The Intelligible Universe

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> A symbol is something which has the power of reproducing itself, and that essentially, since it is constituted a symbol only by the interpretation. This interpretation involves a power of the symbol to cause a real fact; and although I desire to avoid metaphysics, yet when a false metaphysics invades the province of logic, I am forced to say that nothing can be more futile than to attempt to form a conception of the universe which shall overlook the power of representations to cause real facts. What is the purpose of trying to form a conception of the universe if it is not to render things intelligible? But if this is to be done, we necessarily defeat ourselves if we insist upon reducing everything to a norm which renders everything that happens, essentially and *ipso facto* unintelligible. That, however, is what we do, if we do not admit the power of representations to cause real facts. If we are to explain the universe, we must assume that there was in the beginning a state of things in which there was nothing, no reaction and no quality, no matter, no consciousness, no space and no time, but just nothing at all. Not determinately nothing. For that which is determinately not *A* supposes the being of *A* in some mode. Utter indetermination. But a symbol alone is indeterminate. Therefore, Nothing, the indeterminate of the absolute beginning, is a symbol. That is the way in which the beginning of things can alone be understood. What logically follows? We are not to content ourselves with our instinctive sense of logicality. That is logical which comes from the essential nature of a symbol. Now it is of the essential nature of a symbol that it determines an interpretant, which is itself a symbol. A symbol, therefore, produces an endless series of interpretants. Does anybody suspect all this of being sheer nonsense? *Distinguo.* There can, it is true, be no positive information about what antedated the entire Universe of being; because, to begin with, there was nothing to have information about. But the universe is intelligible; and therefore it is possible to give a general account of it and its origin. This general account is a symbol; and from the nature of a symbol, it must begin with the formal assertion that there was an indeterminate nothing of the nature of a symbol. This would be false if it conveyed any information. But it is the correct and logical manner of beginning an account of the universe. As a symbol it produced its infinite series of interpretants, which in the beginning were absolutely vague like itself. But the direct interpretant of any symbol must in the first stage of it be merely the *tabula rasa* for an interpretant. Hence the immediate interpretant of this vague Nothing was not even determinately vague, but only vaguely hovering between determinacy and vagueness; and its immediate interpretant was vaguely hovering between vaguely hovering between vagueness and determinacy and determinate vagueness or determinacy, and so on, *ad infinitum*. But every endless series must logically have a limit.

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> Leaving that line of thought unfinished for the present owing to the feeling of insecurity it provokes, let us note, first, that it is of the nature of a symbol to create a *tabula rasa* and therefore an endless series of *tabulae rasae*, since such creation is merely representation, the *tabulae rasae* being entirely indeterminate except to be representative. Herein is a real effect; but a symbol could not be without that power of producing a real effect. The symbol represents itself to be represented; and that representedness is real owing to its utter vagueness. For all that is represented must be thoroughly borne out.
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> For reality is compulsive. But the compulsiveness is absolutely *hic et nunc*. It is for an instant and it is gone. Let it be no more and it is absolutely nothing. The reality only exists as an element of the regularity. And the regularity is the symbol. Reality, therefore, can only be regarded as the limit of the endless series of symbols.
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> A symbol is essentially a purpose, that is to say, is a representation that seeks to make itself definite, or seeks to produce an interpretant more definite than itself. For its whole signification consists in its determining an interpretant; so that it is from its interpretant that it derives the actuality of its signification.
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> A *tabula rasa* having been determined as representative of the symbol that determines it, that *tabula rasa* tends to become determinate. The vague always tends to become determinate, simply because its vagueness does not determine it to be vague (as the limit of an endless series). In so far as the interpretant is the symbol, as it is in some measure, the determination agrees with that of the symbol. But in so far as it fails to be its better self, it is liable to depart from the meaning of the symbol. Its purpose, however, is to represent the symbol in its representation of its object; and therefore, the determination is followed by a further development, in which it becomes corrected. It is of the nature of a sign to be an individual replica and to be in that replica a living general. By virtue of this, the interpretant is animated by the original replica, or by the sign it contains, with the power of representing the true character of the object. That the object has at all a character can only consist in a representation that it has so,—a representation having power to live down all opposition. In these two steps, of determination and of correction, the interpretant aims at the object more than at the original replica and may be truer and fuller than the latter. The very entelechy of being lies in being representable. A sign cannot even be false without being a sign and so far as it is a sign it must be true. A symbol is an embryonic reality endowed with power of growth into the very truth, the very entelechy of reality. This appears mystical and mysterious simply because we insist on remaining blind to what is plain, that there can be no reality which has not the life of a symbol.
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> How could such an idea as that of *red* arise? It can only have been by gradual determination from pure indeterminacy. A vagueness not determined to be vague, by its nature begins at once to determine itself. Apparently we can come no nearer than that to understanding the universe.
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> That is not necessarily logical which strikes me today as logical; still less, as mathematics amply exemplifies, is nothing logical except what appears to me so. That is logical which it is necessary to admit in order to render the universe intelligible. And the first of all logical principles is that the indeterminate should determine itself as best it may.
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> A chaos of reactions utterly without any approach to law is absolutely nothing; and therefore pure nothing was such a chaos. Then pure indeterminacy having developed determinate possibilities, creation consisted in mediating between the lawless reactions and the general possibilities by the influx of a symbol. This symbol was the purpose of creation. Its object was the entelechy of being which is the ultimate representation.
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> EP2: 322-24

The text quoted above is from one of Peirce's most problematic and obscure unfinished writings. It is unclear when Peirce began composing "Καινὰ στοιχεῖα" or for what purpose but there is reason to place it around 1904 and to think that he was returning to a shelved project on the foundations of mathematics. Surprisingly, though, Peirce moved into semiotics and even turned to metaphysics and

the cosmological speculations of the quoted text.[1] There are passages of "Καινὰ στοιχεῖα" that don't seem to cohere smoothly with Peirce's best known writings of the time and this led the distinguished Peirce scholar, Joseph Ransdell, to question the 1904 composition date, but he came to accept it as a good approximation.[2]

The editors of *The Essential Peirce,* vol. 2, the source for the above quotation, have translated Peirce's Greek title as "New Elements," which conforms with Peirce's apparent intent to associate his aim with that of Euclid in the first book of his *Elements:* "[t]he dominating idea of Euclid in writing his first book was plainly that the first elements of geometry can only be comprehended by understanding the logical structure of the doctrine" (EP 2: 301, 1904).[3] About a decade earlier, Peirce had written a textbook entitled "New Elements of Mathematics" in which he rejected the standard order of mathematical instruction which he believed to be out of accord with the more natural conceptual development and organization essential for effective mathematics learning. Peirce believed, for example, that ordinal numbers should be taught before cardinals and he contrived new ways to teach counting and set theory. He believed, contrary to standard practice, that the logical way to teach geometry was to begin with topical geometry, followed by perspective, before taking up metrical geometry. According to Carolyn Eisele, Peirce wanted to give mathematics education "a new look," to take account of the pioneering work of such consequential figures as Cantor, Klein, and Lobatchewsky (NEM II: x ff.). But Peirce could not convince textbook publishers to take a chance on his new approach; according to Arthur Burks, Peirce was simply "too far ahead of his time."[4] So after failing to place his book with three publishers, Peirce gave up writing textbooks and his manuscript, the object of so much creative effort, was set aside and was eventually lost.[5] Nevertheless, a decade later, Peirce was ready to resume his

[1] Peirce's cosmological speculations in "Καινὰ στοιχεῖα" might better be said to be cosmogonical but it has become the general practice to refer to Peirce's "cosmology" even when "cosmogony" would be the more explicit term.

[2] An example of the not so smooth fit of "Καινὰ στοιχεῖα" with other writings of the time is Peirce's treatment of his sign classification in the two sections of his 1903 Syllabus for his Lowell Lectures that are published immediately before "Καινὰ στοιχεῖα" in EP 2. In those sections of his Syllabus (EP 2: sels. 20 & 21), Peirce added two trichotomies of signs that enabled him to make distinctions in his discussion of symbols that, surprisingly, he did not carry into his discussion in "Καινὰ στοιχεῖα." Joseph Ransdell's thoughts on "Καινὰ στοιχεῖα" were expressed on the online Peirce forum, Peirce-L, in the early months of 2006. The Peirce-L archives can be accessed through the Arisbe website at www.cspeirce.com. A new and lively Peirce-L discussion of "Καινὰ στοιχεῖα" started in late 2012 and continued into the Spring of 2013.

[3] Presumably what Peirce means by "logical structure" with reference to Euclid's work is the conceptual organization and the deductive architecture and integrity of the *Elements*.

[4] Burks 1978, p. 917.

[5] Carolyn Eisele spent years working with Peirce's mathematical manuscripts and concluded that the "lost manuscript" had in fact been disassembled but mainly preserved and was mostly reassembled as published in her 1976 edition of *The New Elements of Mathematics* (NEM II). See Eisele's introduction to NEM II for her account of Peirce's travails with his editors. It is hoped that the Indianapolis critical edition of *New Elements* will shed more light on the "lost manuscript" and the compositional history of the pages that have survived.

project or, at any rate, to return to the issue of the logical structure of mathematics.[6] But Peirce's return to his "New Elements" project appears to have been short-lived, perhaps because his thought was still charged with the intellectual focus and energy of his recent stay in Cambridge and Boston where he had composed and delivered his 1903 Harvard and Lowell Lectures, or maybe because it was around this time that the focus of his concern turned to explicating and defending his version of pragmatism in the pages of *The Monist*.[7]

Peirce began "Καινὰ στοιχεῖα" with a comment on the Euclidean style in mathematical writing, a style he had employed in his *New Elements* textbook, but that he had given up: "with advancing years I have lost the power of writing about logic in mathematical style… [and] in losing the power of writing this style, I have equally lost my admiration of it" (EP 2: 301, 1904).[8] In particular, it seems that Peirce no longer wanted to adhere to the Euclidean constraint requiring that mathematics be presented logically but without any consideration, let alone critique, of its underlying logic. So it appeared that Peirce was embarking on a consideration of the logic of mathematics, beginning with a review of the key elements of Euclid's method: definitions, postulates, axioms, corollaries, diagrams, letters, theorems, and scholiums (EP 2: 302-03, 1904). After briefly treating the Euclidean method, Peirce distinguished theoretical from practical propositions and parallel distinctions between *definite* and *vague propositions* and *individual* and *general* propositions. He continued with a discussion of the three ways a sign connects with the truth: (1) by signifying characters or qualities (the Aristotelian *Form*), (2) by *denoting* its object (the

[6] An indication that Peirce's interest in this matter had been rekindled can be found in several of his book reviews for *The Nation* from around this time, for example: his 29 January 1903 "Review of Thomas Smith's *Euclid*" (N 3: 111-13); his 21 May 1903 "Review of J. W. Mellor's *Higher Mathematics for Students of Chemistry and Physics*" (N 3: 121-22); and his 23 July 1903 "Review of J. I. D. Hinds' *Inorganic Chemistry*" (N 3: 132-33). Also of note is Peirce's report on the 23 November 1904 meeting of the National Academy of Sciences which appeared in *The Nation* in December 1904 (N 3: 192-96). Peirce reported on his presentation of his own memoir on topical geometry and made the following remark: "Mr. Peirce remarked that this condition of preserving the connection of parts belongs to vacuous space itself, while it is demonstrable that these properties of space which are investigated by metrics and by graphics have nothing corresponding to them in vacuous space itself. Accordingly, Topics, or topical geometry, is alone the science of space itself, and all graphics, and *à fortiori* all metrics, can be regarded as a special problem of topical geometry." Perhaps it is not such a stretch to suppose that Peirce's focus in 1903 and 1904 on topical geometry, "alone the science of space itself," would have led him to cosmological speculations. It is also of interest that in this same report Peirce remarked that "there are no points upon a line until they are in some way marked; and indeed there is no multitude of points that could be marked without leaving room for a greater multitude to be marked." This recapitulates views on continuity that Peirce first worked out in detail for his Cambridge Conferences Lectures of 1898 (RLT).

[7] For an account of Peirce's intellectual history during this period see the introduction to EP 2, p. xxv ff.

[8] Peirce's mature views about highly technical mathematical logic (or about writing in that style) seem to be echoed by another famous logician, Bertrand Russell, who wrote of his disenchantment with mathematics and logic in *My Philosophical Development:* "I think that the timelessness of mathematics has none of the sublimity that it once seemed to me to have …. I cannot any longer find any mystical satisfaction in the contemplation of mathematical truth" (Russell 1959, pp. 211–212).

Aristotelian *Matter*), and (3) by determining an interpretant, a new sign of the same object with the same signification or *meaning* (ultimately the expression of the very fact in question—Aristotle's *entelechy*). Using his conception of sign, Peirce identified the two great tasks of humanity as theory and practice, stipulating that theory "sets out from a sign of a real object with which it is *acquainted*, passing from this, as its *matter*, to successive interpretants embodying more and more fully its *form*, wishing ultimately to reach a direct *perception* of the entelechy," and that practice sets "out from a sign signifying a character of which it *has an idea*, passes from this, as its *form*, to successive interpretants realizing more and more precisely its *matter*, hoping ultimately to be able to make a direct *effort*, producing the entelechy." Logic, he says takes the "movement" of theory as primary (EP 2: 304-05, 1904).[9]

Peirce went on to discuss the distinction between meaning and reference and to explain the ideas of logical depth (connotation), logical breadth (denotation), and information: "the total of fact (true or false) that in a given state of knowledge a sign embodies." As early as 1867 Peirce had developed these distinctions and had then equated information, or area, to breadth × depth (W2: 78-86).[10] He distinguished between relations as reactions (real relations) and sign relations and he identified three kinds of sign relations, icons, indexes, and symbols corresponding to the three ways signs "connect with" the truth: icons by possessing the very quality signified, indexes by reacting directly with the object denoted, and symbols by actually determining the interpretant sign. Peirce noted that icons, because they bring their interpreters "face to face with the very character signified," are "the mathematical sign par excellence" (EP 2: 307, 1904). Of symbols, Peirce said that they alone express laws and that they are essential for language and all abstract thought and are the only kind of sign that can express an argument. He noted that a "sign has its being in its adaption to fulfill a function" and that a symbol is adapted to fulfill its function simply by fulfilling it, by determining the interpretant it was constituted to determine: "An interpretant of a symbol is an outgrowth of the symbol" (EP 2: 322, 1904). Peirce identified three main kinds of symbols, terms, propositions, and arguments, and explained how an argument can be transformed into a compound proposition by eliminating "every monstration of its special purpose" (EP 2: 308, 1904), and how a proposition can be transformed into a term (or rhema) by eliminating the indexes (the "parts that separately denote its objects").[11]

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[9] Peirce's 1902 entry on "Matter and Form" in Baldwin's *Dictionary of Philosophy and Psychology* (CP 6.353-63) provides background for what he says about matter and form in this paragraph and is also suggestive of some of his cosmological ideas.

[10] See Fernández's contribution to this volume, p. 99, n. 11, for an encapsulation of how "information" is understood by semioticians and for some secondary references relating to Peirce's understanding of information.

[11] In "Sundry Logical Conceptions," Sect. 3 of his Syllabus for his 1903 Lowell Lectures (EP 2: sel. 20), Peirce added the trichotomy *sumisigns, dicisigns, and arguments* to his previous one-trichotomy classification of signs (*icons, indexes, and symbols*). Soon afterwards, in Sect 5 of his Syllabus (EP 2: sel. 21), he added a third trichotomy, *qualisigns, sinsigns, and legisigns,* and renamed *sumisigns,* now calling them *rhemes,* clearly related to the *rhema* of "Καινὰ στοιχεῖα." With his trichotomy of *rhemes, dicisigns, and arguments* in place, Peirce could now make a precise clas-

Peirce had much more to say about symbols, especially about propositions, which he pointed out should not be confused with judgments. He noted that the key distinctions of vague and distinct, and general and individual, so important for logic, are propositional distinctions, and he maintained that, although every proposition must involve an icon to give it content, the vital spark is its indexical reference, its reaching out to the external object it signifies. In themselves, symbols have no real existence and thus cannot exert real force. They exist only in replica, embodied in words or gestures or other instantiations. But Peirce insisted that symbols, though without force, are by no means powerless: "I maintain that every sufficiently complete symbol governs things, and that symbols alone do this. I mean that though it is not a force, it is a law" (EP 2: 313, 1904). This led Peirce to a consideration of the nature of law and its causal efficacy.

Consonant with the semiotic framework of "Καινὰ στοιχεῖα" Peirce described a law as a symbol, or formula, "to which real events truly conform." More specifically, he said that a law is "an asserted symbolical proposition" (EP 2:314, 1904) though he declined to consider whether this implied that laws are always utterances.[12] What Peirce emphasized was that laws are not mere uniformities but are rightly understood to be reasons for predicting the character of relevant types of events.[13] To explain the causal efficacy of laws, Peirce gave an elaborated account of Aristotle's four causes—material, formal, efficient, and final:

> The individuating internal cause is called the *material cause*. Thus the integrant parts of a subject or fact form its *matter*, or material cause. The individuating external cause is called the *efficient,* or *efficient cause*; and the *causatum* is called the *effect*. The defining internal cause is called the *formal cause*, or *form*. All these facts which constitute the definition of a subject or fact make up its form. The defining external cause is called the *final cause,* or end. (EP2: 315-16, 1904)

Applying these distinctions to the conception of law, Peirce noted that the truth of a law (which consists in its being a symbol) is the defining external cause of its agreement with the relevant facts (symbolic expressions of the effects). Accordingly, "a symbol may be the cause of real individual events and things" (EP 2: 316, 1904). This is evident, according to Peirce, if we note that a cause is the premiss of an argument and that only symbols can be arguments. "Every sufficiently complete

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sification of symbols into rhematic symbols, dicent symbols, and argument symbols, obviously related to his older and less technical distinction of terms, propositions, and arguments. Notice that all symbols of whatever kind are legisigns (laws).

[12] About 3 years later, however, in his famous Manuscript 318, Peirce argued forcefully that utterers are not essential (EP 2: 404, 1907). In his contribution to this volume, pp. 51–78, Robert Lane explicitly treats cases of signs without "minded utterers" or "minded interpreters."

[13] In a 1904 draft of a review of Herbert Nichols' *A Treatise on Cosmology* (CP 8.191-193), Peirce contrasted the conception of uniformity with that of law: "For while uniformity is a character which might be realized, in all its fullness, in a short series of past events, law, on the other hand, is essentially a character of an indefinite future; and while uniformity involves a regularity exact and exeptionless, law only requires an approach to uniformity in a decided majority of cases." (See Sect. VI of Eliseo Fernández's contribution to this volume, pp. 79–94, for discussion of different types of laws referred to by Peirce).

symbol is a final cause of, and 'influences,' real events, in precisely the same sense in which my desire to have the window open, that is, the symbol in my mind of the agreeability of it, influences the physical facts of my rising from my chair, going to the window, and opening it" (EP 2: 317, 1904). Peirce had expressed this point more poetically in June 1903 in an unpublished review of Baldwin's *Dictionary of Philosophy and Psychology:* "Minds cannot reconcile themselves to the notion that consciousness stands [an] idle spectator of human conduct" (CP 8.168).

As one reads through the text of "Καινὰ στοιχεῖα" it is easy to lose track that Peirce's subject is the logic of mathematics. However, bearing in mind Peirce's conception of logic as "the study of the essential nature of signs" (EP 2: 311, 1904), one can imagine how Peirce might have brought his discussion back to an explicit treatment of mathematical foundations had he not abandoned this work.[14] It is difficult to imagine, though, how Peirce could have supposed that the "cosmological story" in the opening quotation to this paper would contribute to the logic of mathematics. It is easier to imagine that Peirce's treatment of his theory of signs and, in particular, his concentration on symbols and their law-like nature sidetracked him by suggesting a new approach to the beginning of things. I say "cosmological story" to emphasize the rather puzzling nature of this account which, taken literally, is problematic. For one thing, Peirce's 'story' reads more like poetry or allegory than scientific metaphysics. It reminds one of the biblical creation tale from the Gospel of John which proclaims that "In the beginning was the Word," though in Peirce's rendering the *word* (logos) became the *symbol*. Notice that in the opening quotation Peirce emphasized that the universe is intelligible and therefore explicable, and so "it is possible to give a general account of it and its origin." This "general account," Peirce said, is a symbol, which of course an account of anything must be. But Peirce did not seem to mean only that cosmology, or any account of the origin of the universe, qua account, must be symbolic but more fundamentally that the universe, per se, is an outgrowth of the influx of a symbol into the primeval chaos from which the world emerged. But how could that be? How could a symbol, or even a sign of lesser complexity, sprout from the germinal chaos? That is a mystery.

More problematic than the enigmatic tone of Peirce's account are some of its apparent inconsistencies. He wrote that in order to explain the universe "we must assume that there was in the beginning a state of things in which there was nothing, no reaction and no quality, no matter, no consciousness, no space and no time, but just nothing at all." But this primordial *nothing* must have been a state of utter indetermination rather than a determinate nothing. Thus, according to Peirce, since "a symbol alone is indeterminate," the indeterminate nothing that was the absolute beginning of the universe had to be a symbol. But later, toward the end of the opening quotation, he wrote that the original state of nothingness was a "chaos of reactions utterly without any approach to law" and, as just mentioned in the previous paragraph, that "creation consisted in mediating between the lawless reactions and

[14] For some idea of how Peirce might have developed these themes in the context of the foundations of mathematics, see his "The Logic of Mathematics; an Attempt to Develop My Categories from Within" (CP 1.417-520, c. 1896).

the general possibilities by the influx of a symbol." So the universe at its beginning was said to have been an indeterminate nothingness void of qualities and reactions but was then also described as "a chaos of reactions." This adds to the mystery of the influx of the premier symbol and suggests that Peirce, who was careful with his science, might have been composing a metaphorical or figurative cosmological story. Notice that Peirce, himself, remarked that his readers might suspect what he was writing to be "sheer nonsense" and he pointed out that any account of the origin of the universe must necessarily be general and vague. Yet we must be wary of discounting too quickly Peirce's speculations by writing them off as too vague and figurative.[15]

Many commentators are not so charitable in their assessment of Peirce's cosmological speculations, which began at least as early as 1878 when he wrote: "What sort of a conception we ought to have of the universe, how to think of the ensemble of things, is a fundamental problem in the theory of reasoning" (W3: 307, 1878). By 1884, Peirce would maintain that "the postulate that things shall be explicable extends itself to laws as well as to states of things" and that "all known laws are due to chance and repose upon others far less rigid themselves due to chance and so on in an infinite regress…" (W4: 548, 551, 1883–1884). A growing consensus among Peirce scholars is that Peirce's aim was to explain how natural laws could have evolved from a lawless primordial chaos but there is disagreement about his motivation. Some believe that he was principally driven by his desire to defend his scholastic realism and its claim that laws are real against the nominalist precepts of the science of his day.[16] Others suppose he was primarily interested in filling out the system of philosophy that he referred to as his guess at the riddle, which he hoped would succeed the systematic philosophy of Aristotle.[17] No doubt Peirce's

[15] See Robert Lane's contribution to this volume, pp. 51–78, for an excellent treatment of Peirce's views on semiotic generality and vagueness.

[16] Paul Forster argues in his recent book (Forster 2011) that Peirce's battle against nominalism, in defense of his realism, was central to his philosophical program and that Peirce's "alternative to nominalism was predicated on a positive answer" to the crucial question: "are laws real and how can they be accounted for?" Forster's Chap. 9 and 10 treat Peirce's cosmology and his answer to this crucial question. Not everyone agrees that Peirce developed his cosmology in defense of his realism (see, for example, Short 2012, p. 386), but it is beyond doubt that Forster is right about Peirce being in a life-long battle against nominalism. In 1904, Peirce wrote William James that he and Schiller "carried pragmatism too far" but that its "most important consequence… on which I have always insisted" is that under the pragmatic conception of reality "we must abandon nominalism. That in my opinion is the great need of philosophy" (CP 8. 258). Two years later Peirce wrote: "In the fourteenth century Nominalism was rendered a respectable opinion by the halting realism of Scotus and by the extravagant unpragmatism of his followers. But after physical science has discovered so many general principles in Nature, nominalism becomes a disgraceful habitude of thought" (CP 6.175, 1906).

[17] Murray G. Murphey, for one, seems to hold this view. See his chapter on cosmology in Murphey 1993 (Chap. XVI) and note, especially, p. 355 where he writes that Peirce seems to have regarded the development of an architectonic theory as "the true purpose of philosophy and that it "was just this hope of creating an all embracing system which would serve as the framework for all future discovery and knowledge which seems to have motivated Peirce's work." Andrew Reynolds (Reynolds 2002, p. 113) offers a similar but somewhat divergent motivation by suggesting that Peirce was simply doing the work of philosophy as he understood it. Peirce was contributing to

motivations were complex, perhaps including both of these aims, but it seems certain that he was driven in part by the more straightforward age-old curiosity that had propelled the Pre-Socratic philosophers to ask what the world was made of and thus to conceive of primal matter, their *arche* (W5: 295, 1886; W6: 181, 1887–1888). So although Peirce may well have hoped to improve and strengthen his system of philosophy, it might be more accurate to ascribe a more direct scientific motivation for his cosmological inquiries. By the summer of 1886, he was ready to declare that "If the universe is thus progressing from a state of all but pure chance to a state of all but complete determination by law, we must suppose that there is an original, elemental, tendency of things to acquire determinate properties, to take habits…. Here then is a rational physical hypothesis, which is calculated to account, or all but account for everything in the universe except pure originality itself"—and he went on to say that the next step "would be to attempt to verify this hypothesis by seeing how far it would account for and explain the observed characteristics of the laws of nature" (W5: 293, 1886). Peirce never abandoned his hypothesis that natural laws are emergent, the result of evolution, though he periodically revised his cosmological speculations to accord more smoothly with his classification of the sciences and his developing metaphysics and, presumably, to enable easier verification. He never reached a final theory nor established any scientific results from his cosmological hypothesis and no part of his speculative thought has been more decidedly rejected as a failed program.[18] Peirce's former student, Christine Ladd Franklin, thought that his cosmological speculations of the early 1890's showed that he was losing his mind,[19] and many otherwise laudatory commentators on his work have concluded with W. B. Gallie, that Peirce's cosmology is the "white elephant" of his philosophy.[20] Not many dismiss Peirce's cosmology as crazy, as Ladd Franklin did, but many do reject it as a serious, or at any rate a viable, scientific hypothesis.

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what he believed philosophy ultimately hopes to accomplish: "to find that there is some intelligible truth, some absolutely valid reasonableness, to ascertain how far this reasonableness governs the universe, and to learn how we may best do its service" (CN2: 208, 1899).

[18] It was not without trying, however, that Peirce failed to establish scientific results. Peirce believed that to demonstrate that space was hyperbolic would lend support to his cosmological hypothesis. In early 1891 Peirce began to correspond with Allen Risteen about how to conduct experiments to measure the curvature of space and he acquired instruments from the U. S. Coast & Geodetic Survey for curvature observations. Toward the end of 1891, Peirce sought a grant from the Office of the Nautical Almanac to conduct experiments to investigate the curvature of space. Peirce wrote to Simon Newcomb, Superintendent of the Office of the Nautical Almanac: "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…." But Newcomb turned Peirce down. (See "Methods of Investigating the Constant of Space," W8, sel. 36, and the editorial note to that selection, W8: 424-425; also see the introduction to W8: xlvi & lxiii–lxiv).

[19] See the introduction to W8, pp. xcvi–xcvii, for a brief account of reactions to Peirce's 1890–1892 *Monist* cosmological series. Also see *Houser* 2009.

[20] Gallie 1952, p. 215. Some others who regard Peirce's cosmology as unsuccessful, if not confused or mistaken, include Rulon Wells (1964), Bernard Suits (1979), and Andrew Reynolds (2002). Reynolds concludes his excellent treatment of Peirce's cosmology with the overall assess-

In an important recent study, T. L. Short concluded that not only did Peirce never succeed in formulating a proper cosmology but he failed even to achieve his primary goal of explaining how the laws of nature could have evolved out of a primordial chaos.[21] Short traced Peirce's cosmological program through a number of stages beginning with his early attempt to develop a statistical account of natural law, through his middle period, roughly from 1891 to 1902, dominated by his self-proclaimed and Shelling-inspired objective idealism when he gave mind, as feeling, priority and viewed matter as "mind hidebound in habit," and on into his late period after he had given up his law of mind (that feelings spread and coalesce into ideas) for a teleological account of mind as driven by purpose.[22] Short briefly considered the cosmological story of "Καινὰ στοιχεῖα" that we are considering here and distinguished it as transitional between Peirce's middle period and his teleological period—it contains echoes of the middle cosmological period "but with crucial differences."[23] The "initial indeterminacy" that Peirce postulated to have obtained at the beginning of the universe had shifted from a chaos of feelings (a state of firstness in Peirce's scheme of categories) to a chaos of symbols (a state of thirdness in Peirce's scheme) which seems incompatible with the idea of law evolving out of a lawless chaos (since symbols are themselves laws). So, according to Short, the cosmological story of "Καινὰ στοιχεῖα" has the universe beginning not with firstness but with thirdness and proceeding "not by a law of spreading, or generalization, but by a teleological process of fulfilling a purpose, of becoming more concrete."[24] Short tells us that Peirce was unable to resolve the inconsistencies between the successive versions of his cosmology and his developing theory of categories and he let his cosmological program fade away. But Short acknowledges that Peirce denied that his cosmology suffered from irresolvable internal contradictions even though it is true that he never carried his program forward to resolution.[25] It is well to remember that cosmology abounds with apparent contradictions which are tolerated because of the uniqueness and inscrutability of the circumstances at issue and one must be prepared to give more weight to nuanced distinctions than probably one normally would. In particular, in Peirce's case, one must be careful not to equate the beginning of the universe with a beginning of the timeless chaos, the indeterminate nothingness, out of which the world emerged. Bearing this distinction in mind, it would not be contradictory for Peirce to say that the universe began with the influx of a symbol (perhaps the genesis of thirdness) into a primordial chaos of "general possibilities and lawless reactions."

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ment that it falls short of the mark but says that "if it is not quite good science, it remains at least very interesting metaphysics, which in its effects can act something like good poetry, providing a guiding vision for future research of the kind such as the cosmological theories of the early Ionian philosophers, which proved to be the seeds of an extremely fruitful scientific research tradition" (Reynolds 2002, p. 183).

[21] The results of Short's study appear mainly in two papers, Short 2010a and 2010b. But see also Short 2011, as well as n. 12 from Short 2007, pp. 138–139.

[22] Short discusses this development principally in Short (2010b), see especially pp. 533, 539.

[23] Short 2010b, p. 541.

[24] Short 2010b, p. 542.

[25] Ibid.

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