seems clearly to have been intended to introduce students to analytical geometry and is very likely to have been written for a textbook on geometry.[41] It was intended to demonstrate to the student how "the whole theory of lines is exactly like that of points."

As the year drew to a close, Peirce's thoughts turned to personal matters—although not exclusively: he wrote a very long letter to Newcomb, apparently the day, perhaps the night, before Christmas, defending his views of infinitesimals and limits. Around this time, maybe on Christmas Day, Peirce drew up a list of all of the places where Juliette had spent her Christmases beginning in 1857—presumably the year of her birth. This is something they would have done together. And maybe in turning his attention to a record of events in Juliette's life he was stimulated to jot down what he could recollect of his own beginnings, as we find in "My Life" (sel. 12). It is curious that he says he could remember nothing before he could talk and yet the earliest memories he recounts seem to be quite sensory, even imagistic.

1891 began auspiciously for Peirce with the publication of "The Architecture of Theories" (sel. 23), the lead article for the January issue of *The Monist*. Not only did it bring promise that Peirce might be able to make up from the Open Court some of the loss of income from the Century Company, it gave him renewed prominence. The issue was announced in leading periodicals and free copies were widely distributed to advertise the journal. The January issue of *Book Chat,* published by Brentano's, reported that:[42]

> The January number of *The Monist* contains a most masterful philosophical paper on "The Architecture of Theories," the first of a series from the pen of Prof. Charles S. Peirce, formerly lecturer on Logic at Johns Hopkins University, and well known as an original thinker. Prof. Peirce has heretofore written mostly upon the most recondite themes of Logic and Mathematics, but in this paper he undertakes, for the first time, to sketch out his general philosophical system, and he does so with a scope and competence that are truly singular. He breaks ground for his foundations in strata that far underlie any heretofore chosen for that purpose, and shows the outlines of a philosophy at once all-embracing and organic. The series, it is expected, will create considerable commotion in the philosophical world when its iconoclastic constructiveness shall be realized.

*The Open Court*, in noticing the second issue of *The Monist,* described Peirce as "one of the subtlest thinkers and logicians not only of America, but of the whole globe."[43] This must have pleased Peirce but he was preoccupied with other work and would not return to his *Monist* project for several months. He wrote to Carus on 12 January to apologize for his recent silence "which is due to my being so pressed with work" and sent a list of persons he wished to receive copies of the issue with his first article. Peirce briefly acknowledged a paper in the same issue in which Carus had raised some objections to his views, in particular to the idea that necessity and natural law are products of evolution. Peirce told Carus that his views were "the fruit of long studies" and that he did not "expect or desire people to fall in" with his

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[40] W4, sel. 38; W5, sel. 45; W6, sels. 20 & 21.

[41] See the textual head note for sel. 16, p. 551.

[42] *Book Chat* 6.1 (Jan. 1891): 11.

[43] *Open Court* 5 (31 Dec. 1890): 3076.

views at once. Responding to Carus's criticism of his conception of chance, he wrote that he regarded "chance, without any degree of conformity to law . . . as nonexistence, a mere germ of being in so far as it may acquire habits."

As the new year began, it is doubtful that Peirce had much time to spare for anything except his *Century Dictionary* work and his concentration on his definitions would continue through the summer. The fourth volume of the *Century* had been published in November 1890, so as 1891 got underway, Peirce would have been working on proofs for the fifth volume, covering Q – Stro words, and even though the process was in the proof phase, Peirce was making a lot of revisions and additions that required considerable research. As with all the volumes, Peirce was responsible for hundreds of definitions ranging over the several areas he had charge of, and even though he was not responsible for all of the definitions for each of his words, and for those he was responsible for he had the base definitions and illustrative quotations from the *Imperial Dictionary* to begin with, his contribution was still astonishingly large. Among Peirce's Volume V words requiring especially demanding and complicated definitions were the following: *qualification, qualify, quality, quantity, quarter, question, radial, radical, random, rank, ratio, rational, rationalism, real, realism, reality, reason, reckon, red, reduce, reduction, regular, relation, relative, represent, representation, resolve, right, root, round, rule, run, same, Saturn, scale, scheme, scholastic, scholasticism, school, science, screw, second, secondary, section, self, sense, sentence, sentiment, sequence, series, set, seven, sign, similar, simple, single, singular, singularity, size, society, solar, solid, soul, space, species, sphere, spiral, spirit, spontaneous, square, standard, star, state,* and *straight.* The definitions for this set of words, alone, filled over one hundred and fifty 2½ inch quarto columns in small type.[44]

When in November 1889, Peirce sent Mendenhall his long awaited report on gravity, his manuscript covered all of the technical, theoretical, and historical issues necessary for a comprehensive report on all of his unpublished gravity operations, but it only gave results for four stations: the Smithsonian, Ann Arbor, Madison, and Cornell. That is the report Mendenhall had sent out to specialists for review. Peirce had promised to follow up with a second and concluding part giving the results for the Montreal, Albany, Hoboken, Fort Monroe, St. Augustine, and Key West stations. The reduction of the raw data, for which there were massive quantities, was slow and exceedingly demanding work and, though he had asked more than once for an assistant to be sent to Milford to help with the calculations, he was left to complete the work on his own. It is doubtful that Peirce could have made marked advances toward finishing this work in the year after submitting his report because of the demands made on him by the Century Company, but he made some progress. On 12 December 1890, over a year after receiving Peirce's manuscript, Mendenhall wrote to ask Peirce for a report on his progress, noting that "it would seem that all of the reductions ought to be finished by this time." Also, he advised Peirce that some revisions were necessary before the report already in hand could be published. By this time, Mendenhall had heard back from all of the reviewers and their reviews were mixed. Ferrel, whose review he was waiting for when he wrote to Peirce on 1 October about his plan to use half-seconds pendulums, had found Peirce's report to be "unnecessarily complicated" and thought that Peirce had made some mistakes, but he praised Peirce's method and gave a positive assessment overall.[45] Assuming that Peirce would rearrange his report in a

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[44] The definitions for *semiology, semiotic,* and *semiotics,* also appeared in Volume V, in Peirce's lot, and for each of these words alternate spellings with an extra "e" were given (*semeiology, semeiotic, semeiotics*), but not as the main entries as in the *Imperial Dictionary*. "Semiotics/semeiotics" was listed as a noun and defined as the doctrine or science of signs while "semiotic/semeiotic" was listed as an adjective relating to signs.

[45] Ferrel to Mendenhall, 19 October, 1890; see also W6, p. 481–82, n. 301.18–19.

more traditional way and add a final section of results from the remaining stations, Mendenhall had been given no grounds for rejecting the report. Peirce wrote on the 17th to say that he had been in New York with Juliette, who had undergone "a surgical operation," and had not had time for a progress report.

Finally, on 4 February, Peirce sent Mendenhall a thorough, though not very detailed, accounting of both his progress and his projections. Indeed, he had completed the reductions and he had finished the work on the relative force of gravity for all of the stations. But a lot of time and money had gone into determining the absolute force of gravity using the Peirce pendulums (a series of pendulums designed by Peirce) and the report on that work could not be usefully completed until Peirce had better data for flexure corrections—and, for that, the pendulums would have to be swung again, under proper conditions, so that precise flexure measurements could be obtained. Peirce assured Mendenhall that these flexure determinations could be "readily made" and that, after the corrections, his report "would give for the first time pretty accurate determinations of the absolute force of gravity, which are required for astronomical and other purposes." Peirce also reported on the progress of his work on absolute gravity at Hoboken using a Resold (instead of a Peirce) pendulum, further studies of the motion of the noddy, and his study of the hydrodynamical problems connected with the motion of pendulums. The need to correct for the viscosity of air, and the corresponding need to develop the theory of hydrodynamics for that purpose, was of special interest to Peirce: "The task which I have set myself is to produce a method of treating hydrodynamical problems which shall keep as close as possible to the facts and yet not take a life-time to use." In the draft report that Mendenhall was still considering, Peirce had introduced some viscosity corrections but had stated forthrightly that "[t]he theory of the effect of viscosity upon the pendulum is not sufficiently perfect for us to rely on magnitudes of these terms" (W6: 322). Peirce concluded by mentioning his work on the distribution of gravity and his studies of "the relative advantages of different methods of computation," especially his experiments with logarithmic scales (see sel. 14). It is not known how Mendenhall responded to this report. There was some reason for optimism, but it must have been growing increasingly clear that the full value of Peirce's years of service would require further investment in the Peircean program of gravity research which he was planning to abandon. What Peirce needed for his flexure corrections no doubt fit perfectly under what Mendenhall regarded as "unnecessary refinements."

Jem wrote early in the new year (3 Jan. 1891) in support of Peirce's arithmetic textbook project and listed several American and German textbooks he thought might give Peirce some good ideas.[46] By the beginning of March, Peirce had engaged his former Johns Hopkins student, Allen Risteen, to help with "the Arithmetic" and on 7 March, Risteen sent Peirce a list of twenty-four subjects and twenty-three tables in the order he tentatively recommended. By the end of the summer, Peirce had finished a draft that he sent to Risteen for comment and in the hope that Risteen would assist him by drafting text for some unfinished sections and by supplying examples.

From mid-February into March, a small controversy played itself out in the pages of *The Nation* over Peirce's anonymous notice of a "bulky pamphlet" by Florian Cajori on "The Teaching and History of mathematics in the United States." *The Nation* had published three letters, one of them by Cajori, critical of Peirce's notice, claiming that it conveyed a distorted sense of Cajori's purpose and that it promoted a caricature of the famous J. J. Sylvester by devoting disproportionate space to an anecdote featuring Sylvester's eccentric teaching style during his days at Johns Hopkins. Peirce replied on 12 March with a

[46] Carolyn Eisele wrote that Jem wrote this letter to help Peirce get his arithmetic project started after his forced resignation from the Coast Survey but Eisele mistakenly dated Peirce's resignation as taking effect on 1 January 1891 instead of 1 January 1892 (NEM 1: xxix).

stinging rebuttal, pointing out that it was not the purpose of a book notice "to do justice to the author's merit" but "to give the public such information about a book as it desires, and particularly to show in what way the book may be useful." Against the criticism that in quoting the anecdote about Sylvester he was showing him disrespect, Peirce replied that "it was merely a tale of a bit of eccentricity such as theoretical mathematicians and thinkers generally have been proverbial for since antiquity." Peirce continued: "There was a phase of American development (not yet, unfortunately, altogether past) when to say that a person was different from others was an accusation, to call him eccentric simply shocking. Whenever such a charge was made, those of the party's friends who were conscious of superior powers of mendacity, naturally hastened to repel the odious libel, and to assure the public of the maligned gentleman's eminent mediocrity. No wonder that in such an atmosphere mathematical studies have not flourished."

In March, Peirce began a discussion by correspondence with Allen Risteen about how to conduct experiments to measure the curvature of space. On 3 March, Risteen wrote that the application of Peirce's method for determining "the constant of Non-Euclidean space" was "very beautiful," and on the following day he sent Peirce a list of twenty-three "double (or triple) stars to which the spectroscopic method might perhaps be applied." About three weeks later, on the 24th, Peirce wrote that he intended to go ahead with the investigation: "I propose to see what the evidences of the curvature of space may be. Probably there is no argument on the subject not open to objection. Yet if they all tend one way, it will come to something." Peirce's "Methods of Investigating the Constant of Space" (sel. 36), would guide his experiments. On 16 February, at Peirce's request, Mendenhall had shipped a crate of instruments to him including a theodolite, a wye level, a plane table and alidade, and two telemeters. Presumably, Peirce needed these instruments for his curvature observations.

It was also around this time when Ernst Schröder and his work in logic began to reenter Peirce's stream of thought. Peirce and Schröder had corresponded during Peirce's Johns Hopkins years but they lost touch when Peirce left Baltimore. Schröder reestablished contact in February 1890 when he wrote to let Peirce know that the first volume of his *Vorlesungen über die Algebra der Logik (exakte Logik)* would soon be published and that he would have a copy sent to Peirce. Schröder wanted to resume their communication which, up to 1884 he had "rejoiced in receiving." Peirce was slow to respond, probably mainly because he was so pressed with his work for the Coast Survey and Century Company but he might, also, have been waiting for Schröder's promised *Logik*, which, as it turned out, didn't come out until early in 1891. By then, however, Peirce had replied, but his letter of 7 October 1890 is no longer extant.[47] By March 1891, Peirce would have received his copy of Schröder's first volume, or would have seen it at the Astor Library, and would have known that Schröder had built on his foundations.[48] As Christine Ladd Franklin observed in her January 1892 review in *Mind*: "The plan of Dr. Schröder in his

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47 It would not be until 1893, after Peirce had received three more letters from Schröder, that they would finally resume a regular correspondence (by then Peirce had also received the second volume of Schröder's *Logik*).

48 Peirce would also have noticed that in Schröder's bibliography he was listed as "Peirce, Charles S(antiago)," just below an entry for his father with guidance for pronouncing their surname: "Peirce, Benjamin (gesprochen: Pörss)." This is no doubt the first occurrence of "Santiago" as Peirce's middle name. It is not known why Schröder gave Peirce this name but the fact that all but the "S" is in parentheses suggests that it was only a guess. Soon, however, Schröder's correspondent, the mathematician Ventura Reyes Prósper, would begin using "Santiago" as Peirce's middle name in letters and publications, and this practice may have been picked up by others. In 1903, when Peirce was preparing a personal entry for a biographical dictionary (R1611), he wrote: "I am variously listed in print as Charles Santiago Peirce, Charles Saunders Peirce, and Charles Sanders Peirce. Under the circumstances a noncommittal S. suits me best." Eventually, after William James came so crucially to his aid in later years, it occurred to Peirce to honor James by putting "Santiago" (Saint James) to use and by 1906 he had become Charles Santiago Sanders Peirce.

book follows closely upon that of Mr. Peirce as set forth in Vol. III. of the *American Journal of Mathematics;* that is to say, all the formulae are established by analytical proofs based upon the definitions of sum, of product, and of the negative, and upon the axiom of identity and that of the syllogism. . . . The proofs are, for the most part, the same as those given by Prof. Peirce." Of course there was a lot more Schröder than Peirce in Schröder's *Logik,* and some notable differences of opinion, but Peirce must have been pleased with the promise of Schröder's book for the future of his line of logical thought.

Probably it was in the spring of 1891 when Peirce resumed work on his own "exact logic," specifically on the algebra of the copula (sels. 31–35). This work was the successor to Peirce's well-known treatment of the algebra of the copula in his famous *American Journal of Mathematics* papers of 1880 and 1885,[49] papers that had much influenced Schröder. Peirce might have been working up this treatment of the copula for his correspondence course, but selection 34 seems too specialized for beginning logic students. He might have been working up a presentation paper, possibly stimulated to resume his study of the copula because of Schröder's rejection of his method of solving problems in the algebra of logic by analyzing the properties of the copula (as reported by Ladd Franklin in her review in *Mind*). Peirce may also have been working toward a logic book; his 1894 "How to Reason," more commonly known as his "Grand Logic," would include a substantial chapter on "The Algebra of the Copula." It is noteworthy that Peirce began sel. 32 with what is in effect the truth table for the copula of inclusion—or the copula of consequence, as he called it in sel. 33. In these selections, Peirce showed some movement toward a graphical approach that would gain momentum with his recognition in his summer 1892 "Critic of Arguments" papers that there are significant diagrammatic features in logical algebras, and would lead to his Existential Graphs of 1896. Peirce's attention to operations with parentheses and rules for inserting or omitting propositional variables into or from parenthetical spaces bears some resemblance to operations involving graphs within cuts in EG.[50]

It was sometime in the spring of 1891 when the Peirces decided to name their estate Arisbe. In December 1890, they had settled a claim made against their property by Levi Quick and at last gained clear title to all of their estate. On 21 December, Jem wrote to Charles: "We are all glad to hear of the successful termination of your suit, & hope you will have no more trouble of that sort, & that your property will turn out to be worth all you expect from it." The Peirces had finished a first round of home renovations the previous year and now that Charles had begun construction of his philosophical mansion in the pages of *The Monist,* and with the Quick suit settled, he and Juliette returned to making grand designs for their house and their estate. They had a survey made of Wanda Farm, the Quick Homestead part of their estate that included their house, and they petitioned the township, unsuccessfully, to reroute the public road that passed nearby and asked for confirmation that they held the timber and quarry rights to their property.

Soon after the Peirces had purchased the Quick property, even before they had moved into the main house, Mary Pinchot had urged them to choose a new name for their estate, long known as Quicktown. Peirce was hesitant because, as he wrote to JEM (29 Nov. 1888), Tom Quick "is rather a romantic figure in the history of the valley," but within a year he was beginning to yield and in December 1889, when Juliette was wintering in Europe, Peirce briefly considered renaming the estate "Sunbeams" as a gesture

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[49] W4, sel. 19 and W5, sel. 30.

[50] This suggestion will be stronger if one imagines that the upper and lower ends of parentheses are extended to meet their mates enclosing their operands in cut-like area brims. See the annotations on pp. 419–24 for further discussion of these selections.

of endearment toward Juliette. Still, he continued to use the name "Quicktown," or sometimes "Wanda Farm," in his correspondence. But at the beginning of 1891, with the return of hope for the possibilities of life in their Milford home, and also, perhaps, with the idea of symbolizing that the Peirce estate was now legally disentangled from the Quick Family's claims and ready to assume a new character, the time was right to follow Mrs. Pinchot's advice. The Peirce estate would be named Arisbe.

Precisely when the christening occurred is not known. When Peirce wrote to Risteen on the 24th of March, he wrote "Wanda Farm" for his address. But it seems likely that by then the Peirces had settled on the name "Arisbe"; when the petition went forward, probably by mid-March, seeking to reroute the public road through the Peirce property, reference was made to "the farm formerly known as Quicktown and now as Arisbe." More uncertain is how they came to choose the name "Arisbe." Max H. Fisch believed that Peirce named his Arisbe after the Milesian colony northeast of Troy along the Hellespont in ancient Greece.[51] Miletus, as Fisch pointed out, was "the home of the first philosophers of Greece," and the scientific philosophy they aspired to was of a kind with the philosophical program Peirce had inaugurated with his "Guess at the Riddle" and was now working out in the pages of *The Monist.* More telling, perhaps, is the story of Axylus recounted in Book IV of the *Iliad*, in which Homer remarks that Axylus's home was on the road through Arisbe, on the river Selleis, and was known as a place of welcome to all who passed by. Arisbe, one of the cities of the Troad in league with Troy, sent troops to battle the army of Agamemnon and Axylus, among the Trojan troops, was slain by Diomed. Homer made a special point on noticing that none of the many guests who Axylus had entertained at Arisbe intervened to save his life and this fact may have been compelling for Peirce. Arisbe's attraction might have been greater for Peirce because of its connection with Aristotle's most famous student, Alexander III of Macedonia. Alexander had opened his famous campaign to conquer the Persian world with the Battle of the Granicus River and, in preparation for that key battle, he had concentrated his forces at Arisbe.[52] Peirce greatly admired Alexander for his contribution to philosophy through his patronage of Aristotle.[53]

Peirce would have been familiar with the story of Axylus and it might have been fresh for him from his lexicographical research for the *Century Dictionary,* often taking him to ancient Greek sources. He might also have known the popular poem of Sam Walter Foss, "The House by the Side of the Road," that celebrated Axylus who "lived in a house by the side of the road and was a friend to man,"[54] and he certainly knew Victor Hugo's *Les Miserables,* in which the slaying of Axylus, "who dwelt in happy Arisbe," was recounted. Peirce thought highly of Hugo, listing him with his three hundred great men of

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[51] Fisch stated emphatically, however, that his explanation was "pure hypothesis" and he was by no means confident that it would never be disconfirmed. Perhaps the Peirce estate had been named for the Arisbe butterfly or for something else. (Max H. Fisch, "Peirce's Arisbe: The Greek Influence in His Later Philosophy," *Peirce, Semeiotic, and Pragmatism,* eds. Ketner and Kloesel, n. 40, p. 248—but see Fisch's paper in full for valuable insights on why Peirce chose to call his estate "Arisbe.") For an different guess, see André De Tienne's "The Mystery of Arisbe" in Peirce Project Newsletter 3.1 (1999); see also the introduction to W6, p. lxxii.

[52] Today the Granicus River is called the Biga Çayı. The famous battle took place near the city of Biga in present day Northwestern Turkey.

[53] On 10 January 1892, when Peirce sent Garrison of *The Nation* his review of Harrison's *The New Calendar of Great Men* (sel. 44), his accompanying letter contained the following remark: "I have expressed the *belief*, that is my word, that Aristotle without Alexander would scarcely have been heard of. . . . [Aristotle] spent vast amounts, we know, on books and other things necessary to his studies. He must have worked very calmly and with an easy mind to have produced such vast works which were *never published at all*. There is no reason to suppose his school was very profitable. Without Alexander's vast aid he would have done much less, very much less; and he just escaped oblivion as it was."

[54] Suggested by Frank Palmer Purcell; see his Arisbe Network website: *http://arisbe.wikidot.com*.

history—both in his original list of 1883–84 (W5: sel. 3) and in his revised list of 1892 included in the present volume (sel. 43)—and he was impressed with Hugo for having "written the least foolishly" about "the world of misery," a world he was beginning to experience intimately and that he would unhappily come to experience even more profoundly.[55] But whatever the source of the inspiration, by the spring of 1891 the Peirces had decided to call their estate "Arisbe," and by the fall, at the latest, they had begun using "Arisbe" regularly in their correspondence.[56]

Though it must have been a relief to now have clear title to all of their estate, consisting of the old Wanda Farm, stretching along the Delaware River, with their house, cottage, two barns, and various outbuildings, along with over two square miles of woodland, Peirce knew that his income was not adequate for their needs and that his work for the Century Company was coming to an end. But the Peirce's had been assured of their timber and quarry rights so there was a chance that their estate could be made to generate the wealth they needed—much depended on bringing a railroad through to Milford. Of course Peirce knew that he and Juliette could not survive on hope while they waited for the railroad to come through—he was all too frequently reminded of this by creditors trying to collect on his delinquent accounts—so he continued to look for opportunities. On 4 April, his brother, Herbert, wrote to say that he was sure that Peirce's "stereoscopic zoetrope" was patentable and that he would be glad to handle the paperwork if Peirce would provide a "full statement of the invention in detail" and cover the preliminary expenses. This was one of many inventions that Peirce seems never to have taken beyond the realm of the conceptual.

The fifth volume of the *Century Dictionary* was published in May, so sometime before that Peirce turned to the proofs for the sixth and final volume. He was feeling pressure from Mendenhall to finish his overdue reports for the *Coast Survey* and had a few other writing projects going, including a review of William James's *Principles of Psychology,* and he was working on some income-producing ventures related to his Milford estate, so in mid-May he arranged for the Century Company to hire Allen Risteen to help him with the research for his remaining definitions. Risteen worked as a safety engineer for an insurance company in Hartford, Connecticut, but he was able to spend much of June and July helping Peirce, often traveling to New York or Cambridge for library research. Surviving correspondence indicates that Peirce used Risteen to help with specialized mathematical or scientific terms, working up material for the constellations in the S to Z letter range, for example, but much of Risteen's effort focused on three words given encyclopedic treatment: *theorem, transformation,* and *triangle*. The definitions for these three words, combined, run to over twelve tightly packed columns and include well over two hundred sub-entries separately defining special theorems and transformations and kinds of triangles. Much of Risteen's work seems to have involved searching out information for these sub-entries using lists provided by Peirce.

Along with *theorem, transformation*, and *triangle,* examples of other Volume VI words requiring complex treatment include *subject, substance, suggestion, sum, superior, surface, survey, syllogism, symbol, symmetry, system, tangent, term, theory, think, third, thought, three, tide, time, trace, transcendental, transit, translation, transverse, true, ultimate, understand, understanding, uniform, unit,*

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[55] See Peirce to Wm. James, 13 March 1897 and R. H. Popkin and R. G. Meyers, "Early Influences on Peirce: A Letter to Samuel Barnett," *Journal of the History of Philosophy* 31 (1993): 607–21.

[56] In July, Peirce's sister, Helen, wrote to ask what he and Juliette thought might be a good name for her estate in Sandy Neck on Cape Cod. In a letter of 20 September 1893 (which Peirce did not receive until the following year), his Harvard classmate, William Everett, wrote admiringly of Peirce's choice of the name "Arisbe," remarking that "Asius of Arisbe, the fierce driver of horses, was always a great favorite" of his.

*unitarian, unity, universal, vague, value, variable, variation, vary, vertical, vibration, virtual, virtue, vital, voluntary, vortex, wave, weigh, weight, white, will, wisdom, wit, witness, work, yard, year, yellow, zodiac,* and *zone.* Together, these definitions fill over a hundred columns and they constitute but a small fraction of the number of words Peirce was responsible for in Volume VI. This volume also contained Peirce's famous definition of *university* as "An association of men for the purpose of study, which confers degrees which are acknowledged as valid throughout Christendom, is endowed, and is privileged by the state in order that the people may receive intellectual guidance, and that the theoretical problems which present themselves in the development of civilization may be resolved." Peirce was criticized in this case, and in others, for following in the footsteps of Samuel Johnson by giving definitions that "indicate what he believes people ought to mean by certain words rather than what they did in fact mean,"[57] but, although examples of hortatory definitions can be given, this is not characteristic of the massive contribution Peirce made to the *Century Dictionary*. In explaining to Paul Carus why he had defined "critique" in a way he did not himself accept, he said that it was to "record the fact of its use—God forbid I should approve of above $^{1}/_{10}$ of what I insert" (15 Sept. 1890). "By the middle of July, Risteen had finished his work as Peirce's special assistant and Peirce must have concluded his work by the end of August. The 18 September 1891 issue of *Science* carried a notice that the *Century Dictionary* "is at last completed; the sixth and concluding volume will soon be brought out, the final pages being now on the press."

In early June, Peirce asked Risteen to add "trees" to the list of mathematical subjects he was gathering information on for Peirce's dictionary work. Sometime earlier it must have occurred to Peirce that Arthur Cayley's diagrammatic method of using branching trees to represent and analyze certain kinds of networks based on heritable or repeating relations would be useful for his work on the algebra of the copula and his investigation of the permutations of propositional forms by the rearrangement of parentheses. In "On the Number of Dichotomous Divisions: A Problem in Permutations" (sel. 35), Peirce directly posed the problem of determining how many propositional forms there are given a certain number of copulas (or any other non-associative connective) and a continuous supply of parentheses, and used Cayley's method of trees as a heuristic in working out his solution.[58] When Peirce asked Risteen to add "trees" to his list of words for library research, he may have had it in mind to insert a sub-entry under "tree" to account for Cayley's analytical forms, but nothing about Cayley's trees made it into the *Century* suggesting, perhaps, that Peirce had something else in mind. When Risteen wrote back on 10 June, his report, illustrated with diagrams, dealt fairly extensively with Cayley's 1875 article, "On the Analytical Forms called Trees, with Application to the Theory of Chemical Combinations." It may be that in working with Cayley's tree method for analyzing propositional forms, it had occurred to Peirce that he could improve on the brief treatment of slime-molds and protoplasm he had given in "Architecture of Theories" (sel. 22). By using Cayley's analytical treatment of chemical combinations, perhaps he could work up a "molecular theory of protoplasm" that was more in tune with the current physics and more straightforwardly subject to his mathematical treatment of continuity. In the fourth article of his *Monist* series, "Man's Glassy Essence" (sel. 29), when discussing the "enormous rate" of increase of the numbers of chemical varieties as the number of atoms per molecule increases, Peirce remarked that "Professor

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57 Henry S. Leonard, *Principles of Right Reason,* New York, 1957, p. 282.

58 See the annotations for sel. 35 for further commentary on Peirce's question and his solution, and see annotation 173.29–30, p. 407, for references to Cayley's publications on trees.

Cayley has given a mathematical theory of 'trees,' with a view of throwing a light upon such questions."[59]

One of the most puzzling writings in this volume is Peirce's *Nation* review of William James's *Psychology* (sel. 37), not so much for its content as for its tone.[60] Peirce and James were friends of long-standing, the kind of friends who could take it for granted that they would be friends for life, and Peirce knew that James had spent many hard years writing his first major work. Peirce was one of five persons to whom James, in his preface, expressed gratitude for intellectual companionship. So it is surprising that in his review Peirce takes James rather severely to task. He wrote that James's thought "is highly original, or at least novel," but it is "originality of the destructive kind," and that "the book should have been preceded by an introduction discussing the strange positions in logic upon which all its arguments turn." James, Peirce said, "seems to pin his faith" on "the general incomprehensibility of things," and he is "materialistic to the core . . . in a methodical sense"—according to James, once psychology "has ascertained the empirical correlation of the various sorts of thought and feeling with definite conditions of the brain," it can go no farther. This is part and parcel of the mechanistic philosophy that Peirce has taken it upon himself to refute. Peirce accused James of employing a new principle, the "principle of the uncritical acceptance of data," which "would make a complete rupture with accepted methods of psychology and of science in general." After making these rather harsh criticisms, Peirce chose to examine with some care one section of James's book: "Is Perception Unconscious Inference?" Peirce went to some length to explain in what sense he believed perception to involve unconscious inference and challenged James's claim that although there is inference in perception there is nothing unconscious about it. According to Peirce, James failed to understand that what was meant by "unconscious inference" was only that "the reasoner is not conscious of making an inference," and, furthermore, James "forgets his logic" in assigning the inference in perception to "immediate inference," because it has no middle term, when, in fact, modus ponens is the form it takes. Peirce concluded by characterizing James's reasoning as circular and virtually self-refuting.

Peirce was one of very few reviewers who did not lavishly praise James's book as a landmark work for psychology.[61] And yet, if one takes Peirce at his word in his introductory paragraph, which he surely expected his readers to do, he believed James's *Psychology* to probably be "the most important contribution that has been made to the subject for many years" and certainly to be "one of the most weighty productions of American thought" (and surely he did not only mean heft). Probably noticing the tone of his review, Peirce added to his opening paragraph that the "directness and sharpness" of his objections "must be understood as a tribute of respect." There is good reason to think this to be the case; throughout their lives, Peirce and James practiced candor and forthrightness in their personal relations. Yet what may have been understood to be "intellectual jousting" by James, was not recognized as such by many of *The Nation*'s readers and certainly not by William's brother, Henry, or his sister, Alice. Henry wrote to William from Ireland on 31 July to report on Alice's health—she had been diagnosed to have cancer—and said that "the main thing . . . that has happened to Alice, appears to have been the disgust & indignation experienced by her over the idiotic review of your Psychology in the *Nation*." Henry said he

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[59] Of course sel. 35 is part of the general study of the copula that includes sels. 31–34.

[60] Peirce's review of James's *Psychology* was published in *The Nation* in two parts, the first on 2 July 1891 and the second on 9 July. It also appeared in *The New York Evening Post*.

[61] James's *Principles* also "offended the scientific scruples" of James Sully and G. Stanley Hall, according to Ralph Barton Perry; see his *Thought and Character of William James,* vol. 1, pp. 104–11.

didn't know "what to make of the way the *Nation* treats, & has mainly always treated us. . . . It is some vicious, pigheaded *parti-pris* of Garrison's." William wrote back to Henry on 20 August to express his amusement at his and Alice's "indignation over the Nation review." He made light of it, speculating that it was an "eccentric production probably read by no one" and likely the work of "some old fogy." James added that he "didn't care a single straw for the matter one way or the other, not even enough to find out who wrote it." It seems unlikely that James didn't recognize Peirce's hand in the review so perhaps he was protecting Peirce from his family's indignation.

That Peirce took James's *Psychology* quite seriously is attested to by the fact that he continued to work with it and correspond with James about it. Sometime later, by 1897 but probably before that, Peirce composed a set of forty-six questions on volume one, either to be sent to James or as the basis for a more sustained critical review.[62] On 1 January 1894, Peirce wrote to James to tell him how much he liked his "distinction between substantive and transitive parts of the train of thought" and told him that there was "nothing in your psychology which serves my purposes better." But Peirce believed that James should choose more appropriate "*psychological* terms" for this key distinction and "leave grammar-words for *logic*." Peirce tried more than once to convince James to replace "substantive" and "transitive" with "sessile" and "volatile" or, better yet, with "pteroentic" and "apteroenic" with a nod to the "winged" and "unwinged" words of Homer.

On 9 July, in the same issue that carried the second part of Peirce's review of James, *The Nation* published an editorial, entitled "A Plain Moral Question," that addressed "the idea which the *Christian Union* keeps reiterating . . . that a minister may honorably remain in the service of a church though repudiating leading articles of its creed." *The Nation* praised the open-mindedness of churchmen who could "see how the new wine of modern research is hopelessly bursting the old ecclesiastical wine-skins," but held that if they could not "conscientiously read the new meanings into the old shibboleths" and in continuing to serve their church would have to flout its creed, to do so would be "an immoral thing to do."[63] Peirce felt strong disagreement with *The Nation*'s position and wrote a reply to the editor (sel. 38) declaring that to represent a matter of conduct "wherein serious men differ" as a plain moral question was "highly offensive." Curiously, he argued that while he, a layman, had severed his "visible connection with the Church, and so put [his] soul in jeopardy" because he could not believe "a certain article of faith in the sense in which it is commonly understood," yet "the opposite course of allegiance to God and His Church" was the duty of ordained ministers. The only possible way that the Church can correct its errors is if the "clergy to whom they become known" acknowledge them to be errors "while remaining in their posts." Peirce concluded his letter with a prediction that there would be great "changes in religious beliefs during the course of the coming century" and that any denomination that "pins its existence upon an unyielding creed," as *The Nation* says morality requires, is headed for "break up." Peirce's letter was never published and may not have been sent.

While Peirce worked through the summer to complete his work on the final volume of the *Century Dictionary,* he was thinking of ways to use his familiarity with dictionary work to help make up for the loss of income from the Century Company. Financial pressures were building; in a letter postmarked 22 July, a New York book dealer threatened to take Peirce to court to collect $92.10 that was almost a year overdue. It was crucial to avoid any lessening of income and urgent to find a means of increasing it. He

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[62] These "Questions on William James's Principles of Psychology," will be included in a later volume. Some of the questions were published by Perry, ibid., and some in CP 8.72–90. See Mathias Girel's "The Metaphysics and Logic of Psychology: Peirce's Reading of James's *Principles,*" *Transactions of the Charles S. Peirce Society* 39.2 (2003): 163–203.

[63] See annotation 240.3, pp. 429–30, for the complete editorial.

tried for work with Funk & Wagnalls to help with their famous single-volume *Standard Dictionary,* which was to appear in 1894, and he was hired to provide a table of up to four hundred colors. In August, Peirce offered to work as a general consultant for $5000, but his offer was declined. It occurred to Peirce that he might be able to make some money by lecturing on dictionaries and he wrote to Benjamin Smith, Managing Editor for the *Century Dictionary,* to let him know what he had in mind and to say that he hoped that the Century Company would be "friendly in the matter." Smith, remembering some criticisms Peirce had expressed earlier, wrote back that of course the company "would look upon public *adverse* criticism of the C.D. by a member of its editorial staff as in some sense a breach of trust" but that he did not doubt Peirce's courtesy or fairness (24 Aug. 1891).

Over seven months had passed since on 4 February Peirce had sent Mendenhall the full report on the state of his work for the Survey. Since then, Peirce had continued to send in his monthly "personal reports," but he sent nothing more substantial. Peirce was committed to very high standards for his scientific publications, for which he had achieved an international reputation, and could not bring himself to lower them for the sake of expediency, but he had neither the time nor resources for the work still required before completing his reports. Mendenhall had come to see that he could not make the smooth transition that he wished for from the Peirce era of pendulum research to a new Mendenhall era; to get the full benefit from Peirce's years of gravity research, and perhaps even to give Peirce his due, Mendenhall would have to commit more resources to Peirce's gravity program. He was not prepared for that; he wanted to make a clean break and to start his own program using the half-seconds pendulums he had designed. The time had come to do a hard thing.

On the 21st of September, Mendenhall wrote to ask for Peirce's resignation from the Coast and Geodetic Survey. Mendenhall was now committed to replacing Peirce's European-style operations, which were too expensive, cumbersome, slow, and inefficient, with the simplified program based on his short pendulums.[64] He knew that Peirce would never accept this change and that he might try to impede it, perhaps with the support of other scientists who did not want to see the Survey relax its standards. He could justify letting Peirce go and he thought that was the best course to take. Peirce had shown no inclination to revise his long report in the way Newcomb thought necessary for publication and Mendenhall had waited long enough for the additional reports Peirce owed. Mendenhall could also point to Peirce's heavy commitment to the Century Company and to his connection with *The Nation*. It was time for Peirce to go. Peirce had long anticipated that he would be forced out, even admitting to Mendenhall in his letter of reply (29 Sept. 1891) that it was "a necessary act," yet the fact of it must have been a brutal blow.

Peirce admitted that his work had been going slowly, in part because he could no longer perform the difficult mathematical work needed to finish his reports with the ease of his younger days, but also because of his treatment during Superintendent Thorn's administration and because it had been necessary for him to develop other means of livelihood.[65] But Peirce insisted that he had not been idle and he defended the organization of his gravity report. And even while admitting that Mendenhall was right to ask for his resignation, Peirce suggested ways that he might stay on, asking for a bright assistant for a short time to help him finish his gravity reports and perhaps to help with some new fieldwork at two very interesting sites on his own estate where "valuable determinations of gravity could be made." He noted,

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64 See W6: lxvi ff.

65 See the Introduction to W6 for the story of Peirce's rejected report on gravity and an account of Peirce's treatment during the Thorn administration.

again, that his "chief study for a long time" had been "to produce an efficient method for the practical solution of questions in hydrodynamics," a problem of importance for pendulum research and perhaps the most important current issue for applied mathematics. So, without much hope, Peirce tried to make a case for staying on, but if Mendenhall thought it "more convenient" that his "connection with the survey should be severed" then, Peirce wrote, "I shall depend upon you to indicate to me the date at which my official resignation must be sent at latest, so that it may precede all other official action." Peirce asked if he could meet with Mendenhall in Washington to confer "on the whole question."

Mendenhall replied with a friendly letter, assuring Peirce that he appreciated his "rare abilities and long service" and he promised to find ways to occasionally use Peirce for "discussion of observations" and the like. But he asked Peirce to forward his resignation "at once to take effect on Dec. 31st." Mendenhall did offer to meet with Peirce and suggested that they meet in New York in November when the National Academy of Sciences would hold its meetings at Columbia College. On 1 October 1891, Peirce tendered his resignation to take effect on the last day of the year. That would end thirty years of service for the Coast Survey and would eliminate Peirce's principal source of income, an especially frightening prospect now that his regular work for the Century Company had concluded.

It was clear that making ends meet was fast becoming a truly vital concern. Peirce wrote to John Fiske to ask him to put in "a good word" for him with the editors of *The Youth's Companion,* a highly successful children's magazine that around 1890 began to also target adult readers, and he asked Fiske to help him organize a scheme of lectures that would pay. Peirce also wrote to Garrison asking for more books to review for *The Nation*. His review of Herbert Spencer's *Essays, Scientific, Political, and Speculative* (sel. 39) appeared in the 8 October issue. Peirce previewed some of the key ideas he was developing for his second *Monist* paper, including that there "cannot be the slightest warrant" for holding that the three laws of motion are exactly true, and also that "the law of *vis viva* is plainly violated in the phenomena of growth, since this is not a reversible process."[66] Peirce began his review of Spencer by remarking that the theory of ethics "is, from a practical point of view, one of the most important boons that philosophy has ever imported to the world, since it supplies a worthy motive to conservative morals at a time when all is confused and endangered by the storm of new thought, the disintegration of creeds, and the failure of all evidences of an exalted future life." Peirce's notice of J. Howard Gore's *Geodesy* appeared in the issue for 15 October and Peirce used it as an opportunity to remark on the great contribution the Coast and Geodetic Survey had made on under Superintendents Bache, Peirce, Patterson, and Hilgard in advancing knowledge of the figure of the earth and he expressed confidence that "the present head of the Survey" would continue to pursue this problem.

Sometime during the summer, Peirce had sent a draft of his "Arithmetic" to Risteen and had asked for his assistance in working up examples and in completing some unfinished sections. On 16 October, Risteen returned Peirce's manuscript and said that he had found that he was "not logical enough to arrange the early part of the book" and he asked Peirce to write the text for "notation, numeration, addition, −, ×,÷, 2∫ and 3∫"—Risteen said that he would provide the examples. He offered to draft text for "the commercial part—interest, insurance, stocks, &c." He repeated that he was convinced that he

[66] Peirce's claim that growth is irreversible was promptly challenged and Peirce elaborated and defended his position in the 22 October and 12 November issues of *The Nation:* see annotation 244.6–7, pp. 432–33.

"never could get the earlier part of the book into such shape that it would be logical, and intelligible to a youngster."[67]

One can only suppose that the financial crisis Peirce was confronting was a constantly looming presence for him. How could he and Juliette survive if Mendenhall refused to extend his Coast Survey employment beyond the end of the year? Peirce's new arrangement with the Open Court provided a thin ray of hope. After finishing his definitions for the *Century Dictionary,* Peirce had been able to return to his *Monist* project and on 5 November he was able to send Carus the manuscript for his second article, "The Doctrine of Necessity Examined" (sel. 24). In his letter accompanying the manuscript, Peirce wrote that he considered it "the strongest piece of argumentation I have ever done." He enclosed his bill for $160 and asked Carus if he would consent to printing weekly advertisements in *The Open Court* for his "Instruction in the Art of Reasoning by Correspondence."

In the first paper of his *Monist* series (sel. 23), Peirce had stressed that chance should be an essential element in "our view of the universe" and that it ought to play a key conceptual role in any scientific philosophy. He had reached this conclusion perhaps as early as 1883 (W4: sel. 79), and had been developing its consequences since then, but now he would test it by examining the contrary doctrine, "the common belief that every single fact in the universe is precisely determined by law." Peirce, as a man of science, was looking for a cosmology that explained the world in its fullness and, like Epicurus before him, and Aristotle too, he was convinced that some things could not be explained without appeal to real chance. Peirce was also motivated by his belief that strict determinism left no room for freedom of the will, something he believed there was good reason to admit.

According to Fisch, Peirce had first stated his case against the "doctrine of necessity" in 1887 in "Science and Immortality" (W6: sel. 14), where he took a strong stand against Spencer's "mechanical notion of the universe." In "The Doctrine of Necessity Examined," Peirce constructed a more substantial argumentation by systematically considering and rejecting the main arguments for determinism and then building a positive case for the claim that an element of absolute chance prevails in the world. Peirce named his anti-necessitarian doctrine "tychism" (from *τύχη,* the Greek word for chance) and claimed that "tychism must give birth to an evolutionary cosmology, in which all the regularities of nature and mind are regarded as products of growth." Basic to Peirce's case against determinism were several key ideas, among them, that the prevalence of growth in the universe is inconsistent with the conservation of energy; that the great variety within universe is inexplicable unless due to chance; that law, also prevalent in the universe, must be explained by something other than law, which can only be chance; and that the reality of feeling is "a patent fact enough, but a very inconvenient one to the mechanical philosopher." Peirce claimed that the consequences of tychism can be "traced out with mathematical precision into considerable detail" and that these consequences can be tested as scientific predictions. It is noteworthy that Peirce recommended tychism because it did not barricade "the road of inquiry" as determinism did by insisting on "the regularity of the universe." This marks a step in Peirce's progress toward fallibilism.[68]

Near the end of October 1891, Peirce travelled to New York City for the early November meetings of the New York Mathematical Society and the National Academy of Sciences. He was to meet with Superintendent Mendenhall at the National Academy meetings to discuss his employment with the Coast Survey. Why Peirce went early to New York is unclear, but it was probably to drum up more income-

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[67] Several manuscripts listed in the Chronological Catalog are related to the arithmetic project from around this time, including 1891.46–51 and c.1891.1–2.

[68] See annotation 123.16–17, p. 389.

producing writing projects and to search out other financial opportunities in case his meeting with Mendenhall went badly. He may also have wanted to look into possibilities for the development of his Milford estate. Sometime during the final week of October, while in the office of his friend and Harvard Classmate James Harrison Fay, Peirce noticed a pamphlet written by another Harvard classmate of theirs, an occasional participant in the old Metaphysical Club, Francis Ellingwood Abbot: "Professor Royce's Libel. A Public Appeal for Redress to the Corporation and Overseers of Harvard University."[69] Why Peirce met with Fay isn't known; perhaps he was only visiting an old college friend. But Fay was a businessman of some standing and was well-connected with the railroad industry (he was a Vice-President and on the Board of Directors of the Mobile and Ohio Railroad Company) so Peirce may have wanted to discuss the rapid transit venture he had advanced the year before with the engineer and inventor, Samuel Mott, or he may have had some other venture capital scheme in mind.

Abbot's pamphlet had caught Peirce's attention: it was an appeal to "the President and Fellows and Board of Overseers of Harvard University" to redress "the wrong" perpetrated against Abbot by Josiah Royce, Assistant Professor of Philosophy, who, Abbot alleged, had in his "'professional' position as one of [Harvard's] agents and appointees" publicly attacked his reputation "with no imaginable motive other than mere professional jealousy or rivalry" and who had "gone to the unheard-of length of 'professionally warning the public' against a peaceable and inoffensive private scholar." Abbot had been aggrieved by Royce's stinging review of his book, *The Way Out of Agnosticism,* which had appeared in the inaugural issue of the *International Journal of Ethics* (of which Royce was a founding editor).[70] Ironically, Abbot had based his book on a course of lectures he had given at Harvard when, with Royce's approval, he had filled in while Royce was on leave to recover from a period of serious depression.[71] According to Bruce Kuklick, Abbot had high hopes for his book, thinking it might finally win him an academic post and the respect he thought he had earned, so when Royce's devastating review appeared accusing him of "an unconscious and blundering borrowing from Hegel" and warning readers of his "philosophical pretensions," he knew he had suffered a severe blow.[72] Royce had concluded his review with muted praise for Abbot's "devotion to high ideals" and his "heroic sacrifices in the service of duty," but he justified his harsh assessment of Abbot's book by holding that "in judging of the actual work of philosophical writers, we must lay friendly esteem aside . . . we must show no mercy,—as we ask none." Abbot, wounded and angered by Royce's unkind treatment, prepared a strong reply and submitted it in January to the *International Journal of Ethics,* but after disagreements over demands for revisions and the timing of a rebuttal by Royce, Abbot withdrew it and produced the 48-page pamphlet that caught Peirce's eye when he visited Fay's office.

Peirce had not read Abbot's *The Way Out of Agnosticism,* but he knew Abbot from earlier times and he had recently quoted him on "realism" in the *Century Dictionary,* not to mention that he, too, had had his issues with the Harvard Corporation, so he was sympathetic. He wrote to Abbot from Fay's office saying that, even though he doubted that the pamphlet was "a wise publication," he was confident that Abbot had not plagiarized Hegel and, moreover, that he had long regarded Royce as "one of the large

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69 Abbot's pamphlet, which ran to forty-eight pages, had been printed in Boston by George H. Eliot. See annotation 245.3–4, pp. 433–34.

70 Josiah Royce, "Dr. Abbot's 'Way Out of Agnosticism'," *International Journal of Ethics* 1.1 (Oct. 1890): 98–113..

71 See John Clendenning's *The Life and Thought of Josiah Royce* (Vanderbilt University Press, 2nd ed., 1999) for a full discussion of Royce's health and of his conflict with Abbot.

72 Bruce Kuklick. *The Rise of American Philosophy: Cambridge, Massachusetts, 1860–1930* (New Haven: Yale University Press, 1977).

tribe of philosophical blunderers," so he was prepared to lend a hand (c. 30 Oct 91). Peirce wrote a letter to the editor of *The Nation* in support of Abbot and it was published about two weeks later (sel. 40). In his letter, entitled "Abbot against Royce," Peirce reviewed Abbot's charges against Royce—that Royce had maliciously libeled Abbot and had used unfair means to stifle Abbot's reply—and concluded that while Royce's "warning" was clearly an "unwarranted aspersion," it could not strictly be regarded as libelous though it seemed clear enough that Royce had contrived to have Abbot's reply first postponed and then excluded from publication. Peirce noted that Royce seemed almost openly intent on "ruining Dr. Abbot's reputation," and that is a conclusion often drawn by scholars who examine this dispute.[73] Abbot quickly wrote to thank Peirce for his support, noting that of course Royce had "every advantage of position" on his side: "All the more do I feel the nobility of spirit which moves you to strike a brave blow for me . . . . If it is a high minded thing to champion a just cause against great odds, you have earned, as you certainly receive, my very grateful thanks" (15 Nov. 1891).

Peirce's letter, appearing in such a prominent periodical, brought to the public eye a dispute that had up to that point been isolated to a rather small circle of insiders. James quickly wrote to set Peirce straight, admitting that Royce had taken a harsh and pretentious tone and that Abbot was justified in feeling "sore," but fully taking Royce's side in the dispute (12 Nov. 1891). "Abbot," he wrote, "seems to me simply *insane,* in all that touches on his philosophic or personal pretensions." James said he wished Peirce had just "let the thing die away in silence." Peirce replied that Abbot surely didn't deserve Royce's "sweepingly contemptuous criticism" and that if, indeed, he is "almost insane," then "all the more reason for gentle treatment." James responded that Peirce's view of the matter "does honour to your head and heart, but doesn't convince me that Royce is not *now* the party sinned against" (16 Nov. 1891). James felt duty-bound to now come openly to Royce's defense which he did, as had Peirce, in the pages of *The Nation.*[74] He wrote that Peirce's professed neutrality in the dispute was perhaps more apparent than real, given that Peirce's knowledge of the facts had come principally from Abbot, so "it seems but fair that one with a less *ex-parte* knowledge of the facts should also be heard." James sought to completely absolve Royce and the editors of *International Journal of Ethics* from any moral or legal blame and concluded by asserting that "Mr. Abbot's remedy of heaping personal outrages upon Prof. Royce and his motives, admits of no excuse but a pathological one" and he chastised Peirce for spreading the quarrel "beyond the academic world."

Peirce, having been shown James's letter in the offices of *The Nation* prior to its publication, wrote privately to express his irritation (17 Nov. 1891): "I am sorry you should see fit to sneer at my impartiality." Peirce told James that he knew Abbot and Royce about equally well and that "in searching my consciousness, I cannot detect any more leaning to one side than to the other." Peirce acknowledged that he had adduced some new facts concerning the conduct of the editors of the *Review* which he would reflect on but he insisted that a philosopher could criticize another without hoping to injure him, contrary to what he thought James had implied: **"**Philosophy has not reached the position of an exact science where being in the wrong is somewhat of a reflection upon a man's competence." Royce was plainly trying to injure Abbot, Peirce wrote; his general tone "is that of contempt."

James showed Peirce's letter to Royce and, to his credit, Royce wrote a long and respectful letter to Peirce hoping both to defuse the controversy and to win Peirce's respect: "James knows that I like candid criticism . . . [and] that I deeply respect your work, and your opinion of philosophical matters" (18 Nov.

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[73] See Kuklick 1977, p. 250n.: "For some reason or other, however, Royce had set out to annihilate Abbot's reputation."

[74] "Abbot Against Royce," *The Nation* 53 (19 Nov. 1891): 389–90.

1891). Royce proceeded to set out a long explanation of the dispute and a detailed defense of his position—he assured Peirce that previously his relations with Abbot "had always been cordial" and that he deeply regretted "having so touched his heart when I struck home at his work." This might have ended the matter for Peirce had not yet another letter appeared in *The Nation*, just two days later, purporting to present evidence mitigating, if not refuting, Peirce's account of the Abbot-Royce dispute. The author of the new letter was Joseph Bangs Warner, a lawyer who had been retained by Royce to advise him in the dispute, and who, like Abbot, had been an occasional member of the old Cambridge Metaphysical Club. Warner, like James, while admitting that Royce may have "transgressed the limits of courteous controversy," contended that Abbot's transgressions were greater than Royce's. Warner downplayed any legal culpability on Royce's part but openly warned Abbot that the publication or circulation of his reply to Royce "in its present shape" might "entail a serious legal responsibility" on his part.[75] By so openly demanding that Abbot revise his reply or face legal consequences, Warner was unwittingly strengthening Abbot's position and Peirce's representation of the controversy.

Yet with Warner's letter, the Abbot-Royce controversy had about run its course. On 3 December, one final letter would appear in the pages of *The Nation,* Abbot's retort to Warner.[76] Abbot proclaimed Warner's letter to be "the lawyer's attempt to put forward his own baseless assumptions in his client's behalf" and took the opportunity to quote three long paragraphs from his "suppressed" reply. He concluded by arguing that "when Dr. Royce blew his bugle-blast of defiance, 'We must show no mercy, as we ask none,' he deprived himself of all excuse . . . for seeking refuge behind a menace of prosecution." This closed *The Nation* to the dispute. Following Abbot's letter, the editor of *The Nation,* W. P. Garrison, appended a notice announcing that no more letters respecting the controversy would be printed. Peirce had submitted a second letter but withdrew it and nothing further appeared in *The Nation.* Two months later, a second pamphlet by Abbot was issued: "Is Not Harvard Responsible for the Conduct of her Professors, as well as of her Students? A Public Remonstrance Addressed to the Board of Overseers of Harvard University," but Harvard ignored it and the controversy came to an end.[77]

It is difficult to comprehend this strange altercation and to understand why Peirce came so willingly to Abbot's defense. It seems evident that Abbot and Royce, though cordial up to this point, did not really like each other—certainly they did not respect one another's philosophical powers. Abbot hoped for a Harvard professorship and had even offered to endow a chair for himself, but Royce, as Assistant Professor, clearly had the inside track. Each may have seemed a threat to the other. Abbot was convinced of his importance as a philosopher, and was perhaps almost pathological in the grandiosity of his self-assessments,[78] but he had not come close to achieving the professional recognition that Royce, though much younger, had achieved. It is evident that Abbot was unstable and that he reacted brashly to criticism. But Royce, too, at this time in his life, was somewhat unstable and surprisingly insensitive to the "human factors" involved in philosophical debate.[79] In hindsight, it must be admitted that Royce was the superior philosopher, but it seems evident that he unfairly discounted the strength and originality of Abbot's thought. Royce's review was overly aggressive, even incendiary, but Abbot responded in such an extreme and abrasive way that there was really no chance for reconciliation.

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75 "The Suppression of Dr. Abbot's Reply," *The Nation* 53 (26 Nov. 1891): 408.

76 "Mr. Warner's 'Evidence in Full' Completed," *The Nation* 53 (3 Dec. 1891): 426.

77 See Clendenning, p. 168.

78 Clendenning, p. 148.

79 See John McDermott's introduction to *The Basic Writings of Josiah Royce* (University of Chicago Press, 1969), vol. 1, p. 7.

Why did Peirce, alone among Abbot's peers, come to his defense? It is true, as James had pointed out, that Peirce first learned of the dispute from the account Abbot gave in his first pamphlet, and Peirce had no initial reason to doubt his old classmate's story. More pertinent, perhaps, is that earlier in the year Peirce had selected a surprisingly lengthy quotation from Abbot's *Scientific Theism* to illustrate the different scholastic positions on realism and nominalism for his definition of "Realism" for the *Century Dictionary*. The tensions between realism and nominalism constituted the very heart of philosophical inquiry for Peirce, so for him to appeal to Abbot to clarify the meanings of the relevant terminological distinctions was a sign of considerable respect. It is not surprising that Peirce was repelled by Royce's cynically dismissive treatment of Abbot and that he initially concluded that Royce was trying to ruin Abbot. But as things evolved, particularly with the personal communications from James and Royce, Peirce seems to have warmed to Royce (who would eventually become Peirce's hope for American philosophy). Without condoning Royce's treatment of Abbot, Peirce was content to step away from the battle. But he did write to James to explain why he had made a "plea for gentleness of criticism," which he believed James had assented to partly for the wrong reasons. Among the reasons Peirce gave was his notion that critical journals are implicitly "under contract" with their readers to "notice all books they would be pleased to know about." A journal "is bound not to say a book is mere rubbish, when persons highly qualified to judge may regard it as valuable. As long as that is the case, it is *not* rubbish. (Hence when you tell me you think Abbot's books rubbish, your remark is about as forcible as if you were to inform me you thought Hamilton's Quaternions rubbish.) What competent men find helpful-to-them, is not rubbish." (30 Nov. 1891). Peirce was applying a test similar to the one he had used with Garrison, the editor of *The Nation,* when he criticized him for attaching the title, "A plain moral question," to a "discussion of a point of conduct wherein serious men differ" (sel. 38). In the end, it is likely that Peirce's intervention did Abbot some good and saved his book from being altogether dismissed as worthless. But Abbot's pretentious and caustic treatment of Royce, and of Harvard, left him the loser and surely cost him any chance of a professorship. The general conclusion of the public was probably that expressed in an editorial that appeared in January 1892 in the *Educational Review*, which described the controversy between Abbot and Royce as "the literary *cause célèbre* of the year." The editors of the *Review* considered Abbot to be the main aggressor and made special note of his stuffiness: "University professors . . . will be surprised and amused to find Mr. Abbot assailing their *Lehrfreiheit.*" Abbot's appeal to Harvard to discipline Royce, they said, is the sort of thing "expected from the political partisan and the religious fanatic, but not from a student and teacher of philosophy in this day and generation."[80]

The meeting of the New York Mathematical Society that Peirce had come to New York to attend was held on Saturday, 7 November 1891, at Columbia College and Peirce was elected to its membership, along with Simon Newcomb and others. Peirce had been invited to join the society by Harold Jacoby, Professor of Astronomy at Columbia. Peirce had been a member of the London Mathematical Society since 1880. Peirce would become an active participant in the meetings of the New York Mathematical Society and his intellectual development from this time on was to some degree influenced by his association with the society's members and his involvement in debates over the latest developments in mathematics.[81]

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[80] As for the general public's perception of the whole affair, it was probably best expressed in the subtitle of a short satirical play John Jay Chapman composed after the controversy: *The Two Philosophers: A Quaint and Sad Comedy* (Boston: J. G. Gupples, 1892), where Royce is Josias Josephus Jeremiah Regius, and Abbot is Georgius Gregorius Xavier Gottfried Theisticus.

[81] See Carolyn Eisele's "General Introduction" to *New Elements of Mathematics,* vol. 1, for a discussion of Peirce's association with the New York Mathematical Society and how his participation in its meetings influenced his thought.

The following Tuesday, 10 November, the National Academy of Sciences began its three days of meetings, also at Columbia College. Peirce had been elected to the NAS in 1877 and often attended its meetings. Peirce presented a paper entitled "Astronomical Methods of Determining the Curvature of Space," described as presenting "astronomical evidence tending to show that space possesses a negative curvature, and [calling] attention to various methods of conducting an investigation of this property of space." Peirce's paper, no longer extant, must have been based on methods set out in selection 36 and the results of subsequent measurements of curvature following those methods. Edward C. Pickering, Director of Harvard College Observatory, was the discussant for Peirce's paper. Three months prior to the meeting, on 9 August, Pickering had written to Peirce presumably about the work he was going to present: "Your hypothesis regarding the distribution of the stars is very interesting. As I understand it, hyperbolic space is a mental conception and not a physical fact. It is therefore difficult to understand how it can represent a material phenomenon except by an accidental coincidence." The content of Pickering's response at the meeting was not reported. Peirce was the discussant for a paper by Ogden Rood, "On a Color System," and he was also a discussant for Seth C. Chandler's paper, "On the Variation of Latitude." A presentation that surely attracted Peirce's attention was Mendenhall's paper, "On the Use of a Free Pendulum as a Time Standard."

Peirce's paper on the curvature of space continued to attract attention after the meetings. On 7 December, George Bruce Halstead wrote that he was very much interested in the paper and would like a reprint of it, and E. H. Moore, then of Northwestern University but soon to be Professor of Mathematics at the University of Chicago, wrote also to say that he would "consider it a great favor" if Peirce would send him a copy (27 Feb. 1892).

After the Academy meetings concluded, Peirce stayed on in New York "to try to find some way of making a little money," as he wrote to Juliette, but he also wanted to see Mendenhall. He had come to New York expecting to meet with Mendenhall at the NAS meetings to talk about his "retirement" from the Survey. Even though they both attended the NAS meetings, apparently Mendenhall couldn't find time to meet with Peirce privately. Two days after the close of the meetings, Peirce wrote to Mendenhall: "I came to NY solely at your suggestion for certain necessary conversation. You gave me appointment at Hoboken this morning. Where shall I see you and when?" (14 Nov 91). They met the following day, on Sunday, possibly at the Stevens Institute where Peirce had operated a gravity station for the Survey, but Mendenhall decided that they should continue their discussions in Washington. On Monday (16 Nov.), he issued "official instructions" for Peirce to "proceed to Washington, D.C., for conference with Superintendent," and promised to cover travel expenses.

On 18 Nov, before meeting with Mendenhall in Washington, Peirce wrote to him about their meeting in Hoboken: "I feel impelled to say that one or two things you said to me on Sunday appear to me quite wrong." Peirce objected to Mendenhall's dismissiveness of the aspirations of assistants striving to meet higher standards:

> That view seems to me in the first place to overlook the facts of human nature. If you pay a man a very low salary to begin with, and then forbid him to have any warmth or zeal in the conduct of his office, carefully remove all intellectual interest it might have and leave him nothing but the pure money to work for, and finally construct a series of fiscal regulations the main purpose of which seems to be to take up as much time with accounts as possible,—if you do all that you will have the heads of bureaus even worse than they are now. In the second place, it rather shocks me to hear *you* who know what a slough of materialism this country is sunk in, where nothing is considered as sacred except the holy, holy, holy dollar,—giving in to complaints against heads of bureaus that they are spending a little money in trying to advance science. . . . Then you say that the prosecution of science should be

left to the Universities. Well, I admit the official science here is not very much, but I must say it is better than any our universities can give.

On 19 November, probably before receiving Peirce's impassioned letter, Mendenhall recorded in his diary: "A.M. office: meet Professor Peirce. He walks with me to E. 18 St. N.E. and we arrange for his withdrawal from the Survey." He met Peirce again the following evening at his club (possibly the Metropolitan) where, presumably, they discussed arrangements for the conclusion of Peirce's employment—although Peirce was not yet ready to accept that his career as a professional scientist was so quickly coming to an end.

Probably on the same night, after meeting with Mendenhall at his club, Peirce met with his old friend, George Ferdinand Becker, a member of the U. S. Geological Survey. From a letter Peirce sent to Becker on 21 November, it appears that Peirce had regaled Becker with an account of his cosmology; Peirce wrote that he had been struck with the quality of Becker's objections and told him how much his work would benefit if only he had "such an interlocutor for [his] neighbor." Peirce also must have told Becker about the loss of his position with the Coast Survey and about the financial predicament it put him in. Soon afterwards, Becker wrote to Mrs. Louis Agassiz to see if she would approach Augustus Lowell about engaging Peirce for a course of lectures at the Lowell Institute. Mrs. Agassiz replied that she had always liked Peirce and would be "only too happy" if she could "be in any way instrumental in securing this opportunity for him"; she had forwarded Becker's letter to Lowell, along with a letter of her own urging Lowell to engage Peirce. Lowell readily agreed to offer Peirce a course of lectures for the following winter. Peirce was touched when he learned of this outcome and wrote to thank Becker: "Now this is a truly charming thing that you have done. . . . I hope I shall some day be able to reciprocate."

Peirce wrote to Lowell on 6 December offering to lecture either on the history of science from Copernicus to Newton or on the comparative biography of great men. He sketched what he had in mind for each alternative, first for the course on the history of science:

Two introductory lectures would be required, one to sketch the whole history of science and show that the period in question is the heart of the whole, the other to run over that period and show in a general way what are the works calling for further study. It is to the methods of reasoning that I should draw special attention; and Kepler who on the whole was I think the greatest reasoner who ever lived, would claim three hours. Newton would call for two, Leibniz for one, Galileo for one, Copernicus, Harvey, Gilbert, and Bacon would together want two, Descartes, Pascal, Fermat, would want one. I have counted up to 12, though I have omitted Huygens, Boyle, and other great names, for whom, and for a résumé and concluding sketch of subsequent history, room would have to be made by compression.

The subject of the other course, Peirce wrote, "is much lighter":

It refers, not to the *eminent* men whom Galton has studied, but to a higher order, the *phenomena* of the history of mankind. A list of about 300 of such men would be formed and discussed, and a method for the comparative study of them developed. Comparative lives of a few of them would be given,—a sort of scientific Plutarch,—scientific I mean in the treatment, not so exclusively as to the subjects. Finally, a large number of general questions relating to the nature, kinds, causes, and characters of greatness would be inductively considered. This would be quite elastic as to the time required.

Lowell chose the lectures on the history of science from Copernicus to Newton, "the subject which Mr. Becker suggested," and "a subject which your studies have led you to explore so deeply that there is probably no one who could treat it with so much knowledge and acumen as you," and agreed to twelve

lectures (8 Dec. 1891). Peirce knew that Lowell would pay well but it would be several months before he could expect to see a check from him.[82]

From Washington Peirce returned to New York to make some money—he was determined not to go home to Milford empty handed. Garrison obliged Peirce by giving him an advance and by assigning an obituary of Oliver Wolcott Gibbs for *The Nation*'s graveyard (Gibbs would live until 1908). Garrison also asked him to review George F. Chambers's *Pictorial Astronomy for General Readers* and Dascom Green's *An Introduction to Spherical and Practical Astronomy*. Peirce's dismissive review of Chambers appeared in the 26 November issue of *The Nation* (sel. 41), and his review of Green appeared in the 17 December issue (and was reprinted in *The Evening Post* on 23 December). In his review of Green, Peirce took the opportunity to express his opinion about textbooks: "A book such as this might easily have been, which should touch upon every necessary matter with logical severity, giving all that is needed and excluding all that is superfluous, would serve as an intellectual tonic for the young man, and operate in some degree as a corrective to the dissipating and demulcent influences of other modern textbooks."

Hard-pressed to find alternative sources of income, Peirce's hope rekindled that he could turn his logic into cash by reviving his correspondence course on the art of reasoning. It had not worked when he tried it five years earlier but then it had been seriously interrupted just when it got going by the Peirces' move to Milford.[83] When Peirce sent in his second article for *The Monist,* on 5 November 1891, he had asked Carus to run a weekly advertisement for his correspondence course in *The Open Court*. Carus agreed and the following advertisement ran regularly for a year:[84]

Mr. C.S. Peirce has resumed his lessons by correspondence in the Art of Reasoning, taught in progressive exercises. A special course in logic has been prepared for correspondents interested in philosophy. Terms, $30, for twenty-four lessons. Address: Mr. C. S. Peirce, "Arisbe" Milford

There is a letter from Peirce to a Miss Daniells (12 Sept. 1891) that may be a response to a question about Peirce's logic course: "Suppose a person says that if A is true B is true. Then, if what he says is true, and if the antecedent, A, is true, the consequent, B, is also true; is it not?" Peirce went on to prove that black is white, based on a clever play of assumptions. But there is no further indication of any interest in the course and on 25 August of the following year Peirce wrote that he had "never got a reply" and asked that the advertisement be discontinued. Selection 42, and several other manuscripts composed around this time, were probably intended for the correspondence course.[85]

Another project of Peirce's that might belong to this time was his elaborate "Rules for Cataloging a Library."[86] This document, which incorporates guidelines from several sources, especially from Charles A. Cutter's "Rules for a Dictionary Catalogue" (a third edition of which came out in 1891), may have been prepared for use by the Astor Library or, perhaps more likely, Peirce's intensive library research during this period may have given him the idea of producing an improved cataloging system that could be profitably published. This project might also be connected with Peirce's cataloging of his personal library.

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[82] Peirce delivered his Lowell Lectures on "The History of Science" in Boston, between 28 November 1892 and 5 January 1893. The lectures will be included in W9 and will be discussed more fully in the introduction to that volume.

[83] See W6: xxvii–xxx and sels. 2–13.

[84] In the advertisement, "Arisbe" was misspelled as "Avisbe."

[85] See the following entries in the Chronological Catalog: c.1891.6; 8–10.

[86] See entry c.1891.4 in the Chronological Catalog.

While in New York, Peirce renewed his acquaintance with Albert Stickney, another Harvard classmate who had become an attorney. Stickney was surprised when Peirce sought him out, not remembering that Peirce had ever shown much interest in him in earlier days, but he was glad to reconnect with "one of the few men who reason—and think" (30 Sept. 1891). Peirce had invited Stickney to visit Milford, ostensibly to "shoot," but he may already have been thinking that it might become necessary to rent out the main house on a seasonal basis and that Stickney might be useful for finding wealthy New Yorkers interested in vacationing in the Poconos near the famed Delaware Water Gap. When Peirce met with Stickney, sometime in December before returning to Milford, renting out his house at Arisbe was a main topic of discussion. With their relations reestablished, Stickney would serve as Peirce's legal counsel for several years to come.

Mid-way through December, with the agreed-on date for his resignation from the Coast Survey drawing near, Peirce became increasingly anxious over its dire portent for him and for Juliette. The prospect of the almost immediate loss of the regular income he had depended on for most of his adult life was surely distressing, but so too was the significance of the loss of the position that had made him part of America's oldest and probably still most prestigious scientific institution, one that his father had led for a time, and which had shaped him into one of America's leading scientists. He made a final attempt to postpone the inevitable. On 18 December, he wrote to Mendenhall to request a furlough without pay and he asked Henry Cabot Lodge, a member of the U. S. House of Representatives and a relative through marriage, to approach Mendenhall in support of his request. Lodge wrote to Mendenhall but failed to persuade him.[87] In his letter to Mendenhall, Peirce was reflective and tried to make sense of what was happening. He again acknowledged that his computing proficiency had declined in recent years and that he had come to have difficulty with some kinds of mathematics; he had said little about it but he had asked, unsuccessfully, for an aid. This helped explain why he had taken so long with his reports. But he still had strengths, he said, and he had hoped, even expected, that Mendenhall would have called him back into the field. Though now more accepting of being let go, Peirce pleaded with Mendenhall to grant him more time to finish his reports.

> Now if you insist on these papers being ready before December 31, I fear I shall be so crazed by it that it will be the end of me. Yet even that would be less cruel than making me return them as they are. Let their return be postponed. About the report I sent you, you have treated me unjustly. Nothing could be more carefully done. The separation of the treatment of relative from absolute gravity is *logical*. To insert in that paper the value of *g* I earnestly protest against as *illogical*. The expression *g* in *dynes* I hope you see yourself is a total violation of the C. G. S. system to which the word *dyne* belongs. The expression by means of logarithmic seconds is in my opinion a great convenience. And I think considering Mr. Thorn's formal promise to that effect, the paper should be printed as I wish it. But I cannot complain at your wanting my resignation. I say to myself that I am the victim of a malady the result of excessively hard work in the Survey.[88]

Mendenhall wrote back the day before Christmas denying Peirce's request for a furlough but offering again to keep Peirce on as a consultant, calling on him from time to time to avail of his special knowledge and compensating him for his service. Mendenhall was sympathetic with Peirce's feelings concerning his reports and said he could retain his work for the time being in order to "put it into shape as you feel able to do so." If Peirce found that he could not finish the reports, Mendenhall asked that he "put the material

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87 Lodge to Peirce, 18 Dec. 1891.

88 For more of this letter see W6: xxxvi.

in such condition that something might be made of it by others." Mendenhall then asked Peirce to return promptly the books and other property of the Coast Survey that he held and he asked if Peirce would like to have a notice of his withdrawal from the Survey placed in the weekly periodical, *Science*. On 26 December, Mendenhall forwarded Peirce's letter of resignation to the Secretary of the Treasury and ask that it be accepted "to take effect from and after December 31, 1891." On 8 January 1892, the following notice appeared in *Science:*[89]

> Mr. Charles S. Peirce has tendered his resignation as Assistant in the United States Coast and Geodetic Survey, to take effect Dec. 31. Mr. Peirce was first attached to the Survey about thirty years ago. During the greater part of the time he has had charge of its operations relating to the determination of the force of gravity. Some of the results of his investigations have been published as appendices to the Annual Reports and have embodied contributions of great importance to science. It is understood that Mr. Peirce will continue to furnish the Survey from time to time special discussions of topics related to the subject to which he has devoted so many years.

When, two years later, Mendenhall was questioned about Peirce's dismissal by a Congressional Committee, he said that Peirce's work, though of the highest character, "lacked the practical quality" which he believed to be essential. About Peirce's late gravity reports, he said that he had not published them because Newcomb and other experts had found them to be "not valuable."[90]

Looking back on these events seventy-five years later, Victor Lenzen, professor of physics and the man who, as a philosophy student at Harvard in 1914, the year of Peirce's death, had been sent by Josiah Royce to Milford to help Juliette pack up Peirce's manuscripts and books for shipment to the Harvard Philosophy Department, considered the justification for some of the key decisions that had led to Peirce's separation from the Coast Survey. With respect to Mendenhall's decision to replace Peirce's gravity program with one that employed half-seconds pendulums, Lenzen wrote to Max Fisch that Etienne Gilbert Defforges, "the foremost French pendulum swinger" who was in Washington in 1891, agreed with Peirce's criticism of half-seconds pendulums and considered the work of Von Sterneck to be of no value (7 July 1965). Later, in his published study of Peirce's disputed "Report on Gravity at the Smithsonian, Ann Arbor, Madison, and Cornell," which Mendenhall claimed in 1894 to be of no value, Lenzen concluded that "the experimental and theoretical work . . . was the best work of its kind in the nineteenth century."[91] Finally, in 1988, historian Thomas G. Manning examined this transitional period in the long history of the U. S. Coast & Geodetic Survey, and gave this concluding assessment: "The departure of Peirce meant the end of world renown for the Coast Survey in gravity studies."[92]

It is ironic that Peirce spent the final days of 1891, the last days of his employment with the Coast Survey, in epistolary debate with Simon Newcomb, the very man who, unbeknownst to him, had cemented Mendenhall's resolve to let him go. But Newcomb was, after all, the Superintendent of the Department of the Navy's Office of the Nautical Almanac and was one of the most influential scientists in the United States. Peirce wrote to Newcomb in mid-December about the possibility of getting a grant to enable him to continue his investigation of the curvature of space. In letters of 17 and 21 December,

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89 *Science* 19.466 (8 Jan. 1892): 18.

90 See Victor Lenzen. "An Unpublished Scientific Monograph by C. S. Peirce," *Transactions of the Charles S. Peirce Society* 5.1 (1969): 5–24, and W6: lxviii..

91 Lenzen, ibid., p. 20.

92 *U.S. Coast Survey vs. Naval Hydrographic Office; a 19th-Century Rivalry in Science and Politics* (University of Alabama Press, 1988), p. 110.

Peirce laid out in great detail for Newcomb the evidence he had already gathered, and what his next steps should be, but he said he could no longer "afford the luxury of unremunerative work." Clearly, Peirce expected his project to be attractive to an astronomer of Newcomb's rank: "The discovery that space has a curvature would be more than a striking one: it would be epoch-making. It would do more than anything to break up the belief in the immutable character of mechanical law, and would thus lead to a conception of the universe in which mechanical law should not be the head and centre of the whole. . . . I should like to have a whack at it myself." Newcomb wrote back on 24 December to say that he was too busy to "give the subject the study which it deserves," but that he saw problems with Peirce's project. "First, does not the fact that all recent determinations of parallax are relative, prevent us drawing any conclusion as to a limit of ultimate parallax? It seems to me it does. . . . Second, in drawing conclusions from statistics of stellar magnitudes, the number of disposable hypothesis seems to me so great that we can scarcely test them . . . much less, then can we draw a conclusion as to the curvature of space. . . . Third, the proposition that the proper motions of faint stars are not much smaller than those of bright ones seems to me not established." Newcomb did not think Peirce had any chance of getting a grant: "the task of getting the scientific world to accept any proof now possible that space is not homoloidal is hopeless and you could have no other satisfaction than that of doing a work for posterity" and it would be "unusual, if not unprecedented, to pay an investigator to do a work of his own out of trust funds for the advancement of science." Clearly, Peirce would get no help from Newcomb. Peirce replied the following day, on Christmas Day 1891, that he had "for the present given up the idea that anything can be concluded with considerable probability concerning the curvature of space." He reiterated that the results he had already obtained using his method did favor a negative curvature: "But it may simply be due to the fact that my 'distances' are still affected no doubt seriously by intrinsic brightness and by absolute motion. So that, all things considered, I can only say that excessively doubtful indications favor a negative curvature. In point of fact, we remain in ignorance."

A grant to provide needed income while enabling Peirce to pursue scientific work of revolutionary significance would have been ideal but he surely knew that his chances were not very great. It might be some time before he could again devote his intellectual powers to the straightforward advancement of knowledge. His principal ideas for recovering from the reduction of income following the completion of the *Century Dictionary* and from the impending disastrous loss of his Coast Survey salary were mainly focused on writing or public lecturing, or on investment schemes of one sort or another. But Peirce never gave up hope that he might return one day to university life. On 24 December, Peirce's friend, Edward S. Holden, Director of the Lick Observatory, wrote to Peirce about the recent opening of Stanford University and the possibilities there. Holden knew Stanford President, David Starr Jordan, and said he would speak to him about hiring "the best man on the planet in Logic." Peirce asked Newcomb to recommend him to Jordan but Newcomb declined. Peirce also tried for a non-resident position at Cornell University's Susan Linn Sage School of Philosophy, also founded in 1891. Peirce wrote to Estevan Antonio Fuertes, Dean of the Department of Civil Engineering at Cornell, to ask about the possibilities of an appointment there. Fuertes had been Peirce's host at Cornell when he was stationed there in 1885 for gravity research and Peirce was so impressed with Fuertes that he recommended him for the superintendency of the Coast Survey to replace Hilgard, who had been dismissed in July. Fuertes passed Peirce's letter on to the Cornell University President, Charles Kendall Adams, who replied very cordially, remembering with pleasure the weeks Peirce had spent at Cornel with Juliette, but with the news that given the cost of erecting new buildings, there was little remaining for non-resident lecturers. Still, he would confer with the Dean of the School of Philosophy to see if anything could be arranged. Nothing came from either

attempt but Peirce did not lose hope and would try for positions with other universities in the coming year.

Friday, January 1st, 1892 was not only the beginning of a new year for Peirce, it was the beginning of a life of financial instability such as he and Juliette had never known. After thirty years of service to the Federal Government, Peirce had been let go without a pension and without any regular income. This was on Peirce's mind as midnight passed and the new year started. At 12:05 a.m. Peirce penned a note: "I have a hard year, a year of effort before me; and I think it will help me to keep a diary. My greatest trial is my inertness of mind. I think I shall very soon be completely ruined; it seems inevitable. What I have to do is to peg away and try to do my duty, and starve if necessary. One thing I must make up my mind to clearly. I must earn some money every day." In the morning he packed up Coast Survey instruments, books, and records that Mendenhall had asked him to return and sent them by express to Washington. But Peirce was not ready to sever all ties with the Survey; he still hoped to finish his report and see his results in print. On the 9th he wrote to Mendenhall to ask for some materials to help him complete his work and on the 20th Mendenhall sent what was needed.

Peirce knew that to fulfill his resolution to earn some money every day he would have to find additional sources of income and that it would help to be in New York. This was becoming an old story but it was now more crucial than ever. Peirce's friend, Stickney, wrote to him on January 2nd that he might have found someone to rent the Arisbe house—a Dr. McBurney, presumably the surgeon who would be called to Buffalo in September 1901 to try to save President McKinley after he had been shot at the Pan-American Exposition. After telling Peirce about McBurney, Stickney added: "I will bear in mind what you say about work and shall most gladly do anything in my power to bring you and opportunity together. The rarer a man's powers are, the harder it is to find their channel." Peirce wrote again to John Fiske asking for more information about entering the public lecture circuit. Fiske replied on the 2nd with helpful hints from his own experience. He told Peirce that he never bothered with agents: "I write a few months beforehand to the people in different places, and arrange dates, prices, and subjects; and it is an infernal bore." He wanted to hear back from Peirce after he had "made a start with it," and wished him success. Peirce would soon begin preparing a few popular lectures to see how it would go—one of his first tries would be a literary rendering of his experiences in Thessaly in 1870, when, as a young man, he had travelled there for the U.S. Coast Survey. Peirce also went to work early in January on his scholarly Lowell lectures on the history of science, aware that his work on those lectures could provide materials for spin-off lectures of a popular nature. And Peirce kept trying for additional writing venues—he heard from *The Sun*, in a belated reply to an inquiry, that any contribution he offered would "receive favorable attention and if used will be paid for" (11 Feb. 1892).

On 3 January, Peirce received a letter from the social historian, Brooks Adams, grandson of U.S. President, John Quincy Adams, commenting on Peirce's first *Monist* paper, "The Architecture of Theories." Adams had been educated at Harvard where, as an undergraduate, he had taken his mathematics with Benjamin Peirce and, later, had studied law under Nicholas St. John Green, the lawyer who had championed Alexander Bain's definition of belief at the Cambridge Metaphysical Club. Apparently Adams and Peirce had spent some recent time together, perhaps at the Century Club, and their conversation had stimulated Adams to read Peirce's paper. Adams told Peirce that he admired his argument, though he didn't think he quite understood what Peirce meant by "chance," but he thought he followed Peirce's reasoning and didn't find any great gap between them: "You do not maintain that we are in chaos at present; and I do not care what instant you set for the beginning so long as order reigns in the evolution of the phenomena I observe." Adams remarked casually on Peirce's views on causation,

time, and chaos, and concluded that "If we can discover one law we can amuse ourselves by tinkering with that." It was a light-hearted note that might have brought a bit of cheer to Peirce at the beginning of what was bound to be a difficult year. There is no indication that Adams, now remembered as a critic of capitalism, and Peirce had discussed social issues or politics but Peirce's increasing attention to the inequities of the capitalism of his day would have been consonant with the concerns of Adams.

Early in the new year, Peirce returned to the study of great men that he had conducted with his students at Johns Hopkins in 1883–84 (W5: xxiii–xxiv). What renewed his interest in comparative biography[93] is not certain, but there was a convergence of circumstances around this time that were likely factors. Peirce's review of Fraser's *Locke* (sel. 10), written in September 1890, had certainly brought his old study to mind—it was clearly alluded to in the opening paragraph of the review, and Locke, after all, had been the subject of one of his detailed great men questionnaires (W5: 68–70). And in December, when he offered to prepare a course of lectures for the Lowell Institute on "the comparative biography of great men," Peirce evidently was thinking of the study he and his students had conducted eight years earlier. It was also around this time when Peirce was assigned two books to review for *The Nation* that connected significantly with the substance of Peirce's earlier study: Frederic Harrison's *The New Calendar of Great Men* and Cesare Lombroso's *The Man of Genius*.

In January, with interest in his old study renewed, Peirce undertook to revise the provisional list of 287 great men he had stopped with in 1884 (W5: sel. 3). His intention, from the beginning, had been to compile a list with 300 names, but his departure from Baltimore in the fall of 1884 had ended the great men project prematurely. Now he took up his old list again, renaming it "The Great Men of History," to bring it to 300 names as originally planned (sel. 43). Peirce added twenty new names to his list,[94] removed five,[95] and bracketed two, Paul Morphy and Lavater, including them with nineteen other bracketed names of persons thought to "very extraordinary" but not "exactly great." Peirce now, at last, had his list of 300 names. All but five of the added names had come from Peirce's early "Materials for and Impressionist List of 300 Great Men" (W5: sel. 2); the five names not originally considered at all were Claude Lorraine, Alexandre Dumas, W. L. Garrison, Madame Roland, and Daniel Webster.

On 10 January, Peirce sent Garrison his review of Harrison's *New Calendar of Great Men* which was published in the 21 January issue of *The Nation* (and the 26 January issue of *The New York Evening Post*) under the title "The Comtist Calendar" (sel. 44). Peirce focused on Comte's method and choice of "worthies" and severely took him to task for excluding altogether (among others) such indisputably great persons as Bentham, Berkeley, Calvin, Cauchy, Charles XII, Cortez, Queen Elizabeth, Epicurus, Fresnel, Gauss, Gilbert, Herschel, Jesus, Laplace, Luther, James Mill, Napoleon, Ockham, Ricardo, Rousseau, Rumford, Duns Scotus, Sydenham, Vesalius, Wesley, and William the Conqueror, all included in Peirce's list. Comte's selections were "plainly animated by some ulterior purpose," Peirce wrote, not by the dispassionate objectivity of a genuinely scientific man. Comte's great men were only "figureheads," selected for the purpose of serving "as factors in the advancement of the human race, abstractly considered"; Comte, Peirce said, was "utterly wanting" in genuine "admiration and sympathy for great

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93 Now we would say "historiometry," a term coined by Frederick Adams Woods and introduced in his book, *The Influence of Monarchs,* 1913, for which Peirce contributed a promotional comment, as did Josiah Royce, to support sales. Peirce told Woods that "biometry" would have been a better word.

94 The added names were: St. Bernard, John Bernoulli, St. Charles Borromeo, Canova, Carlyle, Chopin, Claude Lorraine, Sir Humphrey Davy, Diderot, Dryden, Alexandre Dumas, Froissart, W. L. Garrison, Pasteur, Madame Roland, Marshall [Maurice de] Saxe, Solomon, Swift, Vauban, and Daniel Webster.

95 The five names Peirce removed were: Aristophanes, Grassmann, Haroun al-Rashid, Riemann, and Sylvester.

men." No study of truly great persons can be valuable if it is beholden to an agenda that turns heroes into biased abstractions that neglect their "living reality and passion" or their "concrete souls." Incensed by Comte's unfair treatment of Fermat, Peirce deplored the general incomprehension in which reasoners are held in a utilitarian world: reasoners are of use only to posterity, and that makes them perpetually irrelevant since "ordinary men have not imagination enough to be interested in posterity"—an indirect answer to the acid remark Newcomb had made to Peirce in his Christmas eve letter: "you could have no other satisfaction than that of doing a work for posterity." Peirce dismissed the organization of Comte's calendar, intended to replace the Gregorian calendar, as "a fanciful invention" and "no transcript from nature." Toward the end of his review, Peirce reflected on the conditions necessary for the emergence of greatness, and one supposes he was, in part, thinking of his own circumstances. Kepler's great work, "the most marvelous piece of ampliative reasoning ever executed, as well as the most momentous in its consequences, was rendered possible only by his wife's riches and the bounty of the Emperor," and it was "only a sinecure professorship . . . that enabled Newton to do his work." Peirce's favorite example of the dependence of greatness on opportunity and material support was Aristotle and Alexander. Without Alexander, Aristotle "would scarcely . . . be heard of today. . . . the greatest man of thought of all time was beloved by the greatest man of action. It needed an Alexander to appreciate an Aristotle. Peirce again quoted Palissy the Potter, who held that "a large majority of the world's powerful thinkers are either crushed by circumstances or forced into the pursuit of wealth, and so lost for the world's uses."[96] Men of thought faced the most difficulty in America: "There is no civilized country where a great work of reasoning is less feasible than in ours."

After finishing his review of Harrison's *New Calendar of Great Men,* Peirce took up Lombroso's *The Man of Genius.* Lombroso, one of the founders of criminal anthropology, was much discussed in psychological literature that Peirce was probably familiar with, in particular, in G. Stanley Hall's *American Journal of Psychology*—Hall had noticed Lombroso's *The Man of Genius* (in its French edition of 1889) in the April 1890 issue. Lombroso was a biological determinist whose work contributed to the theoretical framework supporting the eugenics movement and is said to have been used by the Nazis to support their targeting of select "biological" groups.[97] In his dismissive review (sel. 47), published in the 25 February issue of *The Nation* (and the 27 February issue of *The New York Evening Post*), Peirce examined in some detail Lombroso's inductive argument that genius is a mental defect or disease, with its unintended corollary that "the whole of civilization is due to insanity," and demonstrated that Lombroso's inductive method was seriously flawed. Peirce used his own list of "Great Men of History" (sel. 43) to expose the unsoundness of Lombroso's conclusion that geniuses tend to be "of smaller stature than ordinary men"—Peirce managed to cite nearly one third of the names from his own list in the process. Peirce's general conclusion was that "the main argument of the book proves nothing and renders nothing probable." Peirce did not dispute the obvious fact that genius is abnormal—later he would say that the greater of great men "somewhat partake of the nature of monstrous births in that their exceptional natures are largely due to causes that very rarely operate at all" (R1125; W5: xxiv)—but if genius is a disease, as Lombroso claimed, then "we had better try to propagate it" rather than committing "our Napoleons, our Pythagorases, our Newtons, and our Dantes" to "Genius Asylums." Peirce devoted the final two paragraphs of his review to a consideration of the importance of abnormality for genius. He speculated that a normal brain, with its abundance of commissures, tends to determine behavior as though we were

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[96] See note 28 above.

[97] *The Origins of Nazi Genocide* by Henry Friedlander, University of North Carolina Press, 1995.

"wild animals." It is true that, over time, we can control our actions "a great deal" by forcing ourselves to "take habits, certain commissures becoming partially atrophied, while others are brought into activity under exercise. But in the main we behave as it is our nature to." Peirce even speculated that "an excess of medial commissures, or those between the two halves of the brain," might cause stupidity, "deliberation becoming impossible," and that in such cases a "disease of the brain may cause an improvement in the general intelligence." But if the brains of the greatest geniuses are significantly different than ordinary brains, perhaps by being more complicated or by unusual connectivity, it will likely be "less adapted to the ordinary purposes of life" making its owner "the victim of his own higher organization." Peirce supposed that such brains could benefit mankind in ways "ordinary heads" could not but that the genius would "have to pay for it . . . vainly trying to make [his brain] do things for which it is entirely unadapted, though other brains do them with ease." It is difficult to read the final paragraphs of Peirce's review of Lombroso without thinking that he, again, had himself in mind.

Near the end of January, Peirce returned to New York, where he would stay for an extended period. He knew that New York offered financial opportunities not open to him in Milford—and for his writing projects he probably wanted to be close to the Astor Library. Juliette was already in the city, apparently visiting their friends, the Gills, in upper Manhattan. William Fearing Gill was an author and poet, the biographer of Edgar Allan Poe, and once described in the *New York Times* as an "indefatigable promoter of cheap cabs and bad plays."[98] In 1888, Gill had married Edith Olive Gwynne, a younger sister of Mrs. Cornelius Vanderbilt, and the marriage had caused something of a scandal. In October 1891, Gill told Juliette he was negotiating for the production rights for a play in which he wanted to cast her as the heroine. The Peirces and Gills were good friends and apparently saw each other often—in 1894 the Peirces would become the godparents to the Gills' first child. It is unclear how long Juliette had been away from Milford, but, at the close of January, Peirce wrote to her (in French) to say that he was "sick, unhappy, almost in despair" and that he was leaving for New York and would try to see her on the following day. On February 2nd he wrote that his train had arrived too late and that he had spent the next day "down town" in the hopes of finding "something favorable to report" before seeing her. He had met with his brother, Herbert (Berts), who "proposed something which looks as if it had a small fortune in it" and had found some other possibilities: "One or other of them might give me a salary of $5000. Very doubtful, but worth trying for." He told Juliette he had gone up to the Gills that morning only to find that she had left for to Milford. He wrote that he could not return to Milford "till I have some money coming right in" and he urged her to come back to New York: "I need you & must have you here. I want your *counsel* and *help*."

Fortunately for Peirce, he could depend on Garrison for piecemeal work for *The Nation.* Of course his reviews and commentaries brought far less than he and Juliette needed, but Garrison did what he could to direct more assignments to Peirce during the hardest times. On 29 January, Garrison wrote to apologize to Peirce for unthinkingly sending the 1891 English edition of Dmitry Mendeleyev's *The Principles of Chemistry* to someone else for review: "By way of compensation I turn over to you rather than to your rival Tyndall's new book,[99] which has several 'men of genius' in it & other good matter. I trust a simple notice of it can be made to suffice." Garrison offered to let Peirce add something about Mendeleyev's *Principles* if the occasion arose and he asked Peirce to look over a letter that Werner Stille had sent about Peirce's "The Comtist Calendar." Peirce wrote up a review of Tyndall which never appeared, but in

98 *New York Times,* 1 July 1888.

99 John Tyndall, *New Fragments,* 2nd edition, Appletons, 1892.

March he would get a chance to add something about Mendeleyev (sel. 48). The letter from Stille, with an editorial reply written by Peirce, appeared in *The Nation* for 11 February.

Peirce's interest in the geometry of space did not lessen with his decision to suspend his experimental investigation of the hypothesis that space has a negative curvature. On 15 January, Halsted wrote to express interest in a suggestion of Peirce's for "a modern-synthetic-geometry treatment of non-Euclidean geometry." Halsted enclosed a copy of the fourth edition of his translation of Lobachewski and promised to soon send his translation of Bolyai. Halsted's translation of Lobachewski, which in its first edition had appeared only a few months earlier, had not yet been reviewed in *The Nation,* and Peirce set to work to remedy that neglect. Peirce's review, "The Non-Euclidean Geometry" (sel. 45), appeared in the 11 February issue of *The Nation* (and was reprinted on 1 March in *The Evening Post*), and Peirce took the opportunity to promote non-Euclidean geometry. He began by announcing that Lobachewski's "little book" marked "an epoch in the history of thought, that of the overthrow of the axioms of geometry," and that the "philosophical consequences" of this revolution "are undoubtedly momentous." He told the story of how Euclid's fifth postulate, his theory of parallels, had been the "one little speck" that Lobachewski had found in Euclid's "empyrean of geometry" that was susceptible of refutation, and how Riemann, in 1854, had demonstrated that Euclid's "pretended proof" was fallacious. "The truth is," Peirce wrote, "that elementary geometry, instead of being the perfection of human reasoning, is riddled with fallacies." Peirce pointed out that, according to Lobachewski, we cannot be sure that "the infinitely distant parts of an unbounded plane . . . represented in perspective by a straight horizon or vanishing line" would be straight—it might be "a hyperbola like the perspective of the terrestrial horizon." Peirce wanted to make room for his theory of interstellar space. He concluded his review by advocating for a "new synthetic exposition" of non-Euclidean geometry—what he had proposed to Halsted.

Later in January (sometime after the 15th), Peirce wrote to Halsted to tell him that he had expected the "projective treatment" of non-Euclidean geometry to be "easier than it is. . . . I thought the whole thing would readily come out by the use of Story's definition of a circle as a conic having double contact with the absolute." Peirce had discovered that a different "point of view" would be necessary but had not had the time to work one out. He proceeded to write out some rather impressionistic ideas that he hoped might prove useful.[100] Peirce's correspondence with Halsted on synthetic geometry seems not to have gone much further, although the following month Halsted wrote again about a "pseudo-proof of Euclid's Axiom" to ask Peirce if he could send "a hint on a reference" for an explanation of the fallacy (15 Feb 1892).[101] In 1893, Halsted published an article in the *Educational Review* on "The Old and the New Geometry" in which he described the "three possible geometries of uniform space" and reported that "Charles S. Peirce claims to have established, from astronomical measurements, that our particular space is hyperbolic, is the space first expounded by Lobatschewsky and Bolyai. . . . It is thinkable that our space, the space in which we move, may be finite and recurrent; nor would this contradict our perceptive intuition (Anschauung), since this always relates only to a finite part of space. Just so there is nothing absurd in C. S. Peirce's claim to have proved that what Cayley calls 'the physical space of our experience' belongs to Lobatschewsky-Bolyai, not to Euclid."

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[100] There are a number of manuscripts listed in the Chronological Catalog that may be related to the project Peirce wrote to Halsted about; see especially 1892.37–41.

[101] Seven years later, Halsted published a "Report on Progress in Non-Euclidean Geometry" (*American Mathematical Monthly,* vol. 6, October, 1899), in which he attributed "the pseudo-proof of the parallel postulate" to John Playfair, who first gave it in his Note to Proposition XXIX in his *Elements of Geometry*, which first appeared in 1795. According to Halsted, Colonel T. Perronet Thompson, of Queen's College, Cambridge "very elegantly" proved it to be a fallacy in his "Geometry without Axioms."

Halsted was probably referring to Peirce's November 1891 paper to the National Academy of Sciences where Peirce may have made a stronger claim for negative curvature than he did later with Newcomb. There is some evidence that Peirce did not altogether give up on his investigations of curvature, as he told Newcomb he had; in February 1892, Risteen wrote that he could give Peirce a list of about twelve "determinations of stellar parallax that came out negative" if he wanted them, information related to Peirce's curvature investigations. Peirce did not, however, raise the question again in correspondence with Newcomb even though they continued to correspond occasionally until 1908, the year before Newcomb's death. Early in March 1892, Peirce sent Newcomb a question involving "fundamental points relating to infinity" and said he would like "to see how you would answer it." It was a problem involving parallel lines and an infinite series of equidistant perpendiculars that was probably related to Halsted's pseudo-proof of the parallel postulate. On 9 March, Newcomb responded: "Your last letter seems decisive in favor of a proposition which I have often been inclined to maintain, to wit, that all philosophical and logical discussion is useless. If there is any one question which illustrates the correctness of the doctrine of infinities, always maintained by me, it is the very one suggested by the demonstration you and Halstead sent me. I have always held that infinity, considered in itself, could not be treated as a mathematical quantity, and that it is pure nonsense to talk about one infinity being greater or less than another." This response, according to Carolyn Eisele, reveals Newcomb's "extreme conservatism."[102] Eisele points to Newcomb's Presidential address to the American Mathematical Society in 1897, "The Philosophy of Hyper-Space," where he said that "For us the limits of space are simply the limits to which we can suppose a body to move. Hence when space itself is spoken of as having possible curvatures, hills and hollows, it seems to me that this should be regarded only as a curvature, if I may use the term, of the laws of position of material bodies in space." According to Eisele, this highlights Newcomb's scientific conservatism in refusing to entertain a hypothesis which had not yet come completely unscathed through the acid test of experiment. . . . Peirce was, without doubt, the more daring intellectual of the two."[103]

By February, Peirce had started working on his Lowell lectures, presumably making use of the resources of the Astor Library. Since the subject he and agreed on for his course of lectures was the history of science, Peirce decided to begin with a look at his classification of the sciences.[104] The classification of the sciences was then a frequently discussed subject, usually with reference to the well-known classifications of Comte and Spencer. Comte, although given credit for having made the first clear distinction between abstract and concrete sciences, was known for having made his classification of sciences according to their generality, while Spencer arranged sciences according to their abstractness.[105] In his definition of "science" for the *Century Dictionary,* finished in proofs in the spring of 1891 but probably written a year or more earlier, Peirce gave a classification with sciences arranged according to "their degree of specialization," but in February 1892, when he sketched essentially the same classification for use in his first Lowell Lecture, he referred to it as one based on "order of generality"

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[102] *Studies in the Scientific and Mathematical Philosophy of Charles S. Peirce,* ed. R. M. Martin (Mouton 1979), p. 74.

[103] Ibid. pp. 73–75.

[104] "A look" at his classification is literally what he intended to give his auditors; when he wrote to Lowell on 13 January 1892 to confirm that his twelve lectures would be on the "History of Science from Copernicus to Newton," he asked if Lowell would like to have "the lectures illustrated with magic lantern slides." One of Peirce's drafts of his first lecture confirms that he intended to show a diagram of his classification (R 1274).

[105] See the entry, "Herbert Spencer," *Chambers's Encyclopaedia,* New Edition, vol. IX, Philadelphia 1892.

(sel. 46, p. 275, and the illustration on the following page).[106] What is noticeably missing from these classifications is any mention of phenomenology or semeiotic; it would be several years before those sciences would appear in his classifications—and before he would come to equate semeiotic with logic, broadly speaking.

On 7 February, a vacancy opened in the Department of Mathematics at Columbia College following the death of Professor William Guy Peck. This provided another opportunity for Peirce to try to reenter the academy—and into a college he was familiar with and a department he respected. He wrote to Mendenhall on 11 February to ask if he would support him for Peck's professorship: "All I ask is a favorable letter when the time comes for it." Later in the month, Peirce's former student, Henry Taber, wrote to Peirce asking for a letter of support for the Columbia College vacancy. Peirce obliged Tabor by sending a letter of support but informed him that he intended to try for Peck's professorship for himself. On the 29th, Peirce wrote to Juliette to tell her that no decision had been made at Columbia and to apologize for not returning to Arisbe "now you are ill," but that he was of more use to her in New York. "I was at work all day yesterday writing notes into my copy of the Dictionary so as to get a better price for it."[107] Peirce did return to Milford sometime during the third week of February but by Wednesday the 24th he was back in New York where he wrote to Juliette from the Century Club: "It was a sad thing to leave the house there where everything spoke so much to my heart and where my rooms were so well adapted to doing my work. It brought a sharp pain to my breast. I found at Port Jervis that the train was 40 minutes late as usual, but I had in my pocket a book on the Geometry of the Circle which I am studying. It will bring me a few dollars immediately for a notice,[108] but the chief reason for studying it is to keep up my acquaintance with every branch of mathematics, which gives me a reputation and is useful to me in other ways. . . . Arrived I went to the Century, got a Welsh rabbit, saw nobody but Swain Gifford, a rich artist, and went home.[109] There I read a chapter of a great book on chemistry I am studying and went to beg."

On 12 February 1892, Peirce had written to Nicholas Murray Butler, editor of *Educational Review*, trying to find another outlet for his writing. Butler wrote back on the 15th to ask Peirce to submit a brief article "following out the hint contained in your *Nation* paper concerning the teaching of geometry. It would be most interesting and valuable to have clearly stated what changes should now be made in the method of presenting elementary geometry owing to the discoveries of modern mathematics." It is not certain which *Nation* paper Butler was referring to but it was probably "The Non-Euclidean Geometry" (sel. 45), Peirce's 11 February review of Halsted's translation of Lobachewski. The "hint" Butler had in mind was likely contained in Peirce's third from the last paragraph where he claimed that elementary geometry is "riddled with fallacies" and is "thoroughly unmathematical" in its usual method of development: "It leads young men into bad logical ways . . . The study of geometry ought to begin with

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106 See the first annotation for this selection, p. 447, for an account of the differences.

107 Peirce was hoping that the Century Company would not wait long to issue a supplement but the *Century Dictionary Supplement* would not appear until 1909, seventeen years later. A more complete treatment of Peirce's dictionary work will be given in the W7 introduction: see note 10 above.

108 "Review of William J. M'Clelland's *A Treatise on the Geometry of the Circle,*" *The Nation,* 24 March 1892; see 1892.31 in the chronological catalog.

109 Peirce frequently stayed at the Buckingham Hotel at Fifth Avenue and Fiftieth Street, one of the most exclusive hotels in New York, according to Gustav Kobbé (*New York and its Environs*, Harper & Brothers, 1891). But when he was in New York for a long stretch he probably stayed in a boarding house. Peirce usually received his mail at the Century Club at 7 West 43rd Street, so that is the address he usually gave out.

the theory of perspective." There is no evidence that Peirce wrote the paper Butler asked for unless it was his paper on "The Logic of Mathematics in Relation to Education" that appeared six years later, apparently the only paper he ever published in *Educational Review*.

Peirce's opportunity to write something about Mendeleyev's *Principles* came when the editor of *The Nation* received a letter, signed "C. De K," responding to the review of 4 February (written by Peirce's "rival") in which it was claimed that Mendeleyev was the discoverer of the Periodic Law. C. De K acknowledged that Mendeleyev, along with Lothar Meyer, had been recognized by the Royal Society of London "for their discovery of the periodic relations of the atomic weights," but he claimed that the priority for discovering the Periodic Law belonged to John A. R. Newlands, a fact later recognized by the Royal Society. C. De K's letter appeared in the 3 March issue of *The Nation* followed by an editor's reply written by Peirce (sel. 48). Peirce pointed out that the Royal Society "did not commit themselves very far" in their acknowledgment of Newlands' contribution and that "the step taken by him was not a difficult one." Peirce named Josiah P. Cooke as the "principal precursor" of Mendeleyev for having "first proved that all the elements were arranged in a natural series." Peirce suggested that "[a]fter the new atomic weights came in" it was inevitable that "every well-informed and ingenious chemist" would begin "speculating upon the relations of the properties and atomic weights of the elements" and that these speculations would naturally be laid out in tables. He gave, as an example of such early speculations, a table based on one he had published anonymously in 1869 (W2: sel. 25)—which he ascribed to an "obscure American chemist"—and noted that "this was all, if not more than all, that Newlands did." It was Mendeleyev alone who "had the sagacity to discern the true scheme of relationship," thus accomplishing one of the greatest inductions in the history of science. Peirce concluded his editorial reply by speculating that the atoms of the chemical elements may have "been built up from a few kinds" of subatomic "atomicules that are Boscovichian points," an idea he would take up in his fourth *Monist* article, "Man's Glassy Essence" (sel. 29), which he would begin writing only a few weeks later.[110]

In March, Peirce contributed five notices or editorial responses and one review to *The Nation*. In addition to his note on Mendeleyev mentioned above (3 March), he contributed an editorial reply to a discussion on the state of mathematics education in America (3 March); an editorial response to J.McL.S's remarks about induction, especially to his claim that induction is not inference (10 March); a note on Halsted's translation of Bolyai's *The Science of Absolute Space*, which Halsted had personally sent Peirce in early February (17 March); a note on William James's abridged edition of his *Principles of Psychology* in which Peirce briefly took James to task for carrying further his "natural science" method, "which consists of ignoring all general doubt" which "practically comes to keeping the most general questions out of the focus of distinct apprehension and thus entrapping himself, or at least the reader, into confident but dangerous and unexamined assumptions" (17 March); and a review of William J. McClelland's *A Treatise on the Geometry of the Circle,* the book that occupied Peirce at the train station in Port Jervis when he was travelling back to New York in late January (24 March).

It was now almost five months since Peirce had finished his second article for *The Monist*, "The Doctrine of Necessity Examined," and had long ago received his payment, so *The Nation* was providing

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110 The theory of atomicules may first have been introduced by J. J. Sylvester in 1878, in "On an Application of the New Atomic Theory to the Graphical Representation of the Invariants and Covariants of Binary Quantics" (*American Journal of Mathematics* 1, pp. 64–82), where he extended "the new Atomic Theory" to include sub-atomic "atomicules" of differing valencies for a better analysis of chemical elements. Peirce referred to Sylvester's paper when first introducing his reduction thesis (see W4: sel. 20). Boscovichian points are atomicules that are presumed to be centers or fields of force of which matter is composed. See the textual head note, pp. 649–50, and the annotations, pp. 450–51, for more historical discussion of sel. 48.

his only relatively steady income—far too little to meet his and Juliette's needs. His Lowell lectures, which would bring him $1800, were months away. The Peirces were sinking into serious debt. On 8 March, the Court of Common Pleas of Pike County issued a mechanics lien on Arisbe for $464.99 for "carpenter work and material furnished." Peirce had to bring in more money. His attention turned, again, to the prospect of public lectures. In February he had started consulting geography and travel books on Thessaly in Northern Greece for the background information he needed to write up an embroidered tail of his travels there in the fall of 1870 when, as a young man of thirty-one he had scouted out sites for the American party of astronomers who would come to the Mediterranean region to observe the solar eclipse of 22 December 1870.[111] Thessaly was then still under Ottoman rule and the Greeks, animated by the "Great Idea" of reconstituting a free Greek state, were in nearly continuous rebellion against Ottoman domination. Peirce had travelled through Thessaly on his own, staying mainly with the Greeks, who, as he later wrote to Victoria Lady Welby, "were queer creatures, but the warmest natured, most *sympatisch,* people in the world."[112]

Peirce set his tale, with its "fictional embroideries," about 1862, the year King Otto was expelled from Greece. It was the story of Karolos Kalerges,[113] a young Harvard graduate on a grand tour of Europe, who, by a curious turn of events, "landed one bright summer's morning from an Aegean steamer at the little town of Bolos" in southeastern Thessaly. Thus began Karolos's eventful tour of Thessaly, during which he was befriended by Theodores Maurokordato, with whom he became a blood-brother on the way to Larissa; ingratiated himself to the Turkish governor-general, Husni Pasha, (as a precaution, since Karolos was a Christian) and contrived to borrow the governor-general's carriage, the only carriage in Thessaly; was captured by a band of klephts and saved by Theodores; was wounded while participating in a raid on a Turkish estate during which he abducted a young Persian widow (or so she believed), Roshaná, with whom he fell in love. There is some exploration of friendship and love in Peirce's tale, and occasional revealing moments, such as when Karolos and Theodores discuss the abduction of Roshaná and Karolos remarks that "In America . . . more women than horses are stolen by gentlemen in one way or another," but it was not a story of ideas. Peirce's experience in Thessaly had been singular and deeply impressive and, as he wrote some years later in a revised preface to his "Tale," he wanted "to give an idea of the place and the people as I saw them, and to express the sentiment which they strongly excited in the breast of a young American."[114]

Peirce wrote his tale to be presented orally, but on 26 March he wrote to Richard Watson Gilder, editor of the quality magazine, *The Century*, offering his story, "An Excursion into Thessaly: a Tale" (sel. 51), for publication: "I have just written a *Tale,* which without being extraordinary, is pretty, fresh, interesting, and well adapted to woodcut illustration." On 1 April, after a positive reply from Gilder, Peirce sent his manuscript under cover of a letter expressing doubts that it was right for *The Century* but

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111 See W2: xxxi–xxxv for Max H. Fisch's account of Peirce's Mediterranean assignment.

112 Peirce wrote this to Welby on 9 March 1906 but the letter appears not to have been sent; see the first annotation for sel. 51, pp. 453–54, for more details about the origins of Peirce's Thessalian tale.

113 "Karolos," the Greek equivalent of "Charles," and "Kalerges" taken from the famed Greek military leader, Demitrius Kalergis (1803–1867), who played the leading role in the "Bloodless Revolution" of 1843 that led to the adoption of the Greek constitution the following year and Greece's transition from an absolute to a constitutional monarchy. Kalerges was granted the title, "Great Citizen of Greece," for his wisdom and leadership in the bloodless Revolution. (*The Mirror of Literature, Amusement, and Instruction,* Vol. 1, 1847, pp. 45–49.)

114 Two versions of Peirce's revised preface (item c. 1902 in the supplement to the "Chronological Catalog") are reproduced on pp. 453–54.

remaining hopeful: “But still I venture to ask you to read it, because if you think the vein would be popular, I could write half a dozen such describing picturesque countries with an ingenuous & foolish young man getting into fearful predicaments in them; and all in a poetical and naive fashion.”[115]

Another selection from about this time that appears to have been intended for a popular audience, either as an article or lecture, is “Keppler” (sel. 49). Peirce’s proposal for his Lowell lectures had called for three lectures to be devoted to Kepler, “who on the whole was I think the greatest reasoner who ever lived,” so sel. 49 probably began with Peirce’s research for his Lowell lectures, but it also connects with his renewed attention to the study of great men. In casting about for an attractive subject for a set of popular lectures or articles, great men would have been an obvious choice for Peirce with so much research already devoted to that subject. In this paper, as was typical with Peirce, the reader (showing that, in this form, “Keppler” was intended for print publication) was told that “[t]o gain any idea of a scientific research, one must look with one’s own eyes and brain at the things with which it deals,” and that 1892 “happens to be a good one for watching Mars.” Peirce then gave instructions for how to record the path of Mars on a star-map. As in his January review of Harrison’s *New Calendar of Great Men* (sel. 44), Peirce had reminded his readers that Kepler’s momentous achievement had been made possible by a rare university appointment that actually provided the opportunity and means to do his singular work, a necessary condition for greatness. Peirce stressed Kepler’s “admirable method of thinking” which consisted in forming diagrams to represent “the entangled state of things before him” and “observing suggestive relations between the parts of the diagram” and then “performing diverse experiments upon it, or upon the natural objects, and noting the results.” The main requirement for success in reasoning by this method, according to Peirce, is “a docile imagination, quick to take Dame Nature’s hints.”

It was probably also around this time when Peirce wrote up his proposal for a “Summa Scientiæ” (sel. 50) to be organized according to his classification of the sciences and intended to appear in a single volume of 1500 pages. The seven divisions with their sixty-four sections would be filled with articles mostly of less than one page in length, about one third of which Peirce would write himself. The rest would be assigned to young men, selected for their “exceptional mental power and special competence” but “who have not yet achieved great reputations.” Peirce probably had Allen Risteen in mind as one of his young specialists; on 24 February, Risteen had written to Peirce about a scheme Peirce was about to take up and asked “if it is anything you might want me for.” It is likely that much of the material for Peirce’s own entries was to come from his *Century Dictionary* definitions and, with ninety pages reserved for biographies, his research on great men would have been put to good use as well. It is not known which publisher Peirce submitted his proposal to, or even if he sent it out, but had it been accepted in would have given the Peirces a chance to reorganize their lives without the severe threat of total financial collapse. Peirce was asking for $3000 a year for two years and, additionally, for $10 to $15 per one thousand words.

In April, Peirce tried to see Cornelius Vanderbilt, presumably for financial backing for his rapid transit project with Samuel Mott. On 11 April, Peirce’s friend, Edith Gill, wrote to Vanderbilt, her brother-in-law: “Will you see Professor Charles S Peirce a few moments on a railroad matter? He is one of the greatest scientists of the age.” It is not certain what the outcome was, but later in the year Peirce wrote a note to Juliette listing his rather exaggerated expectations for earnings from his various ventures and the list includes a “Vanderbilt contract” for $57,216.35.

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[115] Later Peirce would rename his story “Embroidered Thessaly.” See the lengthy textual head note for sel. 51, pp. 655–63, for the complicated story of its composition and development.

The second article of Peirce's metaphysical series, "The Doctrine of Necessity Examined" (sel. 24, discussed earlier), appeared in the April 1st issue of *The Monist.* This was the paper that would draw the hottest fire from Carus. In a note published in the same issue with Peirce's article, Carus remarked on the philosophical depth of Peirce's analysis and announced his intention to issue a reply:[116]

> Mr. Charles S. Peirce is one of those thinkers who in the investigation of a subject go right down to the bottom of the problem. This appears to me the more conspicuously so, as the result to which his investigations lead stand in a strong contrast to my own views. Yet I cannot help admiring the boldness of his trenchant critique which finds the difficulties at the point where really the main difficulty of all philosophical inquiry lies buried. It lies buried, i.e. it does not appear on the surface of things. If it lay on the surface, our most superficial thinkers would naturally light on it; but most of them walk their way in peace, unmolested by the question, Is there any truth in the idea of necessity. An editorial treatment of this problem may be expected in a forthcoming number of *The Monist*.

Indeed, Carus did publish an "editorial treatment" in July in the "forthcoming number,"[117] and a second response in the October number,[118] reigniting the controversy that Peirce had started with his review of Carus's *Fundamental Problems* (sel. 8). Peirce rejoined the controversy, which Carus referred to as a "battle," with his lengthy "Reply to the Necessitarians"[119] to which Carus answered with "The Founder of Tychism, His Methods, Philosophy, and Criticisms."[120] Although numerous points were debated, the principal issue under dispute was Peirce's doctrine of absolute chance, the "corner-stone" of Peirce's philosophy, according to Carus, and Peirce's resultant "radical and sweeping indeterminism."[121]

Peirce had been waiting for his article on necessity to appear; he wrote to Carus on 3 April inquiring if the new issue was out and he requested that six copies be mailed to him at the Century Club. He told Carus that he would soon send a third article. Peirce had begun some preliminary work for his next two *Monist* articles, which he thought of as his papers on mind (sels. 27 and 29), and over the coming weeks he would catch up on current debates on various related topics including the molecular theory of protoplasm, theories of time, and theories of infinity and continuity. Peirce would be entertaining radical ideas about individuality and personality at a low point in his own life, when he was suffering from a sense of exclusion and defeat. For months, Peirce had been casting about for opportunities, living a life of interruptions, trying to find a new path to financial security, but always having to resort to hard-won but passing expedients just to make ends meet. April would be a month of more focused reflection and concentration. Peirce wrote nothing for *The Nation* or for other periodicals in April. On the 11th, he would visit Cornelius Vanderbilt about his railroad scheme but, except for that, there is little evidence of further attention to investment schemes or book projects. Only two things would occupy Peirce in April, his "Tale of Thessaly" and his next articles for *The Monist*.

Even though Peirce had sent Gilder the manuscript of his Thessalian story at the end of March, and would not see it again for three weeks, he did not stop working to improve the complex story line. When he wrote to Gilder on Wednesday, 20 April, to ask for the temporary return of his story so he could read it

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116 "Mr. Charles S. Peirce on Necessity," *The Monist* 2.3 (April 1892): 442.

117 "Mr. Charles S. Peirce's Onslaught on the Doctrine of Necessity" *The Monist* 2.4 (July 1892): 560–82.

118 "The Idea of Necessity, Its Basis and Its Scope," *The Monist* 3.1 (October 1892): 68–96.

119 *The Monist* 3.4 (July 1893): 571–622.

120 Ibid.

121 See annotation 125.35, p. 389. Except for Carus's final rejoinder, the exchange will be published in W9 and the controversy will be discussed more fully in the introduction to that volume.

at the Century Club on Friday the 22nd, he said he was going to make a few changes and remarked on revisions he had been considering.[122] It is surprising that Peirce had taken up this complicated writing project at this time in his life since it was a new genre for him and his chance of reaping significant returns could not have been good. It is true that Peirce thought his story would make a compelling popular lecture and he had great confidence in his skill as an orator. Yet given the considerable historical, geographical, and linguistic research necessary to give his tale the cachet of genuineness it had to have, and the sheer length of the story, running to over twelve hundred words in the form sent to Gilder, Peirce must have know that the effort spent on the tale would have been far more likely to yield significant returns if he had devoted it to writing in one of his many areas of expertise. All things considered, it seems unlikely that monetary return was Peirce's deepest motive.

What did motivate Peirce to devote so much time and effort to this composition? In part, it was precisely the newness of it, as he told Gilder: "[it is my] first attempt in the line of writing except scientific and philosophical discussion, and therefore it is important and exciting to me." Some years later, in a letter to Lady Welby (1906), Peirce said that he had written his story "as an experiment to test a certain psychological theory of mine. . . . What I aimed at was to reproduce the psychical effect of a peculiar atmosphere, both meteorological and social."[123] But one senses that there was a sentimental factor motivating Peirce to dwell on this romantic and valiant episode in his life, a time of vibrancy and confidence. Peirce's life in April 1892 was on the brink of ruin and it must have been consoling to remember back to such a time and to compose the story, embroidered though it was, of the young man he had been. It would no doubt have been satisfying, also, for Peirce to read the story of Karolos's adventures, knowing that his auditors would understand that in some basic if poetic sense he was telling his own story. This was understood by Peirce's one-time friend, Ogden Rood, who, the following year, in writing to his wife about Peirce's "Greek story," referred to Karolos as Charles No 2: "In this story the hero (Charles No 2) arrives a total stranger in a Turkish town, and at once sends a message to the Governor asking for his carriage for the purpose of taking a pleasant drive—and gets it." Rood thought this showed a "supreme impudence" on Peirce's part that paralleled his "descent" on Helmholtz in New York in 1893 when Peirce contrived to encounter "the lion of the day" for a private tete-a-tete: "Then probably the idea was to publish in the newspapers an ornamented account of the meeting of these two great scientists, which it was expected would greatly redound to the benefit of Mr Charles."[124] Rood had no idea how much Peirce had suffered and of his desperation in the years following his dismissal from the Coast Survey just when the United States was going into one of its most severe economic depressions.

Peirce's philosophical energies in April were focused on the next two papers for his *Monist* series, "The Law of Mind" and "Man's Glassy Essence" (sels. 27 and 29). Even though Peirce was writing for *The Monist* to make money, he was engaged in some of the most profound philosophical ruminations of his life. It is not certain precisely when the surviving working papers for "The Law of Mind" were composed, but selections 25 and 26 surely represent the early work on that paper which he told Carus at the beginning of April he would soon be sending. These selections, and some pages entitled "A Molecular Theory of Protoplasm," preliminary to "Man's Glassy Essence," are products of Peirce's April

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[122] One change Peirce told Gilder he was contemplating was to give Karolos's letter to Husni Pasha. Item 1892.48 in the Chronological Catalog is a small notebook with thirteen pages inscribed recto and verso with working notes for Karolos's letter, notes that Peirce may have made while the story was in Gilder's hands.

[123] Peirce to Lady Welby, 9 March 1906; see note 112 above.

[124] Ogden Rood to Mathilde Rood, 8 Oct. 1893, Rood Papers, Columbia University Rare Book & Manuscript Library (transcription in the Max H. Fisch papers).

cogitations. In "The Law of Mind /Early Try/" (sel. 25), Peirce reveals a stronger religious motivation than had previously been evident in his writings:

> I propose next to show, by the study of the soul, that, if my previous conclusions are accepted, we shall be naturally led to the belief that the universe is governed by a father, with whom we can be in real relations of communion, and who may be expected to listen to prayer, and answer it. In short, necessitarianism once out of the way, which puts nature under the rule of blind and inexorable law, that leaves no room for any other influence, we find no other serious objection to a return to the principle of Christianity.

It was to be expected, perhaps, that in writing articles for *The Monist,* a journal devoted to the reconciliation of science and religion, Peirce would bring religion into his work more than he might have under other circumstances; but whatever the provocation, it seems clear that Peirce was becoming increasingly interested in questions bearing on religion.[125]

Peirce continued with a sketch of an argument he would develop much more fully in sel. 27. The mind acts in accordance with the law that "ideas tend to spread and to affect certain others which stand to them in a peculiar relation which I will name 'continuous affectibility.'" This "one law of mind" can be stated more succinctly: "ideas tend towards uniformity." Peirce considered yet another formulation: "Thus the general law is that ideas tend to be more connected. But ideas are not discrete units with definite boundaries; and therefore we must rather say ideas tend to interpenetrate one another and become more and more mingled, welded, and generalized." Peirce pointed out that the law of mind "essentially involves time" and that "the relation of a state of thought to another which it draws with it is a *transitive* relation, like the copula of logic," and he argued that since "no complication or specialization of physical law can possibly impart a definite direction or flow to time," psychical law could not result from physical law. Peirce noted that "precisely all that psychical law does is to regulate the formation of habits."

One familiar with Peirce's theory of signs might wonder why he did not formulate his general law of mind in semiotic terms, as it seems to call for; the answer might be that Peirce suspected that the readers of *The Monist,* and possibly its editor as well, would be less eager for his work if he introduced another layer of theory. His idea for the *Monist* series was to present his views, as far as possible, in terms of main-stream science. But it is unlikely that Peirce did not consider employing his theory of signs; in preparing his *Monist* papers on mind Peirce returned to his 1868–69 *Journal of Speculative Philosophy* papers (especially W2: sels. 21 and 22) where he had explicitly used his theory of signs as the basis for his theory of mind, and within two years he would follow that course again in "What is a Sign," a chapter for his book, *How to Reason* (W11).

Peirce tried a number of approaches for his third *Monist* article before deciding on the approach taken in sel. 27.[126] In his "The Law of Mind /Excursus on the Idea of Time/" (sel. 26), Peirce turned his attention to his theory of time because of its centrality for his theory of mind—the temporal irreversibility of psychical processes fundamentally distinguished them from physical processes. Peirce's key idea was that "the properties of time" could "be conveniently stated" as four properties of instants: (1) "Of two different instants, the one is previous to the other, the latter subsequent to the former; and no instant is both previous and subsequent to the same instant." (2) "This general temporal relation is a transitive one." (3) "If one instant is previous to another, there is a continuously infinite series of instants, subsequent to

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[125] See the first annotation for sel. 25, pp. 389–90, for a similar quotation from an alternative draft.

[126] Five "intermediate attempts" between sel. 25 and Peirce's earliest notes specifically for sel. 27 are listed in the Chronological Catalog: 1892.50–54. Peirce's earliest notes for sel. 27 are dated 10 May (1892.64).

the former and previous to the latter." (4) "Given any three instants, A, B, C, there is a fourth instant D as much previous or subsequent to C as B is to A." Peirce called the fourth property, the "condition of continuity."

In working out his third condition, first expressed more simply as "time is infinitely divisible," Peirce noted that infinite divisibility was often confounded with continuity but that Cantor had refuted that idea. Peirce made some comparisons between his views on multitudes (collections, or sets) and continuity and those of Cantor, noting in particular the distinction he had made as early as 1881 between finite and infinite collections (W4: sel. 38): Fermatian inference (mathematical induction) is applicable to finite collections but not to infinite ones. Peirce said that the number of points on a line, "however short," is "continuously infinite," and claimed that a "continuously infinite multitude" is the greatest infinity that can be "present" to us in a mathematical construction. He noted, however, that "a continuum of an infinite number of dimensions would be incomparably greater," though it could not be "present" in a construction. The conception of continuity would play an increasingly crucial role in Peirce's philosophy and he would work on improving his mathematical treatment of continuity, generally with Cantor's views at the forefront, for the rest of his life.[127] Peirce concluded his discussion by defining time as a "hyperbolic" continuum in which "the infinitely past and the infinitely future are distinct and do not coincide," which he belived "accords with our natural idea of time."

Based on the extant record of correspondence, and on other documentary evidence, Peirce's autobiographical and philosophical reveries during the month of April do not appear to have been too frequently disturbed. If he needed a reminder of his impending financial ruin, on 10 April, J. M. Sanford, a New York tailor, wrote to him about his long overdue account: "Your account has now stood *over* a year. It was to have been cash. . . . The balance is $107.00." It was on the following day that Peirce visited Vanderbilt about his railroad scheme. On the 17th, a Harvard student, Justus Pearl Sheffield, having failed to "catch" Peirce "at his house" or at the Century Club, wrote to invite him to speak, sometime before final examinations commenced on the first of June, to the Graduate Philosophical Club at Harvard: "We have all been very anxious to hear you, on any topic that you might be pleased to select: all the more anxious in that your paper would in all likelihood be to Harvard men 'the other side.'" Peirce must have been pleased with this invitation and on May 21st he would read his "Law of Mind" to the Philosophical Club, only three days before submitting it for publication. On Friday evening, 22 April, Peirce gave his premier reading of his "Tale of Thessaly" to a select group at the Century Club and the following month, when he told Frances Russell about the Century Club reading, he said it had been before "some of the very best judges of such things" and that "they were much struck and delighted" with his story. Peirce said that the reading had taken an hour and a half, but was "not at all tedious" (14 May 1892). It is not indicated in the record whether or not Peirce received any pay for this first reading.

The strengthening religious motivation that revealed itself in the opening paragraph of Peirce's "The Law of Mind /Early Try/ (sel. 25), was not the result of an intellectual turn but was deeply personal, a consequence of Peirce's manifest experiences. The transformational power of the religious feelings Peirce had begun to experience is revealed in the famous letter he wrote on Sunday Morning, 24 April 1892, to Rev. John Wesley Brown, Rector of St. Thomas's Episcopal Church on Fifth Avenue.

Dear & Reverend Sir:

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[127] See the annotations for sel. 26, pp. 390–91, for more background information on the development of Peirce's views on time and for more on his views in comparison to those of Cantor.

I took the Holy Communion at St. Thomas's this morning,—in fact, just now,—under peculiar circumstances, which it seems proper to report.

For many years I have not taken the Communion and have seldom entered a church, although I have always had a passionate love for the church and a complete faith that the essence of christianity, whatever that might be, was Divine; but still I could not reconcile my notions of common sense and of evidence with the propositions of the creed, and I found going to church made me sophistical and gave me an impulse to play fast and loose with matters of intellectual integrity. Therefore, I gave it up; though it has been the cause of many a bitter reflection. Many times I have tried to cipher out some justification for my return to the communion of the church; but I could not. Especially, the last two nights I have lain awake thinking of the matter.

This morning after breakfast I felt I must go to church anyway. I wandered about, not knowing where to find a regular episcopal church, in which I was confirmed; but I finally came to St. Thomas. I had several times been in it on week days to look at the chancel. I therefore saw nothing new to me. But this time,—I was not thinking of St. Thomas and his doubts, either,—no sooner had I got into the church than I seemed to receive the direct permission of the Master to come. Still, I said to myself, I must not go to the communion without further reflection! I must go home & duly prepare myself before I venture. But when the instant came, I found myself carried up to the altar rail, almost without my own volition. I am perfectly sure that it was right. Anyway, I could not help it.

I may mention as a reason why I do not offer to put my gratitude for the bounty granted to me into some form of church work, that which seemed to call me today seemed to promise me that I should bear a cross like death for the Master's sake, and he would give me strength to bear it. I am sure that it will happen. My part is to wait.

I have never before been mystical; but now I am. After giving myself time to reflect upon the situation, I will call to see you.

Yours very truly
C. S. Peirce

Peirce added a postscript informing Rev. Brown that he was a married man fifty-two years old.[128]

This letter is sometimes taken as sufficient evidence for the conclusion that Peirce had undergone a religious conversion on 24 April 1892 after undergoing a profound mystical experience.[129] One must be cautious, however, in drawing conclusions based on this letter, coming as it did, at a time when Peirce was feeling much stress and an increasing sense of helplessness. What Peirce meant by "mystical" is also open to question. Presumably he meant what is found in the *Century Dictionary* under "mystical theology" (not one of Peirce's definitions, however): "the knowledge of God or of divine things, derived not from observation or from argument, but wholly from spiritual experience, and not discriminated or tested by the reason." But it should be noted that in his 1878 article, "The Order of Nature," the paper Peirce pointed to as the ancestor of his *Monist* metaphysical series, he wrote that by "mystical theories" he meant "all those which have no possibility of being mechanically explained" (W3: 321). In any case, it is clear that Peirce was undergoing a profound change, a conversion of some kind, that he might have felt most directly and pointedly at St. Thomas's on the morning of 24 April.

Peirce's state of mind at this time is further revealed in a letter he wrote to Carus offering to write an article for *The Open Court* on the positive value of unusual personal experience:[130]

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[128] The letter is in RL 482: 12–13; it is not known if it was ever sent. The decorative art in the chancel at St. Thomas's included works by John La Farge, an acquaintance of Peirce's.

[129] See Joseph Brent's discussion of this episode in the second (1998) edition of his *Charles Sanders Peirce: A Life,* pp. 209–212. Also Henry C. Johnson, Jr., "Charles Sanders Peirce and the Book of Common Prayer: Elocution and the Feigning of Piety" in *Transactions of the Charles S. Peirce Society* 42.4 (2006): 552–73, esp. 562–64.

[130] This letter draft is undated but is thought to have been written around the end of April. It is not known if a finished letter was sent.

Dear Sir:

I think I could write an acceptable article or even two for the Open Court on the following materials[:]
1. Personal experience has a positive value always. This is greater the more unusual the experience. That which I have to report seems worth mention. (A) Of late years I have suffered extreme adversity & affliction, being (B) In the somewhat unusual situation of a student of philosophy, laboratory-bred, who holds on essentially to the creed & communion of the Church. (C) Now, the facts which seem worth reporting are 1st, what kinds of reflections I have found really consoling, 2nd, how the different literary works addressed to those in such circumstances sound. 2. Of course, it is nothing but the experience of a single individual; still, it is out of individual experiences that general experience is built. But I wish to say clearly that a single case can have, until verified & supported by others, no importance at all. Still, I write as a means of collecting other testimony.

Under the 1st head, my experience would, if generally borne out by others, go to support the law of continuity. For first, I find, ideas about heaven of very little or no support, evidently because that life is completely cut off from this. Myself in a life the whole aim, motives, means, problems, of which radically differ from those of this life, does not seem to come within my special interests. Second, I have found immense help from certain other reflections. Such as this. "If," I would say to myself, "by voluntarily enduring what I am forced to bear I could further certain objects I had at heart, would I not do so and more? And if I could comprehend the purposes of God, would I not give an absolute preference to these purposes over the objects I actually have at heart,—which indeed I only now prefer as being as near as I can make out the objects it is God's will I should pursue? Since then God is doubtless using me, so far as I can be of use, to promote his own purposes[,] should I not be content?

Why should I not feel particularly honored that I have been selected to undergo all this agony?

Peirce's reflections on the agony and aim of his life seem to have instilled in him a new point of view, one that would receive clearer expression in his forthcoming articles for *The Monist,* especially the final two (sels. 29 and 30).

As April drew to a close, Peirce's inward focus seemed to yield to the need to more quickly alleviate the dire straits he and Juliette were suffering. He resumed his writing for *The Nation* and his efforts to place articles in other publications. But he did not devote his time exclusively to writing for pay. The leading story in the *New York Evening World* on 4 May was about a murder committed by a sixteen-year old boy, Robert Alden Fales. The murder was gruesome and the Fales boy was unrepentant, but Peirce was struck by the fact that though criminal behavior seemed to run in the boy's family, he had a loving mother who had done all she could to protect him from "the danger of contamination." Pressure was building to execute the boy and Peirce did not see the point of it and especially felt sympathy for the boy's mother. He wrote a letter to the editor of *The Independent* questioning why we punish criminals and outlining a case against it based on Christian, scientific, and economic principles (sel. 52). Peirce urged that "the facts of science" should be recognized, "disagreeable as they may be to [the] blood-thirsty and politico-economical heart," and that society should accept that "the criminal is a man of diseased mind." Criminals should be put in asylums, treated respectfully, and rehabilitated if possible, but they should not be allowed to breed. "I do not believe in punishments, unless it be in summary inflictions of bodily pain springing from natural indignation. But as for the slow tortures we inflict upon criminals, if that be the outcome of ideas of right and wrong, I think ideas of right and wrong were better given up. I notice those ideas have might[y] little influence in deterring men from evil; they serve chiefly to steel our hearts against other offenders." Peirce signed his letter "Outsider," the pseudonym he had used in 1890 when he

was feeling ostracized, and urged the editor to publish his letter: "I beg you *will* take it." Peirce's letter was not published.[131]

On 4 May, an article entitled "Milford on the Delaware" appeared in *The Home Journal* and must have raised Peirce's and Juliette's hopes that they could turn Arisbe into a seasonal resort or, at least, that they would be able to rent the main house for the summer. The article made Milford and the surrounding countryside seem almost irresistible: "With the exception of an occasional sporadic advertisement setting forth the merits of one of its village inns, the world at large has never been in touch with the picturesque and beautiful chain of mountain villages and hamlets centering about the country town of Milford, Pike County, Pa. Yet to the aesthetic traveler there is all and more in Milford and its surrounding drives and views—all and more of the same picturesque beauty that has made the Bernese Oberland and Switzerland world-famous." Special mention was made of the Peirce estate: "Private enterprise has been lacking in the building of villas and cottages a la Tuxedo, but within the past year Mrs. Charles S. Peirce, wife of the eminent scientist, has brought her exquisite French taste and continental experience to the building of a picturesque villa. While not in the least pretentious, this Arcadian Manse, placed as it is half way between the bridge and the village, form as it were the prelude to the feast of grand river and mountain views which fill the eye and stimulate the mind. It is a quaint villa with inviting porches, saucy latticed windows, and an air of settled exclusiveness." This publicity may have helped the Peirces directly; on 14 May, Juliette wrote a note in her diary indicating that she had managed to negotiate a second mortgage (for one thousand dollars) to run for five years.

On 6 May, Peirce submitted three manuscripts to Charles A. Dana, editor of the *New York Sun*. One of them was a paper on "Babylonian Astronomy," which indicates that Peirce was trying to draw popular articles from his research for his upcoming Lowell lectures on the history of science. In the fall, he would advertise public lectures on "The Constellations" and "The Story of Pythagoras," probably also derived from his research for his Lowell lectures and maybe the other two papers he had submitted to Dana. Unfortunately for Peirce, Dana returned Peirce's manuscripts (even after two of them had been set in type) because he decided they were too general and abstract for a daily newspaper.

On 8 May, Peirce received a letter that Carus had sent on 27 April (possibly the letter had been addressed to Milford and not New York) asking if he would assist with a translation of Ernst Mach's *Der Geschichte der Mechanik* that was underway at the Open Court: "Although the translation is made with great care I should nevertheless like someone who is an authority in this province or as learned in similar fields of investigation to look over the proof sheets before they go to press." Peirce wrote back at once to accept Carus's offer and in the coming months he would devote a great deal of effort helping with the translation, even rewriting an entire section in the chapter on units and measures because Mach's original was not applicable to the United States and, besides, was "slightly out of date."[132] Peirce assured Carus that he was working on his next two articles for *The Monist* and expected them to be "the most valuable things I have done" and he took the opportunity to tell Carus about his Thessalian story and to offer to come to Chicago for a reading if he could be assured of an audience large enough to pay expenses: "I should like to go and read it there, and so have an opportunity of meeting you."

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131 See the textual head note for sel. 52, pp. 670–72, for a more complete account of the Fales case. Peirce's views on punishing criminals were developed further in "Dmesis," an article he published in *The Open Court* in September 1892. It will be published in W9.

132 The Open Court published Mach's book in 1893. The section that Peirce rewrote in the chapter on units and measures, "Mechanical Units in Use in the United States and Great Britain," will be published in W9 and Peirce's work on the translation will be discussed more fully in the W9 introduction.

Carus also wanted to meet Peirce so he asked Francis Russell to arrange for a reading in Chicago. But when Russell wrote to Peirce on 10 May, asking for details about his "Tale," he concluded his letter with the question: "Why don't you come here and be a Professor in our new Chicago University where they are paying $7000 per year?"[133] Peirce replied on the 14th, answering Russell's questions about his "Tale," but his interest had shifted to the University of Chicago professorship: "The idea of a professorship in Chicago is new to me, but I confess rather pleasing. I have always felt that Chicago was the real American city." This was an opportunity Peirce was anxious to pursue. He wrote to Russell again on the 17th:

I have been reflecting upon your suggestion that I should go to Chicago and become professor there. It seems to be the thing for me to do, provided they call me. During many years, I felt that for my peculiar powers the world had no use. Hence, I only threw off pieces here and there, and my deeper studies in logic remain today unpublished and nobody dreams of the things I have found out. But during the last year or two, I have been getting more and more impressed with a prevision of the miserable consequences which must ensue from the prevalent necessitarian conception of the universe. It makes God a limited monarch or *roi faineant,* acting under law so blind and inexorable as to leave no room for any acts of paternal love, or any listening & answering of prayer. Now whoever will follow out with me the higher logic of relations will see as clearly and as evidently as can be the baselessness of the materialistic necessitarian fabric. Nor can his eyes fail to be opened to the fearful abyss into which that machine-made doctrine is precipitating society. A return to christian principles, to which a knowledge of my discoveries would lead, is the sole way of salvation. Accordingly, I now feel that if a way is shown to me to teach logic, it is my sacred duty to pursue it.

Peirce decided that it would be best to cancel plans for the Chicago reading of his "Tale": "I fear the telling of emotional stories is hardly compatible with the self-abnegation and exclusive devotion to the cause of sound learning and education to which a man who proposes to become a professor must surrender himself." Peirce noted that he was about to leave for Cambridge and would be there until further notice; he gave Russell his Cambridge address.

Russell replied on the 19th with information about the Chicago position and with some suggestions for pursuing it. Cambridge, Russell thought, was a good place to find the support Peirce would need. George Herbert Palmer, from Harvard's philosophy department, had been recruited by President Harper for the Chicago professorship but, after stringing Harper along for several weeks, had declined: "so he ought to know about the avenues towards such a place." President Harper was, of course, "the Great Mogul in all the appointments," so Russell advised Peirce to arrange for influential friends to write to Harper on his behalf.

In the late summer of 1890, Carus had written an article, "Kant on Evolution," for *The Open Court* which included the following passage:[134]

Kant's philosophy is by no means a perfected system; it rather represents (as perhaps necessarily all philosophies do) the development of a thinker's mind. The "Critique of Pure Reason" especially shows traces of the state of Kant's mind at different periods, and thus it is that we discover passages which closely considered will be found to be contradictory. When reading this remarkable work we feel like travelers walking over the petrified relics of a

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[133] The University of Chicago was established in 1891 with the support of John D. Rockefeller. William Rainey Harper was appointed as its first president on 1 July 1891.

[134] *The Open Court* 4: 2492–7. This characterization of Kant's writings is remarkable for how well it characterizes Peirce's writings—with the added consideration that the ideas Peirce left us seem less like "petrified relics" than stored programs always at the ready to be activated to resume their work.

powerful eruption. There are strata of ideas of the oldest formation close to the thoughts of a recent date. There are also vestiges of intermediate phases. Here they stand in the petrification of printed words, peacefully side by side, as memorials of a great revolution in the development of human thought. It is this state of things which more than anything else makes of Kant's writings such difficult reading.

Peirce had replied in a private letter to Carus that he did not agree that Kant was "hard reading." On 10 May 1892, Carus wrote to tell Peirce he was going to reprint his article on Kant and asked if he could quote from Peirce's letter. Peirce wrote back that he had no objection and in the July issue of *The Monist,* Carus's "Kant on Evolution" was reprinted with the following footnote:

The proposition that Kant is no easy reading found an unexpected and strong opposition. Immediately after the publication of this article, Sept. 4th, 1890, Mr. Charles S. Peirce made the following incidental remark in a letter to the author dated Sept. 6th, 1890: "I have heard too much of Kant's being hard reading. 1 think he is one of the easiest of philosophers; for he generally knows what he wants to say, which is more than half the battle, and he says it in terms which are very clear. Of course, it is quite absurd to try to read Kant without preliminary studies of Leibnizian and English philosophers, as well as of the terminology of which Kant's is a modification or transmogrification. But there is a way of making out what he meant, while such writers as Hume and J. S. Mill, the more you study them the more they puzzle you."

In his note giving Carus permission to quote from his letter, Peirce added that he was "suffering torments" with his two articles "on the nature of mind." For the second of these two papers, he was developing the molecular theory of protoplasm he had begun working up in April. Sometime after 10 May, but probably not long afterwards, Peirce sketched out the molecular theory that he would use to make his case for a new conception of mind (sel. 28). Peirce began by noting that the "problem is to elucidate the relation between the physical aspect of a substance and its psychical aspect." He argued that nerve-cells do not seem to do much "mechanical work" but that "the phenomenon of taking habits" is "strongly predominant" in nerve action, so it is necessary to consider how habits can form. Peirce suggested that the capacity to feel is crucial to habit-taking and that the molecular theory of protoplasm, therefore, has to account for feeling. This would be elaborated in the "Man's Glassy Essence" in its finished form (sel. 29).

The first of Peirce's three contributions to *The Nation* for May 1892 was a brief notice on the 12th of Frank Nelson Cole's translation of Eugen Netto's *The Theory of Substitutions and its Applications to Algebra*—and a mention of Joseph Edwards' *Elementary Treatise on the Differential Calculus* (the same notice had been printed on 9 May in *The Evening Post*). According to Peirce, with his English translation (which included authorial revisions), Cole had produced a better book than the German original, "not to speak of the comfort of reading mathematics in our clear and concise language." A somewhat longer review of W. W. Rouse Ball's *Mathematical Recreations, and Problems of Past and Present Times,* appeared in the same 12 May issue. It was not a notice Ball would have hoped for: an entertaining book with "as good a notion of a fourth dimension . . . as could be acquired without serious study," but scrappy throughout, with a bad sketch of non-Euclidean geometry and with the results of Klein and Riemann misstated. Peirce's third and last piece to appear in *The Nation* in May (in the 19 May issue) was a one-paragraph notice of Robert Grimshaw's *Record of Scientific Progress for the Year 1891*. Here again, Peirce delivered harsh treatment, writing that Grimshaw had filled his book with "engineering matter of no special interest from a scientific point of view" and that he had been "miserably careless" in drawing up his "record of progress." Physics and astronomy were the "only sciences, properly so called" treated by Grimshaw but, regarding astronomical achievements, he had concluded that there had been little in

1891 "worthy of special chronicle." "On the contrary," Peirce countered, "there is probably no scientific man who has not remarked the exceptionally great general interest attaching to the astronomical work of 1891." Peirce gave four examples, none remarked on by Grimshaw.

Peirce travelled to Cambridge around 17 May and stayed for about a week. The record of his time there is thin although it is known that he spoke at the Philosophical Club on the 21st and that sometime after that he gave what William James described as "a godlike talk at Royce's." Much of what we know about Peirce's talk to the Philosophical Club comes from Frank Abbot, who attended the talk and remarked on it in his diary. He recorded that some twenty graduates and friends, including Peirce's brother Jem, attended the talk which Abbot noted was on synechism, Peirce's "new system of philosophy." The paper Peirce read was his "Law of Mind" (sel. 27), which he was about to submit to *The Monist*. Abbot invited Peirce to dine with him the following evening but Peirce developed a tormenting headache and had to send a note of regret. Royce was probably also at the Philosophical Club talk, possibly occasioning a little tension in light of the recent battle between him and Abbot. James did not see Peirce at all because he was too occupied with preparations to depart on the 25th for a fifteen-month trip to Europe with his family. James sent a note to Peirce probably on the 23rd: "It has been a great chagrin to me to have you here all this time without meeting or hearing you. I especially wanted to hear you on Continuity, and I hear of a godlike talk at Royce's. But Continuity will appear in Monist. *Talks* can never come again!! . . . I have been so driven that even now we shall just escape by the skin of our teeth." James added a friendly remark about Peirce's recent paper "The Doctrine of Necessity Examined" (sel. 24): "I meant to write you long ago to say how I enjoyed your last paper in the Monist. I believe in that sort of thing myself, but even if I didn't it would be a blessed piece of radicalism."

It is unclear what the "godlike talk" was that James had heard about. It is possible that Peirce gave a talk at Royce's home or lectured to one of his classes. When Peirce wrote to Carus on 24 May, he said that his *Monist* article on necessity "had formed the subject of several seances of Royce's seminarium" and that Royce intended to "attack it" in *The Philosophical Review,* but there is no indication that Peirce lectured directly to any of Royce's classes.[135] According to one of Royce's students, Dickinson Miller, remembering back to Peirce's Cambridge visit many years later, what James had heard about may have been an informal conversation between Peirce and Royce that occurred in Royce's study, an impressive conversation witnessed by Miller and Justus Sheffield.[136] What else Peirce did while he was in Cambridge can only be guessed. He may have had some time to take advantage of Harvard's libraries for research for his Lowell lectures or for his remaining *Monist* papers. It is probable that he followed Francis Russell's suggestion to rally support for his candidacy for the University of Chicago philosophy professorship, and he probably tried to learn more about it from George Herbert Palmer. With his letter mentioned above, James enclosed "a scrap for Harper which you can send with your other 'credentials,'"

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[135] Royce's "attack" did not appear in the *Philosophical Review.* He pronounced against Peirce's tychism in a paper read to the Philosophical Club at Brown University on 23 May 1895. The paper was later expanded into ch. 8 of his *Studies of Good and Evil* (Appleton, 1898), where Royce says on p. 237: "I do not myself accept this notion that the laws of phenomenal nature, where they are genuinely objective laws, and not relatively superficial human generalizations, are the evolutionary product of any such cosmical process of acquiring habits, as Mr. Peirce has so ingeniously supposed in his hypothesis of 'Tychism'."

[136] From correspondence between Dickinson Miller and Max H. Fisch and from notes typed up by Fisch after an interview with Miller on 6 May 1960. Miller could not remember anything about the conversation in Royce's study except that Royce was making "continuous utterances," suggesting that he had the lion's share of that conversation, and that Peirce would interrupt from time to time beginning with a polite "Pardon me." Still, the thrill of the experience may have made Miller speak about it in high terms to James, his favorite professor. Fisch's notes and a postcard note from Miller, dated 14 May 1960, leave it indefinite whether the conversation Miller witnessed occurred during Peirce's May 1892 visit to Cambridge.

and promised to write to Harper from the steamer. It isn't known how many of Peirce's friends besides James wrote to recommend him to Harper, but Carus did and surely others as well. When Palmer learned that James had written, he wrote to Harper to warn him about Peirce: "I am astonished at James' recommendation of Peirce. Of course my impressions may be erroneous, and I have no personal acquaintance with Peirce. I know, too, very well his eminence as a logician. But from so many sources I have heard of his broken and dissolute character that I should advise you to make most careful inquiries before engaging him. I am sure it is suspicions of this sort which have prevented his appointment here, and I suppose the same causes procured his dismissal from Johns Hopkins."[137] Palmer's letter took Peirce out of the running.

Peirce's 24 May letter to Carus was the cover for his "The Law of Mind" (sel. 27): "I enclose one of the two articles on Mind in my series on my philosophy, I have not counted the words; but there cannot be far from 8400; so, I shall be much obliged if you will send me $200, on account." This article plays a crucial role in his *Monist* series since it is an examination of the general law of mental action, which was claimed by Peirce to be fundamentally distinct from mechanical action. Peirce's main objective in "The Law of Mind" was to argue for the importance of continuity for mental operations and to examine the law of mind guided by a mathematically informed understanding of continuity. Peirce's ideas about the "prime importance" of continuity for understanding mental processes, and for philosophy in general, were brought together in the theory or doctrine he called "synechism." About a year later, Peirce wrote an article for *The Open Court,* "Immortality in the Light of Synechism" (W9: sel. 54), in which he stated, concisely, that he "proposed to make *synechism* mean the tendency to regard everything as continuous." Peirce said that this third *Monist* paper was "intended chiefly to show what synechism is, and what it leads to," and he connected his work for *The Monist* to his 1868–69 Cognition Series (W2: sels. 21–23) where his study of mind was explicitly based on semiotic principles (Peirce claimed to have been "a little blinded by nominalistic prepossessions" when writing those early papers).

If psychical processes are fundamentally irreversible, as Peirce believed, as distinct from physical processes, which, if irreversible, are so only statistically speaking due to their inherent complexity (such as with the behavior of gases), then how is that to be explained. More generally, how do mental, or psychical, processes work as distinct from physical processes? According to Peirce, the law of mind (the general law of mental action) is that "ideas tend to spread continuously and to affect certain others which stand to them in a peculiar relation of affectability." In spreading, ideas lose intensity as they gain generality. Ideas must not be supposed to be fleeting events that pass from consciousness abruptly as time passes but, rather, to be states of consciousness occupying infinitesimal intervals of time. In this infinitesimal interval "we directly perceive the temporal sequence" and are thus able to immediately perceive relations between emerging and passing, but temporally overlapping, ideas. "We are thus brought to the conclusion that the present is connected with the past by a series of real infinitesimal steps." Through inference, or mediate perception, a train of thought can be built up and comprehended.

The "peculiar relation of affectability" is what gives the movement of thought (and mental time) its forward direction. Ideas can only be affected by ideas that have preceded them, not by ideas yet to come: "The present is affectable by the past, but not by the future." Affectability is a non-associative transitive relation like the copula of Peirce's algebra of logic, a point stressed by Peirce in the earlier versions of "The Law of Mind" (sels. 25 & 26). According to Peirce, we "encounter three elements" in considering how ideas affect other ideas: their intrinsic qualities as feelings, their energy, and "the tendency of an idea

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[137] Darnell Rucker, *The Chicago Pragmatists* (Minneapolis: University of Minnesota Press, 1969), p. 10.

to bring along other ideas with it." As ideas spread, their intrinsic quality remains "nearly unchanged," but their energy dissipates quickly while their tendency to affect other ideas increases. As more and more ideas are affected they become "welded together in association," which results in a general idea. The feeling associated with a general idea is that of "a vague possibility of more than is present."

Peirce says that the law of mind follows the forms of logic. By the "hypothetical process" (abduction), sensations somehow "suggest" general ideas; by induction, habits become established ("a number of sensations followed by one reaction become united under one general idea followed by the same reaction"); and by deduction, the mind functions under the domination of habit (by "calling out certain reactions on certain occasions"). But a telling difference between the law of mind and physical law is that the mental law is not "rigid" and allows for some spontaneity in mental action: "the uncertainty of the mental law is no mere defect of it, but is . . . of its essence." If the law of mind acted with the rigidity of physical law, intellectual life would come to "a speedy close."

Peirce's introduction of infinitesimals into his philosophy of mind required support from mathematics. Peirce held that the "spread-out" feeling in a moment of consciousness was not just "consciousness continuous in a subjective sense" but was "*ipso facto* continuous." Peirce devoted a lengthy section of "The Law of Mind" to his philosophy of continuity and infinity to provide the formal basis for his theory of mind. One can see how Peirce's distinction between instants and moments of consciousness is elucidated, and justified, by his distinction between mere (dimensionless) points on a line and the "thick" (infinitesimal) points he employs to construct his theory of real continuity—especially as his theory will be developed in his 1898 Cambridge Conference Lectures. Peirce supposed that it was the spreading of infinitesimal feelings through continuous space, by means of their overlapping and welding, that could explain how "communities of feeling" arise and how communication is possible.

In a section on personality, near the end of "The Law of Mind," Peirce argued that "personality is some kind of coördination or connection of ideas" and that a "personality, like any general idea, is not a thing to be apprehended in an instant." Personality, as something really continuous, is a welding of infinitesimal moments, like any general idea, and not a concatenation of instants of "immediate self-consciousness." Peirce claimed that there is a "teleological harmony" in coordinated ideas and that "in the case of personality this teleology is more than a mere purposive pursuit of a predeterminate end; it is a developmental teleology. . . . A general idea, living and conscious now, is already determinative of acts in the future to an extent to which it is not now conscious." This account of personality explains the continuity of feeling and consciousness that is generally supposed to attach to personal identity but Peirce's old semiotic account from his 1868 *Journal of Speculative Philosophy* papers may provide a clearer sense of the role of the other (the interpreter) in the development of a personality.

Peirce concluded by arguing that the synechistic philosophy "is forced to accept the doctrine of a personal God" and, moreover, that "we must have a direct perception of that person and indeed be in personal communication with him." How, then, can God's existence be doubted? This may have been the beginning of the line of thought that would lead to Peirce's "Neglected Argument for the Reality of God" sixteen years later.

Before sending Carus his manuscript for "The Law of Mind" on 24 May—whether from Cambridge or New York is unclear—Peirce had received a telegram from Carus with the brief message: "Send manuscript at once. Intend to print next week. Letter follows." Peirce had not yet received Carus's letter when he posted his manuscript. In his letter, Carus responded to an emotional letter that Peirce had written in a state of frustration or anger which had clearly raised Carus's hackles (Peirce's letter has not been found): "I do not know whether I shall take it as an insult or an unwarranted outbreak of temper."

Carus continued politely, though testily, to explain to Peirce the process by which *The Monist* brought articles to print and why printing for the forthcoming issue had to be finished by June 10th for the issue to appear on July 1st. Carus told Peirce he had no objection to publishing six of his articles in consecutive issues (indicating that Peirce still intended to run his series to a sixth article), but that he would not make a binding promise "more than a year ahead." Carus defended his practice of replying to principal authors whose views deviated significantly from the position of *The Monist*: "I accept articles from any standpoint. But when I publish articles that differ in some important point considerably from our position, I have to point out the difference." This was necessary because of Mr. Hegeler, who wanted *The Monist* "to represent a definite world view," and who held Carus responsible for making sure the journal adequately represented that view. Carus observed in passing that Peirce had expressed a wish to contribute to *The Open Court* and said he would be glad for contributions from his pen.

On 27 May, soon after receiving Carus's letter, Peirce wrote to apologize for having used an offensive expression: "I much regret it, and ask for pardon. It was a case of the pen of a tired and hurried man running away and making him say things whose *posteê* he did not perceive. One of 'things one would rather have left unsaid.'" But he went on to express surprise that Carus thought his articles were not in harmony with the position of *The Monist* and said that if Hegeler's view of the purpose of his journal was so narrow as to promote the conciliation of science and religion only "if it takes place in a preconceived way," then that "*is* a pretty good reason why my writings should not appear in the *Monist*, and makes me wonder why they are welcome to you." Carus replied on the 31st, relieved that Peirce's letter had defused some of the tension between them and hopeful of putting it completely behind them. Carus seemed to backtrack a little, saying he had not made himself sufficiently clear. Peirce *was* in harmony with *The Monist,* although his first paper did contain "an important deviation from our conception of necessity." Carus explained that since necessity was "such a fundamental idea" he was preparing a reply to explain why "in this point I differ from you. . . . My discussion of your article on "Necessity" will soon be in your hands, and I am curious what you will think of it."[138]

Back in New York after his Cambridge visit, Peirce quickly resumed his 'academic journalism' for *The Nation*. He must have been hoping for good news from Chicago (unaware of Palmer's intervention), but his hopes had been dashed more often than not and all he could really count on was increasing pressure from creditors. Probably during the last week of May, Peirce wrote his fairly lengthy review of Arabella Buckley's *Moral Teachings of Science* (sel. 53). The subject of Buckley's book struck a chord with Peirce. One thing that science teaches is "perfect fairness and moral indifference as to the outcome of any inquiry." As an example, Peirce imagined an inquiry that posed a conflict between science and religion: "Many great scientists go to church, and are there very unlike what they are in their laboratories. At one time they are studying one aspect of truth, at another time another. To regard either aspect fairly and honestly, the other must for the time be excluded. If they conflict, the presumption, the faith of the scientific man is, that it is because the last word has not been said, on one side or on the other; at any rate, it must at least be hoped that there is an ultimate resting-place which will be satisfactory from both points of view." Another important "teaching of science" is the need for perfect candor in recognizing facts, "without trying to explain away real difficulties so as to make out a decided conclusion": this "is the very first point of scientific morals." Elaborating on this point, Peirce noted that unlike the practice of law, with its "rules for excluding certain kinds of testimony," science must exclude nothing: "It must let instincts and superstitions have their say, unchecked, and listen to them; and then it must let scientific

[138] See note 121 above.

observation have its say, equally unchecked. Science will erect a theory which shall do full justice to both orders of facts, if it can."

But these are more the teachings of "scientific logic" than the "moral teachings" that concerned Buckley. "She means the moral and spiritual beliefs and tendencies which are in harmony with the discoveries and theories of science." Only "airy optimism" could suppose these beliefs to be necessarily sound. Science is only "the sum of human activity at any epoch in the path of discovery" and "is *essentially* incomplete." Science "has nothing whatever to say about eternal verities" and "makes no pretence to teaching spiritual things." Peirce concluded by remarking that insofar as the teachings of science are taken to be moral teachings they are "in the main distinctly anti-Christian." Science follows the mechanical philosophy which leaves no room for final causes and reduces "God to the condition of a limited monarch, acting under laws which leave no room for personal favors." One can see how the thought Peirce was devoting to his *Monist* papers was flowing over into his more "popular" writings.

On 3 June, Peirce answered Carus's letter of 31 May, and was not yet quite ready to put aside his concerns about his relations to Carus and *The Monist*:

> As for the flags and parties in philosophy, I think it is 10 to 1 we are all in the wrong. We should therefore exercise the utmost toleration. Besides philosophy has little practical value. It is a poor thing to base religion or conduct or politics or business of any kind on. The *study* of philosophy is not altogether useless in elevating the spirit, and we hope it will one day yield some unquestionable results. But little or nothing of that kind has yet been reached. And I for one am not at all disposed to risk any skin upon it or make a party to advocate any particular variety of philosophy. When I enter a philosophical disputation it is in the hopes that I and the audience will learn something, not at all to cause the triumph of any doctrine. In fact, when philosophy becomes partisan, it may be *sophy* but it ceases to be philosophy. I should as soon think of getting up a party to further the cause of a proposition in mathematics or chemistry. The scientist, like the philosopher, does not busy himself with vindicating doctrines but in searching out truth. He is a student, not a party-leader. A chemist would not think the Church Journal or The Methodist a proper place to print his researches, even if his clergymen should think his conclusions somehow helped their purposes and furthered the cause of righteousness. I as a philosopher have no more to do with the cause of religion than the chemist has. I am just pegging away at my studies and giving the results to the world, without any ulterior purpose. I want to publish them in a journal which does not care a straw what the results may be, or what cause they forward or injure.

In concluding his letter, Peirce abruptly changed his tone, as he was always so capable of doing, and referred back to Carus's invitation to contribute to *The Open Court.* Peirce offered to write a series of short articles "intended to further the cause of right reasoning" to be entitled "The Critic of Arguments."

Peirce was still working on his table of colors for Funk & Wagnalls in the spring of 1892. He tried again for some kind of "steady engagement" with the dictionary but was told that his work on the color table was proving to be too "technical and scientific" and that until he managed to put the table into a form they could use they would not consider his proposition "for further services" (3 June 1892). Nevertheless, a month later, Funk offered to give Peirce further work provided his "work can be made to conform to our fundamental of *average* intelligence" (6 July 92): but Peirce's work went slowly and he was still working on his table of colors in the spring of 1893.

Peirce wrote two reviews for *The Nation* in June; the first, written around the middle of the month, was a review of William Ridgeway's *The Origin of Metallic Currency* (sel. 54). Peirce, who was not only an historian of science but was a member of the National Academy of Sciences Committee on Weights, Measures, and Coinage, and had once been in charge of the United States Office of Weights and

Measures,[139] was clearly an expert on the subject of Ridgeway's book. Peirce gave the readers of *The Nation* a brief but compelling critique of the history of standards and finished with restrained praise for Ridgeway, who he said was "old school"—shown by the fact that "he attaches more importance to documents than to monuments"—yet, from that standpoint, his book "must be acknowledged to be a strong work." Peirce's review of Ridgeway appeared in both *The Nation* and the *Evening Post* on 23 June.

Earlier in the month, pressed for money, Peirce had written to Carus to ask him for immediate payment for "The Law of Mind" and for an advance "for the article I am now engaged in" (sel. 29): "A succession of misfortunes in the last year has put me for the time being into great straits financially. I am on the point of placing two inventions each for a very large sum, but negotiations are slow, and it is essential that I should keep up appearances. Consequently, a few hundred dollars now will be worth to me many thousand a little later." Peirce sent his letter on 9 June and the following day Carus sent a check for $200 for "The Law of Mind"; on the 16th he advanced $100 for "Man's Glassy Essence."

One of the inventions Peirce was referring to was his improvement of a new bleaching process.[140] In June, Peirce was brought into an investment scheme, headed by Wall Street promoter, Thomas J. Montgomery, formed to profit from the efficiencies of a new electrolytic bleaching process recently patented by the inventor, Albert E. Woolf. Woolf, who lived in New York and was apparently aware of Peirce's expertise as a chemical engineer, had invited him to examine his bleaching process. Peirce's examination and suggestions led Montgomery to engage Peirce to thoroughly analyze the Woolf process and prepare a report on its chemistry, and on possible improvements, for the investors. Montgomery, it seems, agreed to pay Peirce $500 for the analysis and report and offered him $100,000 in stock for significant improvements to the process (although a list of expected income that Peirce prepared later indicates that higher fees and yields were expected). Peirce spent a great deal of time analyzing the Woolf process for bleaching by electrolysis and succeeded in discovering patentable improvements that would make the process more efficient and more effective.[141] Peirce's improvements included a new chemical action "hitherto unknown to science," a new "cyclical process" that preserved the effectiveness of the bleaching solution, a new procedure for handling the bleaching solution in relation to the electrodes in the decomposing tank, and a new alternating process of repeatedly bleaching in an acid solution and cleansing in an alkaline solution that could yield marked efficiencies. Peirce reported these findings in detail to Montgomery on 6 July and recommended that he waste no time in applying for patents: "Woolf's patents in my opinion are of no great market value, because there is nothing new in his process except making the solution alkaline. But the invention here described is certainly new in its first claim, and I believe in all; and it cannot be superseded." Peirce's innovations were not only relevant for the bleaching process but had relevance for the electrolytic treatment of solutions more generally.

Peirce believed he had succeeded in finding a way out of his financial hardship. Not only had he earned $500 for his analysis and report but he expected to eventually receive substantial earnings from the stock he supposed he would get for his improvements, which he believed would double "the intrinsic economy of the process." Near the end of July, Montgomery gave Peirce a check for the $500, drawn on the Fifth Avenue Bank, but the check was returned because of inadequate funds. Peirce's brother,

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139 See the introduction to W4, p. xxxv.

140 It isn't certain what the second invention was that Peirce was "on the point of placing." In another letter assumed to have been written to Carus about November 1892, Peirce mentioned three inventions: his bleaching process, a process for distilling wood-alcohol "capable of a basic patent," and a process for preventing scaling in locomotive boilers.

141 See various related manuscripts listed in the Chronological Catalog: 1892.78–80; 89; 96; 110–11.

Herbert, who was involved in the scheme and was more familiar with the business world, intervened to help resolve what he assumed was an inadvertent mix-up. If the problem could not be resolved, however, Herbert was sure they could find someone who would pay more for Peirce's report: "In fact it is a pity to see so much sold for so little" (31 July). But Peirce became impatient and made some unwise remarks in correspondence that turned Montgomery and others in the investment group against him, forcing Herbert to abandon his efforts. Regrettably for Peirce, he had not held back his report as Herbert had recommended, and he never received a penny for his work or his ideas. This unfortunate episode would be alluded to in Peirce's fifth *Monist* paper, "Evolutionary Love," where Montgomery made an appearance as Peirce's "Master in glomery."[142]

Not long before the promise of the bleaching enterprise evaporated, Peirce had written a note to Juliette listing his rather exaggerated expectations for earnings from his 1892 ventures: Vanderbilt contract, $57,216.35; Montgomery, 5,500.00; Wolff's business, 106,018.14; Carus, 1,721.18; Interest, 4, 567.75; for a total of $165,023.42. "Pretty well for hard times," Peirce concluded. For the salutation of his note to Juliette, he romantically penned a stanza from the poem, "L'Andalouse," by Alfred de Musset (which had been set to melody by Hippolyte Monpou), thus addressing Juliette as his beautiful Andalusian, his mistress, his lioness. He was feeling exuberant. But with the collapse of the bleaching scheme, his hopes dissolved; it would be only his work for Carus that would pay, and his Lowell lectures and work for *The Nation,* neither on his list. Financial hardship again loomed before him.

Peirce's third article in his *Monist* series, "The Law of Mind," appeared as planned on the first of July. [143] He must have been pleased that a crucial part of his argument against the mechanical philosophy that he believed ruled the day was now before the intellectual public. It might also have given him some satisfaction that he was on track with *The Monist* for a continuation of his series in consecutive issues—but the appearance of his article would not yield any much-needed income because Carus had advanced him his payment on 10 June. Peirce turned to the ever dependable Garrison, so often the source of his bread and butter during this period, and picked up two more books to review.

He first took up Karl Pearson's *The Grammar of Science*, a widely influential book which in its second edition would decidedly influence the young Einstein ten years later. As Peirce saw it, Pearson's book was an elucidation of "Kantian nominalism," fully in the "spirit of the *Kritik der reinen Vernunft.*" Peirce objected to Pearson's conceptualist account of science that made laws of nature the products of "the perceptive faculty," implied that Newton had not *discovered* the law of gravitation but had *created* it, and made motion to be "wholly relative." Pearson saw concepts where he should have seen percepts. Peirce's criticism of Pearson's nominalistic account of reality as dependent on sense-impressions was aimed at showing how it was self refuting. But Peirce acknowledged that Pearson's book was "one of considerable power" and contained "matter for salutary reflection for anybody who cares to think deeply." Peirce's review (sel. 55) was published in the 7 July issue of *The Nation* (and on 23 July in the *Evening Post*).

The second book Peirce took up was *The Province of Expression,* by Samuel Silas Curry. Peirce had a personal interest in elocution, having studied it in his youth, even gaining an early reputation for his mastery of oratory. The Peirces were friends of New York playwright and director, Steel MacKaye, and Juliette studied acting under him. In 1888, Peirce wrote a short paper, "Trichotomic" (W6: sel. 29), in

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142 See annotation 188.39, pp. 411–12.

143 A lengthy summary extraction from Peirce's "The Law of Mind" was published in *The Philosophical Review* in September 1892, pp. 583–85.

which he applied his categories to MacKaye's theory of dramatic expression. And not long after the period covered by the writings in the present volume, possibly even before the end of 1892, Peirce would apply for a vacant position to teach elocution at the Episcopal Church's General Theological Seminary in New York.[144] So it is not surprising that Peirce took Curry's book to review (sel. 56). Peirce admitted that it was a "thoughtful and refined" work, though he was disappointed that Curry had "degraded" the art of eloquent delivery known as "elocution" to "an offensive display of technique without soul or real art" that he called "expression." Curry had rejected the methods of the four main "schools of delivery," the imitative, the mechanical, the impulsive, and the speculative, without giving "a very definite reply" as to what he would recommend in their place—but, as this was the first of ten volumes Curry promised on the subject, perhaps readers should not expect "anything more than generalities." Peirce took the opportunity to point out that a master of elocution, as a theorist, need not be expected to be a great orator. Indeed, "excessive devotion to the theory of any art is somewhat unfavorable to its practice." Peirce's review of Curry was published on 14 July.

*The Nation* published no more reviews by Peirce in July and only two in August, one of which, a review of George Stuart Fullerton's *The Philosophy of Spinoza,* will be included in W9. In mid-July, Peirce's cousin, Edward Stanton Huntington, wrote to him to announce the publication of his book, *Dreams of the Dead,* and to ask Peirce if he might be able to help with a review. As a favor to his cousin, and because something about the book struck his fancy, Peirce persuaded Garrison to let him review it in *The Nation,* but that review would not appear until September (it will also be included in W9). When Huntington wrote to thank Peirce for offering to help out, he remarked that he was "not a spiritualist nor . . . a follower of Madam Blavatsky—that great Fraud," yet "I have seen enough to knock my old materialistic beliefs out of sight."[145]

The Mach translation project, for which Peirce had been engaged as a scientific advisor, finally got going in July. Peirce worked closely with the Open Court translator, Thomas J. McCormack, and devoted considerable time to the translation. On 5 July, Peirce wrote to McCormack to remind him that Carus had agreed that he would be "final arbiter on questions of literary form" and to make his views on translating clear at the outset: "Now let us not treat Dr Mach's book as if it were a Bible; but just find out what he means to say & express that." He asked McCormack to "keep all I send you relating to Dr Mach's book to be shown to Dr. Carus as evidence of how much work there has been." Work on the Mach translation continued into May of the following year and *The Science of Mechanics* was published a few weeks later.[146]

Throughout the year, Peirce had taken whatever time he could spare to work on his Lowell lectures, often with the idea of using his research for popular articles or lectures along the way, but keeping food on the table and creditors at bay had slowed him down. By mid-year Peirce was losing hope that he could finish by December when he was scheduled to deliver the course of lectures. On 5 July, Peirce wrote to Augustus Lowell to tell him he was in a great quandary; he did not want to cause any serious inconvenience for Lowell but was afraid his lectures could not "be as good as they ought to be." Peirce explained that when he accepted the offer to give the lectures, he had reason to suppose he would have the leisure necessary for their preparation: "Unfortunately, I found myself without the working capital I was counting upon, so that I am obliged to spend more than half my time in drumming up occupation for the

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144 See Henry C. Johnson's paper referred to in note 129 above.

145 Huntington to Peirce, 3 August 1892.

146 See note 132 above.

rest that shall bring immediate returns. Now, in my opinion, no man can do good work on the brink of starvation. Any instances of it were cases in which ideas had been stored up in advance. At least, such is my experience." Peirce suggested that it might be in the "interest of the Lowell Institute and of its audiences" to cancel his December engagement—but "I will go ahead and execute my contract, if desired, or 'perish in the attempt.'" Lowell replied on the 8th that there was no reason for Peirce to suffer so since he would be glad to advance part of the payment for the lectures: "let me know how much you would require to secure the proper leisure for their preparation." Lowell assured Peirce that his lectures on the history of science would be a credit to him and to the Institute, and that they "might afterwards be published upon favorable terms." Surely "it would be a mistake & misfortune if it were to be given up." Peirce was much relieved and asked for half his payment in advance, "one fourth soon, and one fourth about October 1st," and he promised to be ready in December. On 12 July, Lowell mailed Peirce a check for $450, one fourth of what the Lowell Institute paid for a course of twelve lectures.[147]

Peirce wrote to Juliette on Sunday 10 July to give her the good news that Lowell had agreed to advance half the money for his lectures and to let her know that he would "go on with them" and what he would have to do to finish the lectures by December. He would not be able to write them entirely "at home in Pike County" but he thought that with "six weeks here and in Cambridge I could do all that will be necessary in the way of libraries"—it would be "much cheaper & pleasanter" to work in Cambridge but "I know pretty well what there is here & can lay my finger on it." That would leave him about eleven weeks at home, "and I think in that way we shall be able to pull through till December, when we shall go to Boston, if you are here, and don't have to be sent away for your health." Peirce said he hoped they might be able to go abroad together the following summer. He went on to tell Juliette how hard he was working: "so hard that the whole of my mind goes into it & it leaves me almost silly the rest of the time. So I do some very stupid things. Today I jumped out of bed and went to church at seven o'clock. Then I went again at 9 o'clock, and then I came back to write for the rest of the day. I want *very* much to be with you in the country." But he thought he had to stay in New York at least until 13 August when the Astor Library would close for the summer, "when I can do nothing here." He planned to devote the coming week to "Montgomery's bleaching work" but he would try to go to Philadelphia to see if he could "somehow raise that money." It isn't known what money Peirce was referring to, but it might have had something to do with George W. Childs from Philadelphia who was said, in the *Home Journal* article about Milford mentioned above, to be developing "a colossal pleasure-ground" at Dingman's Ferry on the Delaware River a few miles below Milford. The hope was that the Childs' recreation site would bring many vacationing New Yorkers to the Milford area, but still more development was needed: "The present need is for some enterprising society [men] . . . accustomed to meeting Metropolitan taste, to combine in developing other localities in Milford, as the P[ei]rce estate, known as 'Arisbe,' has been developed; and the brilliant future always predicted for Milford, Pike county, Penn., will, at no distant day, be an accomplished fact." It is possible that the Peirces thought this publicity would provide the opportunity to raise capital to create the summer resort at Arisbe they hoped for—maybe to include a casino, an idea Peirce would write about to F. C. Russell in September.

On 15 July, Peirce was finally able to send Carus the fourth article of his *Monist* series, at first entitled "Our Glassy Essence" but soon to be renamed, by an alteration to the galley, "Man's Glassy

147 On 21 September, Lowell sent a second check for $450.

Essence."[148] This was the second of the two papers on mind Peirce had begun working on in April—the companion to "The Law of Mind" (sel. 27). Peirce wrote to Carus that his article was not as good as it should have been "owing to preoccupations and anxieties" but that it still had "some value." In his "Notes" for this second paper "on the nature of mind" (sel. 28), Peirce had written that the "problem is to elucidate the relation between the physical aspect of a substance and its psychical aspect" (in effect, Peirce was aiming to solve the mind-body problem, or to contribute to its solution).[149] Peirce had determined that the crux of the "problem" had to do with the nature of habits and habit formation. In "The Law of Mind," Peirce had concluded that the growth of mind is a process of generalization, infinitesimal feelings welding together to become general ideas; yet the spreading and coordination of feelings that results in a general idea works, somehow, through molecular transformations and the dissipation of energy in a process that is essentially mechanical. The task Peirce took up in "Man's Glassy Essence" was to explain the process of habit formation in physical organisms—how general ideas formed under the rule of the law of mind can gain "the power of exciting reactions."

Peirce's first step was to frame a general molecular theory of matter as a basis for a molecular theory of protoplasm. He then reviewed the properties of protoplasm that have to be accounted for (reaction to disturbances, nutrition and growth, reproduction, and so on) and constructed a theory of protoplasm framed at the molecular level to account for them. He assumed matter to be composed of molecules in swift motion exerting significant mutual attractions and repulsions and that critical molecular changes occur because of dissociation or decomposition—when molecules "throw off" atoms, or when they are "broken up" into atoms or sub-atomic atomicules.[150] Two properties of protoplasm that are of particular importance are the capacity to take habits and to feel (really, Peirce said, to exercise all of the functions of mind). Peirce gave a complicated account of how repeated disturbances of complex molecules of protoplasm that result in derangements of the atomic and sub-atomic parts and repeated restorations of equilibrium by the exchange or replacement of similar but not necessarily exactly equivalent parts (from nutrients or from neighboring molecules) can account for "the law of habit." This explanation of habit is "purely mechanical," Peirce noted, so it might be thought "unnecessary to suppose that habit-taking is a primordial principle of the universe." But this account of habit (as well as all cases of actions apparently violating the law of energy) depends on "aggregations of trillions of molecules in one and the same condition and neighborhood" which Peirce believed could not be accounted for by conservative forces: "let the mechanical explanation be as perfect as it may, the state of things which it supposes presents evidence of a primordial habit-taking tendency." Only "a principle of habit, itself due to the growth by habit of an infinitesimal chance tendency toward habit-taking," can bridge "the chasm between the chance-medley of chaos and the cosmos of order and law."

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[148] See the general headnote for sels. 28 and 29, pp. 594–96, for a detailed account of the genesis of "Man's Glassy Essence" and its relation to earlier writings. Peirce's title, especially his use of the word "glassy," is discussed in the first annotation for sel. 29, pp. 400–01 .

[149] In 1890, in "Logic and Spiritualism" (W6, sel. 44, pp. 391–93), Peirce sketched out the solution to the mind-body problem—which he referred to as "a rational account of the connection of body and soul"—that he would elaborate in "The Law of Mind" and "Man's Glassy Essence."

[150] See note 110 above. The theory of atomicules was also treated by Ira Remsen in his *Principles of Theoretical Chemistry with Special Reference to the Constitution of Chemical Compounds* (Philadelphia: Lea Brothers & Co., 1892). Remsen was a professor of chemistry at Johns Hopkins when Peirce and Sylvester were there; he attended Peirce's 1884 lecture on "Design and Chance."

It remained for Peirce to account for the property of feeling, for he believed that all protoplasm is conscious to some degree. Could feeling also be accounted for by a mechanical explanation of constituent molecular processes? Peirce speculated that if protoplasm were synthesized in a laboratory out of its component chemical elements, which he assumed to be possible, it would be "puerile and ultra-puerile" to refuse to admit that it would feel. Nevertheless, it would be futile to try to account for its feeling by the three laws of mechanics: "It can never be explained, unless we admit that physical events are but degraded or undeveloped forms of psychical events." Once this is granted, Peirce could explain how the "breaking up of habit" in nerve-protoplasm, given the considerable instability of protoplasm in general, leads to "fortuitous departures from regularity . . . accompanied by an intensification of feeling." Thus, Peirce said, the idealist "has no need to dread a mechanical theory of life." Chance-spontaneity, which engenders diversity, is always accompanied by feeling, in fact "chance is but the outward aspect of that which within itself is feeling." The tendency to take habits, which strengthens by its own operation, increases uniformity, which reduces the intensity of feeling but doesn't eliminate it: "wherever actions take place under an established uniformity, there so much feeling as there may be takes the mode of a sense of reaction." With this, Peirce concluded his account of "the relation between the psychical and physical aspects of a substance," the principal aim of "Man's Glassy Essence."

Peirce finished his paper by remarking that "it would be a mistake to conceive of the psychical and the physical aspects of matter as two aspects absolutely distinct. . . . [M]echanical laws are nothing but acquired habits, like all the regularities of mind" and the "action of habit is nothing but generalization, and generalization is nothing but the spreading of feelings." A general idea, according to Peirce, is "a certain modification of consciousness which accompanies any regularity or general relation between chance actions." There is a "unity of the ego" in the consciousness of a general idea that is "quite analogous to a person." Peirce pointed out that as early as 1868, in his *Journal of Speculative Philosophy* paper, "Some Consequences of Four Incapacities" (W2, sel. 22), he had claimed "that a person is nothing but a symbol involving a general idea," but he had been too nominalistic then to "see that every general idea has the unified living feeling of a person." Peirce now believed that what was necessary for personhood is a congeries of feelings—feelings that are "in close enough connection to influence one another." Based on this conception of personhood, Peirce put forward a theory of "corporate personality," the view that *esprit de corps,* national sentiment, and sympathy "are no mere metaphors" and that churches and even corporations can have real personalities. This idea could be put to the test, he believed, by observing whether there is "something like personal consciousness in bodies of men who are in intimate and intensely sympathetic communion." Peirce noted that when some "thirty thousand young people of the society for Christian Endeavor" gathered in Madison Square Garden on 7 July 1892, "there seemed to me to be some mysterious diffusion of sweetness and light."[151] Peirce added that "if such a fact is capable of being made out anywhere, it should be in the church."

Thomas McCormack, from the Open Court, wrote on 20 July to say he had received Peirce's manuscript of "Man's Glassy Essence" and that it would go into proofs as soon as possible. He said that Carus had departed for a short trip to Europe but, before leaving, had mentioned that Peirce intended to contribute "a series of articles to be entitled 'The Critic of Arguments.'" *The Open Court* could make use of Peirce's articles right away if he was ready. Peirce wrote back on the 25th that he would go to work on the new series and, in reply, McCormack asked him to please send a short note describing his project for

[151] Reported to be the largest gathering held in New York City up to that time: see *New York Times,* 7 July 1892 and *Official Report of the Eleventh International Christian Endeavor Convention, Madison Square Garden, New York City, July 7, 8, 9, 10, 1892* (Boston: United Society of Christian Endeavor, 1892). See also annotation 183.7–8, p. 409.

promotional use. Promotional notices of Peirce's "Critic of Arguments" series would appear in a number of newspapers and periodicals. On 29 August, the *New York Times* published a brief announcement in its "Literary Notes" section: "The methods of reasoning is the topic which Mr. Charles S. Peirce will attack in successive numbers of the *Open Court,* beginning with the number for Sept. 1.[152] The series will be a critical and historical discussion which will prove deeply interesting to the devotees of logic, not a large band, but one which reads and contributes to the reports of learned societies with all the more zeal." On 1 September *The Open Court* ran this notice: "In our following number the publication will begin of a series of articles by Mr. Charles S. Peirce on the methods of reasoning. It rarely occurs that the elements of a science are presented by those who have greatly contributed to its advancement. All students, therefore, should hasten to avail themselves of the opportunity to read what Mr. Peirce has to say concerning the fundamental principles of right reasoning." A longer note appeared in *Science* on 23 September, after Peirce's first article had been published, adding to a description of the content of the series that Peirce "is one of the most distinguished scholars and mathematicians of which America boasts" but that, especially in modern logic, his work has "contributed, perhaps more than that of any other living investigator, to the permanent advancement of science." The *Science* notice concluded: "The results of his thought are, however, for the most part locked up in the proceedings and reports of learned societies, and now for the first time, in *The Open Court,* are they to be presented in a less rigid and technical form, and made accessible to all who place a value on right thinking."[153]

At the end of the period we are looking at closely, Peirce was honored publically at an opportune time in advance of his upcoming distinguished Lowell Lectures. On 12 August 1892, the sophisticated art periodical, *Sun and Shade,* published a photogravure portrait of a very dignified looking Peirce with an accompanying biographical note principally extolling his achievements as a scientist and mathematician. The photogravure had been made from a photograph taken the year before by the famous photographer, Napoleon Sarony.[154] The *Sun and Shade* featured a few figures in each issue, generally favoring literary types—earlier issues, for example, had featured James Russell Lowell, Lew Wallace, Walt Whitman, and W.D. Howells. The 13 August issue of *The Critic: a Weekly Review of Literature and the Arts,* noticed that the *Sun and Shade* had printed "a handsome portrait of Mr. Charles S. Peirce, the distinguished mathematician, and author of *Studies in Logic*," and remarked on the striking resemblance of Peirce to Mr. Lowell.

"Man's Glassy Essence" appeared at the beginning of October in the third volume of *The Monist*. On 7 October, Peirce sent in the fifth and last article of his cosmological series, "Evolutionary Love" (sel. 30).[155] He composed "Evolutionary Love" while the U.S. was rapidly descending into a severe economic depression and when labor unrest was escalating. The Homestead Strike was in progress and the deadly battle between the steel workers and Carnegie's Pinkerton detectives had just taken place as Peirce began to write "Evolutionary Love."[156] Peirce's personal finances were in terrible shape and his career

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[152] Publication of the first installment was delayed until the 22 September issue.

[153] Peirce's "Critic of Argument" series for *The Open Court* will be included in W9 and discussed in its introduction.

[154] Sarony's photograph is reproduced as the frontispiece to W8.

[155] "Man's Glassy Essence" was published, and "Evolutionary Love" was submitted, several weeks into the period covered by W9; "Evolutionary Love" would not appear in print until January 1893. The introduction to W9, with a chronological span beginning in August 1892, will provide more biographical and historical context for these selections.

[156] The battle between the steel workers and Pinkerton's detectives occurred on 6 July. The Homestead Strike would not be settled until 20 November 1892. See note 3, above.

prospects were dismal. The bleaching project he had hoped would solve his financial problems was falling apart and he would soon find out that he had been swindled and would never see a penny of return for his considerable efforts. He had been turned down for every university position he had sought and the chance of university life seemed to have slipped from his grasp. He had the Lowell lectures ahead of him and they would bring him an additional $1350, certainly a great relief, but he would have to devote most of his time in the coming weeks to their preparation and that would stop other initiatives. Peirce was working as diligently and intensely as he ever had but for much less return, and on a job-by-job basis with no security for the future. He was losing faith in the institutions that were failing him and was undergoing a personal transformation that is reflected in "Evolutionary Love."

In this paper, one of the most metaphorical that Peirce ever wrote, he adds a new law to his account of the legal cannon of the Universe. The law of love will take its place alongside the mechanical laws and the law of mind. The love that plays a role in the development of the cosmos is not the "exuberance-love" of Eros, nor the "passionate-love" of Empedocles, but something closer to the "cherishing-love" that John, the Ontological Gospeller, attributed to the Supreme Being. From the message of 1st John 1.5, "that God is light, and in him is no darkness at all," together with the assurance of 1st John 4.8, that "God is love," Peirce concluded that just as darkness is the defect of light, so evil must be the defect of love, and that God's love must be great enough to embrace its opposite. Henry James, Sr., the Swedenborgian (and the father of William James), had earlier expressed the position Peirce had arrived at: "It is no doubt very tolerable finite or creaturely love to love one's own in another, to love another for his conformity to one's self: but nothing can be in more flagrant contrast with the creative Love, all whose tenderness *ex vi termini* must be reserved only for what intrinsically is most bitterly hostile and negative to itself."[157] This is true Christian love and the law of Christian love is expressed in the Golden Rule, which, on Peirce's reading, is "Sacrifice your own perfection to the perfectionment of your neighbor." It is this Christian love, in some primeval form, which somehow permeates the universe as the agent of development and growth. "Everybody can see that the statement of St. John is the formula of an evolutionary philosophy, which teaches that growth comes only from love, from—I will not say self-*sacrifice,* but from the ardent impulse to fulfill another's highest impulse. . . . Love, recognizing germs of loveliness in the hateful, gradually warms it into life, and makes it lovely. That is the sort of evolution which every careful student of my essay "The Law of Mind," must see that *synechism* calls for."

Fundamental as the law of love may be cosmically, Peirce saw that it was not well expressed in the age he lived in. Historians of the future, Peirce supposed, would come to think of the 19th century as the economical century "for political economy has more direct relations with all the branches of its activity than has any other science," and Peirce expressed its "formula of redemption" in bitter terms: "It is this: Intelligence in the service of greed ensures the justest prices, the fairest contracts, the most enlightened conduct of all the dealings between men, and leads to the *summum bonum,* food in plenty and perfect comfort. Food for whom? Why, for the greedy master of intelligence."[158] Peirce made it clear that he was not impugning political economy as a science, yet just as physics "has encouraged necessitarianism," a false and dangerous doctrine in Peirce's opinion, so political economy "has induced an exaggeration of the beneficial effects of greed and of the unfortunate results of sentiment, until there has resulted a

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[157] See annotation 185.7–13, p. 411.

[158] Peirce's bitterness was fueled by the fact that he had just been swindled out of his fees and interests in the Woolf bleaching process—something he had hoped would solve his financial problems. He used his misfortune as an example of the outcome of a commitment to the gospel of greed. See annotation 188.39, pp. 411–12 for more on this episode.

philosophy which comes unwittingly to this, that greed is the great agent in the elevation of the human race and in the evolution of the universe." [159] Peirce believed that utilitarianism, a great force in the 19th century which regarded persons only as abstractions, was a natural ally of the political economists who openly endorsed the gospel of greed.

So in "Evolutionary Love" Peirce depicted two opposing gospels, "the gospel of Christ" and "the gospel of greed." According to the gospel of Christ, "progress comes from every individual merging his individuality in sympathy with his neighbors." According to the gospel of greed, "progress takes place by virtue of every individual's striving for himself with all his might and trampling his neighbor under foot whenever he gets a chance to do so." The gospel of Christ was an expression of the law of love. The gospel of greed was an expression of the mechanical law that had been embraced so unreservedly by the age. Peirce saw Darwin's theory of evolution as a natural extension of the gospel of greed to the "entire realm of animal and vegetable life." The struggle for existence was endorsed as the natural and appropriate engine for driving the evolution of the species, an endorsement, Peirce thought, of "ruthless greed." Darwin should have added a motto to the title-page of his *Origin of Species:* "Every individual for himself, and the Devil take the hindmost!"

After confessing to have a "passionate predilection" for the law of love over the law of greed, and cautioning his readers to be on guard because of his "one-sidedness," Peirce considered the different theories of evolution for their "logical affinities." To some extent Peirce recapitulated his discussion of evolution in "The Architecture of Theories" (sel. 23), but from a different standpoint.[160] In "Evolutionary Love," Peirce identified three principal kinds of evolution and a number of sub-varieties. The main varieties were evolution by fortuitous variation, evolution by mechanical necessity, and evolution by creative love. Darwinian evolution is evolution by fortuitous variation, or chance, but with a secondary action required to "secure advance in a definite direction." The secondary action is "struggle for existence" in which greed is the motivating desire. Although chance is the critical factor in Darwinian evolution, the success of 19th century physicists in bringing non-conservative processes into the domain of mechanical law by means of the statistical method satisfied the prevailing nominalist scientific community that the non-conservative action of organic development must also be fundamentally mechanical. Peirce named evolution by fortuitous variation *tychastic* evolution, or *tychasm.*

The second principal kind of evolution was evolution by mechanical necessity. There are different varieties of evolution of this general kind, including Friedrich Weismann's theory that all biological forms are "mechanical resultants of the heredity from two parents,"[161] and the theory of geologists, like Clarence King, that evolution is the result of cataclysmic changes in the environment of the evolving organisms (other geologists point to environmental factors but think cataclysms unnecessary). For

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159 James Wible has pointed out that Peirce's attention to political economy and his opposition to the conservative economic philosophy of Simon Newcomb provide essential background for understanding "Evolutionary Love" (in which Peirce criticized Newcomb's *Principles of Political Economy:* see annotation 186.26, p. 411). See Wible's "Economics, Christianity, and Creative Evolution: Peirce, Newcomb, and Ely and the Issues Surrounding the Creation of the American Economic Association in the 1880s" (2009), available at Arisbe; the Peirce Gateway (www.cspeirce.com/menu/library/aboutcsp/aboutcsp.htm); see also his article "Complexity in Peirce's Economics and Philosophy: An Exploration of His Critique of Simon Newcomb," ch. 5 in David Colander, ed., *Complexity and the History of Economic Thought: Perspectives on the History of Economic Thought* (London & New York: Routledge, 2000), pp. 74–103.

160 See Carl R. Hausman, *Charles S. Peirce's Evolutionary Philosophy* (Cambridge University Press, 1993), p. 173 ff.

161 Weismann strictly ruled out the inheritance of acquired characteristics in opposition to the views of Lamarck and also Darwin.

Weismann, there is an inner necessity at work and for King it is an external necessity, but for all varieties of evolution of this kind, chance is not a factor. Peirce named evolution by mechanical necessity *anancastic* evolution, or *anancasm.*

The third kind of evolution was Lamarckian evolution, or evolution by the transmission to offspring of acquired characteristics ("hypertrophies or atrophies which have affected individuals early in their lives"). According to Peirce, Lamarckians recognize that some transmitted characteristics, or "modifications of form," may have been initially due to mechanical causes, but he identified "the straining of endeavor" and "exercise" as the key factors. "Now, endeavor, since it is directed toward an end, is essentially psychical, even though it be sometimes unconscious; and the growth due to exercise, as I argued in my last paper, follows a law of a character quite contrary to that of mechanics. Peirce was tempted to say that Lamarckian evolution is "evolution by the force of habit," but habit is "mere inertia, a resting on one's oars, not a propulsion." Yet habit "serves to establish the new features, and also to bring them into harmony with the general morphology and function of the animals and plants to which they belong." Peirce's discussion of Lamarckian evolution focuses mainly on the development of mind; he even remarks at one point that the "first step in the Lamarckian evolution of mind is the putting of sundry thoughts into situations in which they are free to play." This seems compatible with the current view that Lamarckian evolution is not as applicable to biological evolution as it is to social evolution—but Peirce's objective idealism may provide the necessary theoretical bridge to span these realms. Peirce finally pointed out, what had surely become obvious to any careful reader, that his "account of Lamarckian evolution coincides with the general description of the action of love." Peirce considered this kind of evolution to be "evolution by creative love" and called it *agapastic* evolution, or *agapasm.* Related names that are probably more familiar to students of Peirce's philosophy are *tychism, anancism,* and *agapism,* which name the doctrines "that absolute chance, mechanical necessity, and the law of love, are severally operative in the cosmos."

In the final section of "Evolutionary Love," Peirce pointed out that there is no sharp line of demarcation between the three kinds of evolution and that the main questions were "whether three radically different evolutionary elements have been operative" and "what are the most striking characteristics of whatever elements have been operative." He briefly considered these questions from the standpoint of "the historical development of thought." After identifying the main features of tychastic, anancastic, and agapastic developments of thought, Peirce gave historical examples supporting the conclusion that these different kinds of evolution really are operative in the world and revealing some interesting characteristics, such as that what distinguishes tychasm from agapasm "is its purposelessness." Peirce's description of the agapastic development of thought stressed the key role that sympathy plays and that the power of sympathy depends on the continuity of mind. Agapasm and synechism are closely linked. A telling conclusion Peirce drew from this exercise was that "all of the greatest achievements of mind have been beyond the powers of unaided individuals."

Although one might read the conclusion of "Evolutionary Love" as a satisfactory culmination of Peirce's cosmological series, it was not intended as such, and Peirce always regretted having to end it so abruptly. Peirce's lengthy "Reply to the Necessitarians" (W9: sel. 47), his rejoinder to Carus's "attack" on his tychism, appeared in *The Monist* in July 1893, and it provided him with an opportunity to expand on and clarify a number of key points from his cosmological series, but it was not the sixth paper he had intended for the conclusion of the series. In 1892 in "Man's Glassy Essence," Peirce had given an early idea about one thing he expected to include in a sixth paper—he promised to consider how the number and distribution of regions of positive and negative potential surrounding atoms would determine their

valency. Early the following year, when Peirce was negotiating with Hegeler to publish a book of his philosophical papers in time for distribution at the Chicago Columbian Exposition (the famous Chicago World's Fair of 1893 that ran from May through October), he planned to include twenty papers, the final six being the five papers of the *Monist* series followed by Chap. 20, a general sketch of the theory of the universe—maybe that was the general idea for the sixth paper. In 1895, Peirce wrote to Russell that had Hegeler kept his promise to allow him another article, "the 6th article, which would have been the keystone of the whole, would have related to that branch which I variously call Second intentional Logic, Objective Logic, & Pure Rhetoric. By this I mean the doctrine of the Evolution of thought." Finally, ten years later, in 1905 in another *Monist* paper, "What Pragmatism Is," Peirce described in some detail what he had planned for the concluding article of his cosmology series (EP 2: 345):

> Had a purposed article concerning the principle of continuity and synthetizing the ideas of the other articles of a series in the early volumes of *The Monist* ever been written, it would have appeared how, with thorough consistency, that theory involved the recognition that continuity is an indispensable element of reality, and that continuity is simply what generality becomes in the logic of relatives, and thus, like generality, and more than generality, is an affair of thought, and is the essence of thought. Yet even in its truncated condition, an extra-intelligent reader might discern that the theory of those cosmological articles made reality to consist in something more than feeling and action could supply, inasmuch as the primeval chaos, where those two elements were present, was explicitly shown to be pure nothing. Now, the motive for alluding to that theory just here is that in this way one can put in a strong light a position which the pragmaticist holds and must hold, whether that cosmological theory be ultimately sustained or exploded, namely, that the third category,—the category of thought, representation, triadic relation, mediation, genuine Thirdness, Thirdness as such,—is an essential ingredient of reality, yet does not by itself constitute reality, since this category (which in that cosmology appears as the element of habit) can have no concrete being without action, as a separate object on which to work its government, just as action cannot exist without the immediate being of feeling on which to act. The truth is that pragmaticism is closely allied to the Hegelian absolute idealism, from which, however, it is sundered by its vigorous denial that the third category (which Hegel degrades to a mere stage of thinking) suffices to make the world, or is even so much as self-sufficient. Had Hegel, instead of regarding the first two stages with his smile of contempt, held on to them as independent or distinct elements of the triune Reality, pragmaticists might have looked up to him as the great vindicator of their truth.

Thinking back on his *Monist* series thirteen years later, Peirce regarded it as "a first crude" try at a modern scientific metaphysics, no longer up-to-date in all its detail but still "serving to indicate just what sort of a thing is wanted."[162] Peirce's assessment of the series is pretty close to the settled view of those who over the years have studied it. As the details of the science become less relevant, the radical and landmark nature of some of his main ideas have become all the more apparent. Peirce's very clever reversal of the received view that uniformity was primordial and that it was its absence that required explanation, so that in his new cosmology the initial condition was one of total chaos out of which uniformities evolved by habit, was a true milestone for both science and philosophy. Ilya Prigogine has recognized Peirce's introduction of absolute chance into his cosmology as "a pioneering step"[163] and Ian Hacking has noted Peirce's success in his *Monist* papers in putting "emergentism together with ideas of

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[162] See annotation 110.7–9, p. 386.

[163] Ilya Prigogine and Isabelle Stengers, *Order out of Chaos: Man's New Dialogue with Nature* (New York: Bantam, 1984), pp. 302–03 (and see Joseph Brent, *Charles Sanders Peirce: a Life,* Indiana, pp. 175–76).

statistical mechanics, to form a new and vigorous indeterminism."[164] By bringing together his absolute chance with the law of mind, Peirce could comprehend an indeterminant and irreversible course of events through time, a process of real growth. If, that is, we also admit his law of love, which J. H. Muirhead noted already in 1928 had received too little attention and which still has yet to this day.[165] Peirce's tychism, and to a lesser extent, his synechism, have been for a long time topics of research for students of philosophy; agapism much less so but perhaps that is beginning to change. To fully grasp the idea of the sort of scientific metaphysics that "is wanted," it is essential to study Peirce's system as a whole. It may be that Peirce's law of love will one day be understood to be the greatest contribution of Peirce's first *Monist* series.

The reaction to Peirce's *Monist* papers varied greatly when they first appeared. William James, as was noted above, thought Peirce's "Doctrine of Necessity Examined" was "a blessed piece of radicalism." Much attention was given to Peirce's papers in the pages of *The Monist,* where Peirce's work was always given prominence, and some attention was given in many other journals and periodicals that treated philosophical or theoretical subjects. In his Presidential Address to the American Medico-Psychological Association in 1919, twenty-seven years after Peirce's articles were published, Elmer E. Southard, Director of the Boston Psychopathic Hospital, introduced Peirce to his audience as "perhaps the most original of American philosophers, from whom both James and Royce drew significant parts of their inspiration," and he gave a summary of Peirce's cosmology, surprisingly referring in particular to "Peirce's celebrated paper on Evolutionary Love." After summarizing Peirce's cosmology, Southard concluded:[166]

> Somehow Peirce has always seemed to me the most American of all philosophers. He was, as you might say, with his Tychism, just the sort of thoroughgoing sport that the Yankee prides himself on being, whereas, with his agapistic doctrines, he worked into the world just that degree of *bonhomie* that the Yankee never quite can succeed in concealing. If it were possible to combine most intimately some of the elements of the chance doctrine of the universe, namely Tychism, with some of the elements of the love doctrine, namely Agapism, then we should perhaps find that Charles S. Peirce stood for being not merely a sport, but a good sport, and this is perhaps a sufficient description of the American end and aim.

Of course Peirce's *Monist* articles were not universally celebrated. Peirce expected this when he wrote the following (possibly as his opening remarks to the Philosophical Club at Harvard on 21 May 1892):[167] "[A]s long as I have only begun to explain my position, people have no disposition to wait to hear me state my meaning in full; and I am made to suffer pains and penalties that are very real, for teaching what is held to be an antiscientific doctrine; and these may have a public interest if they prevent me, as they threaten to do, from completing the exposition of a philosophy which might lead science into the way of truth." Peirce's former student, Christine Ladd Franklin, is known to have believed that Peirce's essay, "Man's Glassy Essence," showed "very definitely" that he "was losing his mind as early as the first half of the nineties." E. B. Wilson, who reported Ladd Franklin's opinion to Paul Weiss,

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164 Ian Hacking, "Nineteenth Century Cracks in the Concept of Determinism," *Journal of the History of Ideas,* vol. 44 (1983): 455–75.

165 J. H. Muirhead, "Peirce's Place in American Philosophy," *The Philosophical Review,* Vol. 37 (1928): 460–81.

166 Elmer E. Southard, "Cross-Sections of Mental Hygiene, 1844, 1869, 1894," *American Journal of Insanity* 76.2 (1919): 91–111, esp. 95–96.

167 See annotation 126.3–12, pp. 389–90.

added: "And I must say that it has always seemed to me that his writings after 1890 gave much evidence of this when compared with those before 1885."[168] In 1891, G. Stanley Hall reviewed William James's *Principles of Psychology* for *The American Journal of Psychology* and in his review he contrasted Peirce's style with that of James: "Charles Peirce . . . burns his own smoke, and talks with the rifle rather than with the shot gun, or water hose."[169] But Hall was thinking of Peirce's work from earlier times. If any of Peirce's principal papers prior to 1885 is compared with "Man's Glassy Essence" or "Evolutionary Love," it is not difficult to see why Ladd-Franklin thought Peirce was losing his mind—if what is meant by losing one's mind is no longer being of one mind, as it were, with one's former self. Ladd Franklin knew Peirce well and she recognized that he had undergone a transformation; she believed it to be pathological, but that is not the only explanation.

Peirce's 24 April 1892 letter to the Rector of St. Thomas's Episcopal Church seems clearly to represent a pivotal moment in Peirce's life, and it is sometimes supposed that Peirce's experience was one of true conversion—in the sense of "becoming a new man." To understand what had brought Peirce to that moment, one must consider the change of fortune Peirce's life had taken, beginning with his father's death in 1880 and running through the loss of his Johns Hopkins lectureship (and the promise of a professorship) in 1884; the reorganization of the Coast Survey in 1885 that led to his suspension from active service and threatened his livelihood; his ostracism from a part of society he had "belonged to" because he had married Juliette, his mistress; his move to Pennsylvania to find a better life for him and Juliette, only to fall deeply into debt and be constantly at risk of losing his estate; his finding out that Juliette was suffering from tuberculosis; his having to work on so many projects at once in order to make ends meet that he could rarely meet expectations; and finally with the loss of his position with the Coast Survey, his having virtually to beg for writing jobs and sometimes loans to keep a semblance of his former life intact. Peirce suffered greatly during these years, both physically and emotionally. During the first months of 1892, no longer with a regular income, he had to stay alone in New York to spend his days writing book reviews and looking for work—always trying for the big chance with an idea for a patent or some other commercial scheme. In April when Peirce was dwelling on the exploits of his youth—writing his Tale of Thessaly—and contriving his new theory of mind for "The Law of Mind" and "Man's Glassy Essence," a transformation that had been ongoing through these hard times found its moment of self-revelation—at St. Thomas's Episcopal Church.

Whatever transpired that morning at St. Thomas's, Peirce's letter shows that he was thinking of himself and his life in a new way. Many of his friends and colleagues also saw him differently. When Peirce started working on "Man's Glassy Essence," he took up a project which in a sense he had put on hold twenty-four years earlier when he finished "Some Consequences of Four Incapacities." In that paper he had argued that "man is an external sign" and that as a sign, what a man is depends on "the ultimate decision of the community." If both Peirce and his community were interpreting the sign that he was in a new way, then by the logic of it he was a new man. What happened at the church that day seems to have been acceptance of the change that had been coming for some time. In fact it may be that in April or May when Peirce wrote in his "The Law of Mind" that he was not conscious of having contracted the virus of "the monstrous mysticism of the East" while he was growing up around the Concord Transcendentalists, but that nevertheless "it is probable that some cultured bacilli, some benignant form of the disease was

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[168] E. B. Wilson to Paul Weiss, 22 November 1946.

[169] G. Stanley Hall, "Review of James's Principles of Psychology," *The American Journal of Psychology* 3 (1891): 578–91 (see p. 590 for the remark about Peirce).

implanted in my soul, unawares, and that now, after long incubation, it comes to the surface, modified by mathematical conceptions and by training in physical investigations," he was quite serious. What both he and Ladd Franklin saw in him now, especially in his writings, seemed more Emerson-like or Schelling-like than before. The greatest developmental change in Peirce's philosophy during the period of this volume may be this directional shift toward a more nuanced objective idealism with more religious and social overtones—really a change of outlook.

To form an idea of how Peirce's work in the present volume contributed to the overall development of his thought, it may be helpful once again, as in the introductions to W5 and W6, to use key stages and turning points identified by Max H. Fisch and Murray G. Murphey to measure Peirce's progress.[170] In Fisch's account of "Peirce's Progress from Nominalism toward Realism,"[171] Fisch identified the final long period of Peirce's life, beginning with "The Architecture of Theories," as a distinct period of development, a time when Peirce "continued to weed out the remaining nominalistic and many of the idealistic elements of his philosophy." Fisch called this Peirce's *Monist* period in recognition of the fact that beginning in 1891, *The Monist* became his "chief medium of publication." According to Fisch, it was in part Peirce's return after almost twenty years to the question of realism that marked the beginning of this period of his thought. Although Fisch noted that Peirce would not explicitly focus again on the realism-nominalism issue until about 1893 in "How to Reason" (W11), in his definition of "realism" for the fourth volume of the *Century Dictionary,* which appeared in November 1890, Peirce inserted a lengthy quotation from Abbot's *Scientific Theism* that expressed well the tension between nominalism and realism, and in his 1892 review of Pearson's *Grammar of Science* (sel. 55) he explicitly criticized Pearson's nominalism. Abbot had characterized the tension between nominalism and realism as an ongoing battle, a battle Peirce had now joined on the side of realism: "so far was the old battle of Nominalism and Realism from being fought out by the end of the fifteenth century that it is to-day the deep, underlying problem of problems, on the right solution of which depends the life of philosophy itself in the ages to come."[172]

Murphey divided the development of Peirce's thought into four successive systems, the last beginning about 1885 with Peirce's and Mitchell's discovery of the quantifier, so during the period of the present volume, Peirce was well into the final phase of his thought.[173] But Murphey noticed that around 1896 Peirce recognized that anything that is continuous "involves real possibility and is accordingly of a general nature," and he regarded this to be "of the greatest philosophical importance," initiating Peirce's synechistic period.[174] It seems apparent, however, that with the evolutionary philosophy of Peirce's 1890–93 *Monist* papers, especially in his "Law of Mind" with its supporting theory of "continuous affectability" and the objective continuity of feeling, he had already made his turn to synechism, even if he had not yet fully comprehended its implications for modal logic and ontology. Clearly, during this period Peirce's conceptions of possibility and continuity moved close to their most developed forms.

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170 See W5, pp. xlv–xlvi and W6, pp. lxxx–lxxxii for some discussion of Fisch's and Murphey's accounts of Peirce's development.

171 Peirce, *Semeiotic, and Pragmatism; Essays by Max H. Fisch,* eds. Kenneth Laine Ketner and Christian J. W. Kloesel (Indiana University Press, 1986).

172 Francis Ellingwood Abbot, *Scientific Theism* (London: Macmillan, 1885), pp. 11–12.

173 Murray G. Murphey, *The Development of Peirce's Philosophy,* revised edition, Hacket 1993, pp. 301–03.

174 Fisch located this change in early1897 and called it Peirce's "most decisive step toward realism." Murphey, pp. 395–96, and Fisch, pp. 193–94; see also W6: pp. lxxx–lxxxi.

Reflecting on Peirce's philosophical motives of the time it seems that his dominant concern was the influence of the mechanical philosophy and what he believed to be the evil consequences of its false doctrine. The mechanical philosophy was for Peirce the twin of nominalism and he was at war with them both. If one limitation of the mechanical philosophy had to be chosen as likely to have been the most damning in Peirce's view, it would be its inadequacy to account for non-reversible growth—in effect erasing teleology and thirdness from the universe.[175] Considering more broadly the philosophical highlights of this period, one would have to point first of all to the evolutionary philosophy expressed in the *Monist* papers. Overall, they constitute Peirce's comprehensive alternative to mechanical philosophy. Many of the insights in those papers had been expressed earlier in Peirce's "Guess at the Riddle" and in other papers in W6, or in earlier volumes, but Peirce's tychism, anancism, and agapism were born in this period. These doctrines, along with Peirce's synechism, are clearly key developments in Peirce's philosophy and Peirce's system as a whole is a great monument of creative thought.[176]

Finally, it might be argued that it was during this period when Peirce became a contrite fallibilist; in a sense that is what the transformation described above led him to. As a practicing scientist for all of his life, Peirce had always known that the path toward knowledge demands acceptance of the facts of the matter regardless of one's wishes and expectations, but the humbling experiences Peirce had endured in recent years, together with the cold truth that he could no longer achieve his best, for want of opportunity and means, had intensified his realization that we must approach our quest for knowledge with humility. None of us alone can make progress or ever know if we have reached the truth. Our greatest contribution is our dedicated participation in the quest for truth along with our fellow searchers.

There are several selections in this volume that show Peirce to be moving toward contrite fallibilism, if he is not already there. In "Notes on the Question of the Existence of an External World" (sel. 19), he emphasized the difference between fallible knowledge and no knowledge, indicating that he had started to think specifically about fallibility. Also, in his review of Buckley's *Moral Teachings of Science* (sel. 53) he pointed out that science is a human activity bound to a time in history and that it is *essentially* incomplete. That is virtually a statement of fallibilism. It is also of note that one of Peirce's reasons, perhaps his main reason, for recommending tychism was that it does not barricade "the road of inquiry" the way determinism does. That also reveals a fallibilist perspective as does Peirce's conclusion in "Evolutionary Love" (sel. 30), that "all of the greatest achievements of mind have been beyond the powers of unaided individuals." Finally, we must remember Peirce's rendition of the gospel of Christ: "progress comes from every individual merging his individuality in sympathy with his neighbors." Clearly Peirce is already a fallibilist by inclination if not quite yet by designation. By the summer of 1893, only a few months after the appearance of "Evolutionary Love," Peirce would write his first paper on fallibilism (W9: sel. 56). It might be that Peirce's deliberate turn toward contrite fallibilism, which calls for true intellectual humility as we confront the reality before us, is his most significant advance during the period covered by this volume. It is the path Peirce would continue on for the remainder of his days.

Nathan Houser

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[175] For recent treatments of Peirce's views on reversibility and teleology see Andrew Reynolds, *Peirce's Scientific Metaphysics* (Vanderbilt University Press, 2002) and T. L. Short, *Peirce's Theory of Signs* (Cambridge University Press, 2007).

[176] Comprehensive treatments of Peirce's evolutionary metaphysics can be found in Carl Hausman, ibid. and in Reynolds, ibid. See also Christopher Hookway's *Peirce* (Routledge & Kegan Paul, 1985), ch. IX and *Truth, Rationality, and Pragmatism* (Clarendon Press, 2000), ch. 6.

Revisions to Dec. 2009 version posted on Arisbe

1. p. 25, n. 48. 1907 changed to 1906. [As early as 15 May 1903, the day following the completion of his 1903 Harvard Lecture Series, Peirce signed a follow-up lecture on "Multitude and Continuity" (R 316a), "Charles S(antiago?) Peirce," perhaps implicitly referring back to Schröder's baptismal use of his new middle name. William James had arranged for Peirce to give the 1903 Harvard Lectures which, along with the following 1903 Lowell Lectures, Peirce's brother, James Mills, believed to have "saved him from going to ruin" (EP 2: xxiv). It may be that this was when Peirce got the idea of honoring William James by adding "Santiago" to his name. Peirce used "Santiago" as his first middle name in print in the January 1906 issue of *The Monist.*]