



Peirce on Mind and the Metaphysics of the Continuum

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1. Introduction: The Role of Synechism in Peirce's System

- ¶1. Synechism is the “doctrine that all that exists is continuous.”^[1] And it is the “tendency to regard continuity . . . as an idea of prime importance in philosophy . . .”^[2] This doctrine is most thoroughly developed by Peirce in his essay, “The Law of Mind” (1892), and his Cambridge Conferences Lectures (1898), but traces of it are found much earlier in his 1868 anti-Cartesian essays published in the *Journal of Speculative Philosophy* series.
- ¶2. Our primary focus here is to examine the relationship between synechism and fallibilism. Peirce sees the doctrine of synechism as closely related to his doctrine of fallibilism. In fact, they imply each other. Synechism is fallibilism objectified. He says

. . . let me call your attention to the natural affinity of [the principle of continuity] to the doctrine of fallibilism. The principle of continuity is the idea of fallibilism objectified. For fallibilism is the doctrine that our knowledge is never absolute but always swims, as it were, in a continuum of uncertainty and of indeterminacy. Now the doctrine of continuity is that *all things* so swim in continua.^[3]

This passage suggests that the ideas of continuity and fallibilism are at least

analogous. The former notion refers to the indeterminacy of things on the ontological level, while the latter refers to the indeterminacy at the epistemological level of ideas, i.e., that ideas are never certain or precise. But fallibilism and continuity are more than just analogous.

- ¶3. We will examine the relationship between the notion of the continuum in nature and the notion of fallibilism as the tendency for all knowledge to grow while resisting certainty and precision. Peirce explicates some aspects of the relationship, but there are other implications that his notion of synechism has for fallibilism which he does not clearly spell out. As we shall see, the doctrine of synechism provides ontological support for Peirce's thoroughgoing fallibilism. The ontological side of the argument appeals to the permanent condition of indeterminacy in nature and in thought, which precludes the possibility of infallible knowledge. At the same time, the hypothesis of synechism implies a world full of regularity (although not *absolute* regularity), which provides the grounds for its intelligibility.
- ¶4. Let us begin by discussing briefly Peirce's understanding of the relationship between fallibilism and synechism. Then we will examine what synechism is and what other cosmological doctrines it entails. Subsequently, we will discuss what further implications synechism has for Peirce's theory of knowledge. From all this, it will be evident that knowledge, for Peirce, is reconceptualized as dynamic integration with the evolving world.

2. Fallibilism Implies Synechism

- ¶5. Before we examine Peirce's notion of synechism, we must first see how synechism fits into his overall system and his motivation for accepting the doctrine of synechism. In several passages Peirce suggests that holding fallibilism, in the sense of a commitment to accepting imprecision and susceptibility to error within knowledge, has consequences for those theories one chooses to adopt. One of these theories, which the fallibilist will adopt (and which the infallibilist will reject), is the theory of continuity. The fallibilist is committed to accepting whatever hypothesis makes the phenomena intelligible. And so he accepts the hypotheses of synechism *and* tychism. Synechism is the idea that all things are continuous, that all things tend to grow, including the laws of nature themselves. No law of nature is static, but changes in time. Tychism refers to the element of chance, the element of uncaused events occurring in the universe. Tychistic events are deviations from laws of nature. The fallibilist chooses the hypotheses of synechism and tychism over the purely mechanistic explanation of the laws of nature, because they can explain the diversity within the present laws of nature. The reason for the hypothesis of synechism then is due to one's commitment to fallibilism, and in particular not to block the road of inquiry. One must choose the hypothesis that explains the phenomena most successfully, on pain of blocking inquiry. The doctrine of synechism can explain diversity in nature and how and why certain forces originated, better than the

determinist model.

- ¶6. The infallibilist naturally thinks that everything always was substantially as it is now. Laws at any rate being absolute could not grow. They either always were, or they sprang instantaneously into being by a sudden fiat like the drill of a company of soldiers. This makes the laws of nature absolutely blind and inexplicable. Their why and wherefore can't be asked. This absolutely blocks the road of inquiry. The fallibilist won't do this. He asks may these *forces* of nature not be somehow amenable to reason? May they not have naturally grown up? After all, there is no reason to think they are absolute. If all things are continuous, the universe must be undergoing a continuous growth from non-existence to existence. There is no difficulty in conceiving existence as a matter of degree.[\[4\]](#)
- ¶7. This explanation of the relationship between fallibilism and synechism suggests that the former implies the latter. That is, since fallibilism commits one to choosing the hypothesis which explains the phenomena, one should accept synechism, because synechism can explain the development of new laws. Peirce's point in these passages is to explain the important impact that the doctrine of fallibilism has on inquiry.
- ¶8. The reason the fallibilist can accept synechism and tychism, while the infallibilist cannot, is that the fallibilist does not *expect* precision in knowledge, whereas the infallibilist does. The latter demands precision and certainty, and so some hypotheses will not be considered. Peirce says,

The ordinary scientific infallibilist—of which sect Büchner in his *Kraft und Stoff* affords a fine example—cannot accept *synechism*, or the doctrine that all that exists is continuous—because he is committed to discontinuity in regard to all those things which he fancies he has exactly ascertained, and especially in regard to that part of his knowledge which he fancies he has exactly ascertained to be *certain*. For where there is continuity, the exact ascertainment of real quantities is too obviously impossible. No sane man can dream that the ratio of the circumference to the diameter could be exactly ascertained by measurement. As to the quantities he has not yet exactly ascertained, the Büchnerite is naturally led to separate them into two distinct classes, those which may be ascertained hereafter (and there, as before, continuity must be excluded), and those absolutely unascertainable—and these in their utter and everlasting severance from the other class present a new breach of continuity. Thus scientific infallibilism draws down a veil before the eyes which prevents the evidence of continuity from being discerned.

But as soon as a man is fully impressed with the fact that absolute exactitude never can be known, he naturally asks whether there are any facts to show that

hard discrete exactitude really exists. That suggestion lifts the edge of that curtain and he begins to see the clear daylight shining in from behind it.[\[5\]](#)

- ¶9. Infallibilism is a commitment to discontinuity. For the infallibilist, to know something is to have certainty, which, in turn, requires that the object of knowledge be precise. To know a law of nature is to have certain knowledge of a law which itself is absolutely exact. Laws can never be a matter of degree. Thus, the infallibilist can accept mechanical law as the only agency of nature, but consequently cannot explain the apparent diversity in nature. On the other hand, synechism as an hypothesis is open to consideration by the fallibilist, because he allows for indeterminacy, imprecision, and uncertainty in his knowledge of nature. On this point, Peirce says that “. . . fallibilism cannot be appreciated in anything like its true significance until evolution has been considered.”[\[6\]](#) And “evolution means nothing but *growth* in the widest sense of that word.”[\[7\]](#) Here we see that essential to an understanding of Peirce’s fallibilism is an understanding of growth and the continuum.

3. Peirce’s Conception of the Continuum

3.1. The Mathematical Conception of the Continuum

- ¶10. Our present concern is not to offer a new interpretation of Peirce’s conception of the continuum nor to discuss his varying definitions of the continuum.[\[8\]](#) Our focus rather is on the essential aspects of his conception of continuity, i.e., those features that do not change throughout his writings and which inform his metaphysics and epistemology. From there our task will be to unpack the ramifications of this ontological hypothesis for his theory of fallible knowledge. We will argue that due to Peirce’s ontological doctrine of synechism, a thoroughgoing fallibilism, even on the level of method, is a defensible position and, furthermore, is most consistent with his overall pragmatism.

3.2. The Continuum as an Infinite Collection of Potentials

- ¶11. To understand Peirce's metaphysical doctrine of synechism, we must first give an account of his mathematical notion of the continuum, which is explained most clearly in his Cambridge Conferences Lectures (1898).^[9] To illustrate his mathematical conception of the continuum, Peirce considers the structure of a line. He explains that a line is, in one sense, a collection of points, but that ". . . no point in this line has any distinct identity absolutely discriminated from every other."^[10] Peirce explains that when a point is discriminated from another point of the line, a *discontinuity* or a break in the continuum of the line is created. Thus, a line is not a collection of actual points, but a collection of potential points. Only when one creates a discontinuity in the continuum of the line, for example, by making a slash mark on the line, does a point have actual reality. Peirce goes on to explain

If we could not distinguish the junction it would not appear distinct. But the line is a mere conception. It is nothing but that which it can show; and therefore it follows that if there were no discontinuity there would *beno* distinct point there, —that is, no point absolutely distinct in its being from all others.^[11]

The points of a line have potential being. But when a discontinuity is created in the line, the indiscriminate, potential point becomes discriminate, and thus the point becomes actualized.

- ¶12. A line, for Peirce, is still a collection of points, but it is a collection of potential points, and it is a collection of an *infinite* number of potential points.^[12] So for example, given any two discriminate numbered points on a line, there is always an infinite number of points between those two discriminate points. The two actual points do not exist successively because there are an infinite number of potential points which exist between them. Peirce's conception is that a line is not a collection of denumerable (or Peirce's word, abnumeral) points, but rather an infinite collection of potential points. Because there are an infinite number of points on a line, all the points cannot possibly have actual existence simultaneously. If all the points on a line were actual, then Zeno's paradox of motion would prevail. The intervals between the points would have no reality. But, for Peirce, the infinite number of points between any two actual points exist only *potentially*. Thus he rejects Zeno's notion of dividing up a continuum into discrete points. For Peirce all of reality shares this nature of the mathematical continuum. That is, reality can be described in terms of collections of potential elements that are not discrete but are "welded" together. Peirce says,

- ¶13. Namely, a continuum is a collection of so vast a multitude that in the whole universe of possibility there is not room for them to retain their distinct identities; but they become welded into one another. Thus the continuum is all that is possible, in whatever dimension it be continuous. By the general or universal of ordinary logic also comprises whatever of a certain description is possible. And thus the *continuum* is that which the Logic of Relatives shows the *true* universal to be. I say the *true* universal; for *no* realist is so foolish as to maintain that [*sic*] universal is a fiction. [13]
- ¶14. The potential points become “welded” together in the continuum. Here Peirce says that “the continuum itself is all that is possible in whatever dimension it be continuous.” So the infinite potentials of the continuum are continuous in some *dimension*. [14] The potential elements lack distinct identity. But the members of the collection have the potential to be actualized by being made distinct somehow. In the case of a line, the point becomes discriminate when a mark is made on the line. And in this case the potential point at which the mark is made becomes actualized, and is no longer continuous with the other potential points of the line segment. While gaining discriminate, actual being, it loses its continuity with the line of which it was once a part.
- ¶15. In the above passage, Peirce also says that the true universal, the real general, is of the nature of the continuum. Thus, the continuum is not only a mathematical notion for Peirce, but also a metaphysical one. So when Peirce discusses his metaphysical realism regarding universals, he is proposing that a universal is a collection of potentials, which are welded together by being continuous in some *dimension*.

3.3. The Continuum as Generality

- ¶16. With this conception of the continuum, Peirce rejects the notion that the universal is a collection of abnumeral or discrete members. Rather the universal is the relation between, or the general condition of, infinite potentials. Peirce says,

That which is possible is in so far *general*, and as general, it ceases to be individual. Hence, remembering that the word “potential” means *indeterminate yet capable of determination in any special case*, there may be a *potential* aggregate of all the possibilities that are consistent with certain general conditions; and this may be such that given any collection of distinct individuals whatsoever, out of that potential aggregate there may be actualized a more multitudinous collection than the given collection. Thus the potential aggregate is with the strictest exactitude greater in multitude than any possible multitude of individuals. But being a potential aggregate only, it does not contain any individuals at all. It only contains general conditions which

permit the determination of individuals.[15]

Continuity is identified with generality, and generality is the condition of knowledge (indeed, the content of knowledge). But at first glance the idea that the universal is made of infinite potentials, which cannot retain their identity, seems to conflict with the idea that universals are knowable. How can one know a real general which consists of infinite potentials? To illustrate how this is possible, Peirce gives an example. One can know that $2/3$ is not a whole number, i.e., one can know that in the entire set of whole numbers, one will not find $2/3$. And in knowing that, one knows something about the entire collection of whole numbers. But even with this knowledge of the collection of whole numbers, one cannot know everything about this collection. One cannot count the aggregate of all whole numbers, because to do so implies that there is a last whole number included.[16] Of course, there is no last whole number, but an infinity of whole numbers. So on the one hand, the individual has a conception of the entire collection of whole numbers. But on the other hand, he does not know all of the members of the collection, and so he does not have *complete* knowledge of the collection. For this reason, Peirce calls the nature of one's conception of this collection general, potential and *vague*,[17] “. . . yet with such a vagueness as permits of its accurate determination in regard to any particular object proposed for examination.”[18]

- ¶17. The conception that an individual has of the set of whole numbers is that it is a “*potential* collection indeterminate yet determinable.”[19] Peirce goes on to explain,

But there cannot be a distinctive quality for each individual; for these qualities would form a collection too multitudinous for them to remain distinct. It must therefore be by means of relations that the individuals are distinguishable from one another.[20]

It is their relation with one another that makes the potential points continuous. At the same time, it is their relations or potential relations with something *outside* the continuum which makes them potentially discontinuous.[21]

- ¶18. In the next section we will see how Peirce extends the mathematical conception of continuity to ontology. But here it is important to note that these same features of vagueness, generality, and potentiality, which are characteristic of one's knowledge of mathematical conceptions, are extended to one's knowledge of the real generals in the universe.

4. The Continuum as the Ontological Explanation of the Universe

- ¶19. Peirce extends the mathematical conception of the continuum to every aspect of the universe. Continuity is the form of all that is real, including space, time, mind, matter, ideas, laws of nature, organisms, species, systems of knowledge, and systems of nature. The continuum is the concept of generality, “the general conditions which *permit* the determination of individuals” and the aggregate of infinite potential (yet determinable) individuals.[\[22\]](#) And this concept of generality pervades all of reality, making reality intelligible.
- ¶20. Reality is not understood in terms of discrete actual parts of being and nonbeing, but relations of actual or potential being.

There is a famous saying of Parmenides . . . ‘being is, and not-being is nothing.’ This sounds plausible; yet synechism flatly denies it, declaring that being is a matter of more or less, so as to merge insensible into nothing. How this can be appears when we consider that to say that a thing *is* is to say that in the upshot of intellectual progress it will attain a permanent status in the realm of ideas. Now, as no experiential question can be answered with absolute certainty, so we never can have reason to think that any given idea will either become unshakably established or be forever exploded. But to say that neither of these two events will come to pass definitively is to say that the object has an imperfect and qualified existence. Surely no reader will suppose that this principle is intended to apply only to some phenomena and not to others, — only, for instance, to the little province of matter and not to the rest of the great empire of ideas. Nor must it be understood only of phenomena to the exclusion of their underlying substrates. Synechism certainly has no concern with any incognizable; but it will not admit a sharp sundering of phenomena from substrates. That which underlies a phenomenon and determines it, thereby is, itself, in a measure, a phenomenon.[\[23\]](#)

Synechism, as the hypothesis which explains all of reality, does so in terms of *processes* rather than *discrete parts*. Real things are processes of infinitesimals from potentiality into actuality. All of reality exists in relations in the form of continua, which weld together discrete singularities. Nothing is essentially discrete or separate. But what would such a universe look like?

4.1. The Evolution of Continua in Nature

¶21. Essential to the understanding of the world as continuity is Peirce's theory of evolution and his conception of tychism, or pure chance. The present world is in one sense a product of evolution. But, in another sense, it is also a "work in progress." The laws of nature which are presently at work are the result of an evolutionary process from chance to regularity. Peirce hypothesizes that in the infinitely distant past the universe was purely tychistic. The laws or habits of nature which one observes in the world today existed then only potentially. But out of this purely tychistic world, chance events began to take habit. These events, first occurring from chance, began to repeat themselves, thus forming regular or general tendencies, i.e., habits of nature. As regularity grew, tychism gradually decreased. This process from chance and disorder to regularity and order is still going on in the universe. Evolution is not yet complete. For Peirce the universe is generally decreasing in potentiality and chance, and increasing in order and habits. Habits have the nature of continua. Thus the increase in habits is an increase in the modes of continua in nature. And, in addition to an increase in order, there is an increase in complexity and diversification.

¶22. Peirce says,

How then can a continuum have been derived? Has it for example been put together? Have the separated points become welded, or what?

Looking upon the course of logic as a whole we see that it proceeds from the question to the answer, —from the vague to the definite. And so likewise all the evolution we know of proceeds from the vague to the definite. The indeterminate future becomes the irrevocable past. In Spencer's phrase the undifferentiated differentiates itself. The homogeneous puts on heterogeneity. However it may be in special cases, then, we must suppose that as a rule the continuum has been derived from a more general continuum, a continuum of higher generality.[\[24\]](#)

In this and other passages in "The Logic of Continuity" (1898), Peirce again describes the process of the growth of generality in the universe as initially originating from pure chance. Tychism is the source of originality and diversity. And the repetition of the tychistic event is the process by which new habits gradually emerge. New continua, or new generals, come into actuality through evolution. Peirce's evolutionary view of the universe accounts for how the ordered laws of nature emerge from the tychism. He describes his conception of evolution as follows. "The evolutionary process is, therefore, not a mere evolution of the *existing universe*, but rather a process by which the very Platonic forms themselves have become or are becoming developed."[\[25\]](#) But the new continua existed once only potentially in the more general continuum out of which it evolved.

- ¶23. Those habits of nature which exist now still have a significant susceptibility to tychism. Chance is still “in operation” in nature and, therefore no law of nature is absolute, exact, or certain. But tychism in the present stage of the evolution of the universe is different quantitatively and qualitatively from the tychism in the beginning. Unlike the “pure” tychism of the far past, the tychism at work presently is *conditioned* by the existing habits of nature. A chance event can occur, but a specific continuum provides the general conditions for, and out of which, the tychistic event occurs. So tychistic events which occur presently in the highly ordered universe are not purely random, but are simply variations from the present actuations of the previous continuum.
- ¶24. A tychistic event breaks the continuum. It is an uncaused (but not an altogether uninfluenced) novel event. This new chance event is not a continuation or repetition of the general conditions of the continuum, but is a discontinuity. This breaking from the continuum can be the origin of a new continuity, a new law of nature, if the chance event is repeated regularly. And this new law is a more complex and further specified continuum than the one out of which it evolved. Of course, sometimes the old continuum changes, dies, or is replaced by a new continuum. The interaction of continuity, tychism, and the general tendency of events to take habit, explains the present diversity of law in nature.
- ¶25. For Peirce this explanation of evolution as a development from chance to further more complex continua explains the variety of law which one observes in the present universe. The present world is full of order, but still is itself a product of chance. The diversity of continua in nature today can only be explained by evolution. It is the result of the same evolutionary process whereby chance events originally began to take habit. Chance events take place because laws have the nature of a continuum, i. e., they are infinite collections of potentials, which are not determinate, but are capable of being determined. Without the interaction of chance and continuity, there would be no growth. And without evolution, the concept of growth at work on all levels of the universe, including organisms, species, laws of chemistry, biology, physics, and ideas, cannot be explained. For Peirce, the infallibilist philosopher who rejects synechism and chance, and opts for pure mechanistic, deterministic, and reversible laws of nature, cannot explain the apparent growth and diversity in the universe.

4.2. Synechism as a Rejection of Dualism

- ¶26. The explanation of the evolution of order in the universe gives more than an account of diversity. It also explains the ultimate connectedness among all things in the universe. The world as it is now in its actuality is the result of many different chance events evolving out of various continua. In the earliest times there was even more potentiality. There was, in a sense, a world of Platonic ideas.[\[26\]](#) As Peirce explains,

Many such reacting systems may spring up in the original continuum; and each of *thesemay* itself act as [*sic*] first line from which a larger system may be built in which it in turn will merge its individuality.

At the same time all this, be it remembered, is not of the order of the existing universe, but is merely a Platonic world, of which we are, therefore, to conceive that there are many, both coördinated and subordinated to one another; until finally out of one of these Platonic worlds is differentiated the particular actual universe of existence in which we happen to be.

There is, therefore, every reason in logic why this here [*sic*] universe should be replete with accidental characters, for each of which in its particularity there is no other reason than that it is one of the ways in which the original vague potentiality has happened to get differentiated.

But, for all that, it will be found that if we suppose the laws of nature to have been formed under the influence of a universal tendency of things to take habits, there are certain characteristics that those laws will necessarily possess.
[\[27\]](#)

All laws share some characteristics due to their being the result of the same evolutionary process, namely, the tendency for events to take habit. And different present laws are similar because they have evolved from the same original continuum.

- ¶27. For Peirce this explanation of the evolution of the universe does away with the usual dualisms of traditional philosophy. Because all laws have a common origin, all laws share common characteristics of the original continuum out of which they have evolved. Thus, absolute distinctions like mind/matter, knower/known, subject/object, and being/nonbeing can be avoided because each side of the dichotomy can be explained in terms of growth and evolution. All continua ultimately grew from the same evolutionary processes and habits. Mind and matter, for example, were not always distinct, nor are they completely distinct at present. In the past mind and matter had potential being within the same continuum,[\[28\]](#) i.e., they were part of the same general and vague habit of nature. And presently, due to this similar origin, they do not differ in kind from each other. Rather they differ only in degree. They still share some of the same characteristics because they are part of the same general

continuum. Yet in the present, they are different, more specified, continua. Thus they also possess significant differences. For example, mind is a continuum which is more plastic, and more open to further tychism and variety than matter is. Habits of matter differ from habits of mind in that they are further habituated and less tychistic, although tychism still exists in material continua as well. But the continua of mind and matter share the same characteristic of all natural continua, and so ultimately they are not ontologically distinct. One has the ability to influence the other because they are still part of the same overall process.

- ¶28. The hypothesis of synechism has the benefit of offering answers to questions which stem from the framework of dualism. By hypothesizing synechism and growth, the fallibilist can explain questions such as, How can mind and matter act on one another? How does one mind act on another? How can a past idea be present? The fallibilist does not have to accept these facts as inexplicable.

Among formal reasons, there are such as these, that it is easier to reason about continuity than about discontinuity, so that it is a convenient assumption. Also, in case of ignorance it is best to adopt the hypothesis which leaves open the greatest field of possibility; now a continuum is merely a discontinuous series with additional possibilities. Among positive reasons, we have the apparent analogy between time and space, between time and degree, and so on. There are various other positive reasons, but the weightiest considerations appears to me to be this: How can one mind act upon another mind? How can one particle of matter act upon another at a distance from it? The nominalists tell us this is an ultimate fact—it cannot be explained. Now, if this were meant in [a] merely practical sense, if it were only meant that we know that one thing does act on another but that how it takes place we cannot very well tell, up to date, I should have nothing to say, except to applaud the moderation and good logic of the statement. But this is not what is meant; what is meant is that we come up, bump against actions absolutely unintelligible and inexplicable, where human inquiries have to stop. Now that is a mere *theory*, and nothing can justify a theory except its explaining observed facts. It is a poor kind of theory which in place of performing this, the sole legitimate function of a theory, merely supposes the facts to be inexplicable. It is one of the peculiarities of nominalism that it is continually supposing things to be absolutely inexplicable. That blocks the road of inquiry. But if we adopt the theory of continuity we escape this illogical situation. We may then say that one portion of mind acts upon another, because it is in a measure immediately present to that other; just as we suppose that the infinitesimally past is in a measure present. And in like manner we may suppose that one portion of matter acts upon another because it is in a measure in the same place.[\[29\]](#)

- ¶29. Here Peirce explains how mind and matter act on one another, how minds act on other minds, and how matter acts on other matter. These phenomena would be inexplicable if one were to consider mind and matter as completely discrete and separate from one another. But if one hypothesizes that reality is of the nature of the continuum, then such things can act on one another because they are ultimately composed of processes having infinitesimal duration and breadth. For example, in the continuum of time, events are not wholly past but only infinitesimally past. Consequently past events can *still* effect the present. The two events are part of the same continuum. In the continuum of matter, one part of matter is not completely distinct from other parts of matter, but is infinitesimally in the same place. In general, by describing reality in terms of *degrees of being* rather than in terms of being and nonbeing, the doctrine of synechism blurs the distinction between these dichotomies.
- ¶30. In summary all continua are composed of infinite potentials (be it points of a line, or a series of potential events). All continua share the similarity of being general (and therefore, intelligible), formed by a regular repetition of events, and originally derived from a chance event. These similarities make all things in the universe similar at least in these minimal respects. For Peirce this type of explanation does away with the dualisms typical of modern and contemporary philosophies which have their roots in a foundationalist framework.

4.3 Synechism Extended to Mind

- ¶31. Peirce sees the general principles of evolution as most evident on the level of mind. The general tendency of things to take habit is, of course, the general principle of the evolution of all of reality. But with mind, evolution occurs quite forcefully because, unlike matter, mind is most plastic and open to chance. He says,

But any fundamental universal tendency ought to manifest itself in nature. Where shall we look for it? We could not expect to find it in such phenomena as gravitation where the evolution has so nearly approached its ultimate limit, that nothing even simulating irregularity can be found in it. But we must search for this generalizing tendency rather in such departments of nature where we find plasticity and evolution still at work. The most plastic of all things is the human mind, and next after that comes the organic world, the world of protoplasm. Now the generalizing tendency is the great law of mind, the law of association, the law of habit taking. We also find in all active protoplasm a tendency to take habits. Hence I was led to the hypothesis that the laws of the universe have been formed under a universal tendency of all things toward generalization and habit-taking.[\[30\]](#)

¶32. In the essay "The Law of Mind" Peirce addresses how the activity of the mind is subject to the same doctrine of synechism. The law of mind states,

. . . that ideas tend to spread continuously and to affect certain others which stand to them in a peculiar relation of affectibility. In this spreading they lose intensity, and especially the power of affecting others, but gain generality and become welded with other ideas.[\[31\]](#)

In this essay Peirce argues that this law of mind is part of the overall hypothesis that thought is experienced in continua. Rather than there being an aggregate of atomistic ideas which are presented to the mind, the mind thinks in processes which are continua. The hypothesis of synechism enables Peirce's realism regarding generals to explain what nominalists cannot, namely, how past ideas can be present. If one takes ideas to be present to the mind in the way in which the nominalist must take them, i. e., individual, discrete, separate, atomistic ideas received by the mind, then one cannot explain how a past idea can be present to the mind. Past ideas cannot be present to the mind only vicariously, for this does not explain how the past idea can be related to the vicarious representation.[\[32\]](#) And yet Peirce clearly does not want to conclude that past ideas are illusions.

¶33. As a result he explains the association of ideas in terms of ideas occurring through the continua of consciousness. Ideas are experienced in infinitesimal steps such that a past idea is not completely past, but is, on some level of consciousness, still present to the mind. Past ideas are thus not wholly past, but are in some sense still present. A past idea can affect present ideas because it is moving only gradually out of consciousness. Peirce describes such an experience of an idea as "spread out" and continuous.[\[33\]](#)

¶34. The ability of ideas to affect and influence other ideas also explains how ideas become general. He argues that, "A finite interval of time generally contains an innumerable series of feelings; and when they become welded together in association, the result is a general idea. For we have just seen how by continuous spreading an idea becomes generalised."[\[34\]](#) So the initial capacity for one idea, continuously and infinitesimally experienced, to affect another, gives way to the further capacity for an idea to become general in the mind. The mind repeats the association by creating a habit of the mind or a general idea. Peirce explains,

Now consider the induction which we have here been led into. . . . that feeling which has not yet emerged into immediate consciousness is already affectible and already affected. In fact, this is habit, by virtue of which an idea is brought up into present consciousness by a bond that had already been established between it, and another idea while it was still *in futuro*.

We can now see what the affection of one idea by another consists in. It is that the affected idea is attached as a logical predicate to the affecting idea as subject. So when a feeling emerges into immediate consciousness, it always appears as a modification of a more or less general object already in the mind. The word suggestion is well adapted to expressing this relation. The future is suggest by, or rather is influenced by the suggestions of, the past.[\[35\]](#)

In this way ideas suggest other ideas, and when done so regularly, a habit of mind is formed. This means that a present idea suggests another in the future. The present idea thus causes or influences new ideas. If this happens with high regularity, then one may say that this is a strong habit of mind. When there is such a habit of mind, a present idea contains the future idea potentially.

¶35. But not all mental associations are rigid and firmly habituated. Many are loose habits, if habits at all. Also other ideas may enter consciousness by chance. At any rate when ideas are regularly experienced together, a general idea is formed. As Peirce says, “I think we can only hold that wherever ideas come together they tend to weld into general ideas; and wherever they are generally connected, general ideas govern the connection; and these general ideas are living feelings spread out.”[\[36\]](#) He notes, however, that once connections between ideas are made, they may be connected through modes other than continuity.[\[37\]](#)

¶36. Furthermore continua of the mind are greatly affected by chance. This causes discontinuity and can give way to new habits of mind, if the chance event is repeated. Mind is one of the most plastic and tychistic dimensions of reality. Or as Peirce says,

Thus, the uncertainty of the mental law is no mere defect of it, but is on the contrary of its essence. The truth is, the mind is not subject to “law,” in the same rigid sense that matter is. It only experiences gentle forces which merely render it more likely to act in a given way than it otherwise would be. There always remains a certain amount of arbitrary spontaneity in its action, without which it would be dead.[\[38\]](#)

Mind does have some rigid habits however. For example, Peirce describes the modes of inference, deduction, induction, and abduction, as habits of the mind with varying degrees of rigidity and plasticity. Deduction, for example, is the most secure mode of inference, which leaves little room for chance, whereas abduction, is the most open to chance.[\[39\]](#)

- ¶37. The continua of mind share the same general characteristics as the continua in nature. The law of mind, like the general principle of evolution of the universe, is that there is an increase in habit taking and a decrease in chance variation of new ideas and associations. Present ideas are tending toward further generality and less chance and chaos.
- ¶38. In our discussion so far we have seen that synechism is an hypothesis which includes all of reality. Mind and the world are processes of evolution from chance and indeterminacy to habit and order. Some continua have more indeterminacy than others, but no continuum is absolutely determined. This ontological hypothesis entails important implications for a theory of knowledge and inquiry.

5. Implications of the Doctrine of Synechism for Peirce's Theory of Knowledge

5.1. No Law Is Absolute

- ¶39. No law of nature can be said to be absolutely accurate.^[40] This is, of course, what enables the fallibilist, who admits of inexactitude in knowledge, to accept the hypothesis of synechism. The nature of a general for Peirce entails both indeterminacy and regularity. The indeterminacy is due, in part, to its susceptibility to chance. The fact that any given continuum is open to the possibility of chance variation means that no law is absolutely exact. An individual may have knowledge of a real general or a habit, and yet this habit can surprise her with a chance event, a deviation from the continuum. This event is a variation from the regularity of past events, those events upon which she has based her knowledge. She is susceptible to faulty predictions, then, because of the element of chance in the habits of nature. Although the inquirer can predict nature due to its overwhelming regularity, this regularity is not absolute, and so her predictions and expectations can fail her.^[41] And as Carl Hausman argues, since chance is a permanent condition in nature, fallibilism is an essential feature of knowledge.^[42]
- ¶40. One may object that although there is variation and chance in nature, this does not mean that one cannot know these general laws and also know that they are rough, or perhaps know even how probable or improbable the laws are.^[43] Against the idea of chance being a support for the thesis of fallibilism, one might ask why inquirers cannot infallibly know the probability with which a law will be the case in the future. But this is not Peirce's view. In numerous passages Peirce says that as contextualized observers of nature, inquirers can never be sure whether the indeterminacy of their knowledge is due to the law of nature being subject to chance *or* is due to the fallibility in their methods, such as faulty instruments. For example, in "A Guess at the Riddle" (1887-1888), Peirce writes

We know that when we try to verify any law of nature by experiment, we

always find discrepancies between the observations and the theory. These we rightly refer to errors of observation; but why may there not be similar aberrations due to the imperfect obedience of the facts to law?[44]

Peirce's point here is that while in cases of discrepancies between theory and observation, inquirers usually attribute them to faulty observations, but one should not rule out the possibility that the discrepancy is due to chance variation within the law itself. But here we see that Peirce's point can work the other way as well. That is, the inquirer also does not know with certainty that the discrepancy is not due to a problem in his theory. He simply cannot know with certainty either way. There is indeterminacy in nature, and there is fallibilism in the methods. And so one cannot know the probability of a law with certainty. Peirce's pragmatic theory of inquiry and his cosmology do not permit the inquirer to get outside the context of inquiry in order to make such a judgment. In the situation of a chance event, he cannot be certain whether it was a problem in his own observation or it was a chance event.

- ¶41. Because there is indeterminacy in nature and fallibility in methods, and because the inquirer cannot get outside of his context "to check" which one it is, the admission of chance in nature poses another source of vulnerability to error in one's knowledge. Fallibility due to the potential for chance (and surprise) will affect all areas of natural science. Of course, for Peirce, as for current scientists, some laws are more open to chance than others, thus contributing to greater levels of fallibility (lower levels of security) in some sciences. For example, Peirce would admit that the laws of physics are more habituated, more regular, and less open to chance than the laws of psychology. And since generality is the condition for intelligibility, the science of physics is more intelligible. It is more capable of being known and known with more security.

5.2. The Vagueness of Real Generals

- ¶42. Habit is Thirdness, Peirce's term for real generality. It is the condition for intelligibility of the universe. That is, if there were not regularity in nature, real events occurring in regular patterns, then the universe would not be intelligible. But generality is of the nature of a continuum, which contains infinite potential particulars. According to Peirce individuality by itself cannot be understood. By itself—outside of regular patterns and relations—an individual thing or an individual event is unintelligible. Such a case would be an instance of what Peirce calls an instant of Secondness, the experience of a single reaction.[45] But such singularity without appeal to generality cannot be understood. So for example, a particular chance event, considered in isolation from other regularities, is an instance of discontinuity.[46] If the chance event is not repeated, and thus does not result in another continuity, then it remains an anomaly.

- ¶43. Relation is required for humans to understand particulars. An inquirer understands a particular by appealing to its relation to the general pattern of which it is a part. That is, he appeals to its continuum. Knowledge of an individual member of a class or of an individual event involves the knowledge of its continuum, the general conditions for the thing or the event. We may remember from the discussion of the mathematical continuum of the line that the points themselves do not have a distinct quality which makes them actual individuals. The points on the line are members of the same collection due to their relations with one another.[\[47\]](#) But points have potential relations with other things outside of their continuum. This enables “breaks” to occur in the continuum, which in turn are the initiations of new continua. The points as such do not create the breaks—rather “outside” forces do. Part of the reason that a continuum can condition and permit future chance events is that a continuum is not fully determinate. The continuum provides the conditions for breaks in the continuum by being a set of potentials. Chance events, and consequently new law, can evolve from a continuum because the continuum has potential being, potential relations.
- ¶44. But this characteristic of the continuum means that it is vague insofar as it is the general condition for the event. It does not and, indeed, cannot determine or actualize all the potential individuals included in it. Knowledge of the continuum, we may recall from the previous section, cannot be knowledge of all of the instances or members of the continuum. There are an infinite number of potential members of a continuum, and so one could not possibly have such knowledge. But it is not merely the case that one cannot know all the members of a general class or all of the events of a pattern of nature. It is also the case that one cannot know all of the *kinds* of events, which could be included in the continuum. The inquirer cannot know all of the relational structures contained potentially within the continuum.[\[48\]](#)
- ¶45. Continua are collections. Thus, when Peirce extends the mathematical conception of the continuum to nature, we see that the real generals in nature are composed of these collections of collections of collections, *ad infinitum*, such that the individuals cannot be distinct, but rather are welded together. He says,

But now let us consider a collection containing an individual for every individual of a collection of collections comprising a collection of every abnumeral multitude. That is, this collection shall consist of all finite multitudes together with all possible collections of those multitudes, together with all possible collections of collections of those multitudes, together with all possible collections of collections of collections of those multitudes, and so on *ad infinitum*. This collection is evidently of a multitude as great as that of all possible collections of its members. But we have just seen that this cannot be true of any collection whose individuals are distinct from one another. We, therefore, find that we have now reached a multitude so vast that the individuals of such a collection melt into one another and lose their distinct

identities. Such a collection is *continuous*.[\[49\]](#)

Knowledge of the continua in nature, like Peirce's example of one's knowledge of mathematical continua, must be vague, general and potential. It is impossible to know all members or all the collections of the collection. The inquirer can further his knowledge of a continuum, but he can never exhaust his knowledge of the continuum. Thus we see that because knowledge involves real generality, and generality refers to the infinite, one's knowledge of a continuum is *infinitely vague*. This is another reason why knowledge of generals or continua can never be absolutely precise.

- ¶46. In addition to continua in nature being open to chance, they are also infinitely vague. While the inquirer can improve his understanding of a general, he can never exhaust this understanding. He can never understand a continuum completely, because he can never understand the infinite potentials and the infinite relations which constitute the continuum. For this reason one's knowledge of the real general is fallible knowledge. It is always incomplete.

5.3. The Universe is Increasing in Intelligibility

- ¶47. But while we have seen the *limits* of the completeness of knowledge due to continuity, it is also important to emphasize that it is because of continuity, that the universe is intelligible at all. If there were no regularity in nature and only pure chance, then there could be no knowledge. There would be nothing to know. But as things are, events tend to form habits, and the universe is growing in generality and diversity. Consequently it is growing in intelligibility. In the future there will be more laws to know. Peirce's cosmology entails an evolution from the vague to the definite.[\[50\]](#) The real evolving generals will be less vague and more determinate than present or past laws. The new evolving generals will be further specified and more definite. And while all continua will still be susceptible to tychistic events, they will be *less susceptible*. And while all continua in the future will still be infinitely vague, they will be *less vague*. Infinite in this sense is infinite by subtraction, which never reaches the limit of zero vagueness.
- ¶48. Both the evolution from the vague to the definite, and the growth of new laws, have ramifications for Peirce's fallibilism. His cosmology implies that present knowledge must be provisional because the objects of present knowledge, i.e., the laws of nature, are subject to further evolution. The nature of knowledge, then, must be open to revision and further specification. Knowledge cannot be permanent, because there is nothing permanent or static to know in Peirce's system. Knowledge is essentially changing due to the fact that the very world which inquirers aim to know is itself changing.

- ¶49. But given Peirce's cosmology on a large scale, the universe is tending toward more order and more complexity. There is then the possibility that new sciences will emerge with higher orders of complexity. This evolution of new laws would also require that one be open and provisional regarding one's present *methods* as well as our theories. Since new and more definite laws will emerge, most likely present methods will not be sufficient to inquire into more specific laws.[\[51\]](#) Fallibilism on the level of method then must be accepted if the cosmology of the evolution of law is accepted. Present methods of science should remain open and provisional, to make way for new methods which can accommodate inquiry into the new, more complex laws at work at a higher level of complexity. New laws will evolve from the present ones, and so there will be more laws to know, but also more definite and specified laws will require more sophisticated methods. Human knowledge will have to adapt to the changing environment.
- ¶50. One may want to object here asking, what pragmatic meaning this speculation has? Given that the evolution of new laws occurs at such a slow pace, and given that regularity is more common than chance, it would appear that the evolution of new law would not have a significant effect on present knowledge. And would Peirce himself want to speculate about what knowledge would be like in a world which the human species may never survive to see? It is not our concern here to explore the ultimate end of time in Peirce's theory. We are concerned only with the present view of knowledge as contextualized and temporal. Thus our point in this discussion is to note that a Peircean theory of knowledge must be essentially changing and provisional. Unlike traditional criteria for knowledge, Peirce cannot and does not hold a criterion of permanency for knowledge. Knowledge must be open and changing, as the very objects of knowledge are open and changing.

5.4 Implications of the Mind as Continuous: Knowledge as Integration

- ¶51. In order to see what knowledge is in Peirce's evolutionary system, we must explicate the implications of the law of mind. The law of mind is that tendency for ideas to spread and take habit. The mind is tending toward regular, ordered habits, by which one idea will regularly produce another idea. Although there is always an element of indeterminacy and chance, ideas tend to evolve toward more generality. In progressing toward general ideas, it tends towards *intelligibility*, moving from unassociated ideas or random association to general associations, which are experienced regularly. This is a movement toward successive action in the mind, where the mind gains further regularity in thought. Not only is the universe tending toward more generality, habits, order, and complexity, but the law of mind, and human thought itself, are also tending toward more generality.

- ¶52. But because thought is of the nature of the continuum, there will always be vagueness in humans' knowledge of the real generals of nature. The real generals are themselves vague, and general ideas are also necessarily vague because they are experienced infinitesimally. They are not fully determined, but are open to chance as they are experienced in the mind.
- ¶53. But the mind is not simply pushed toward greater regularity and generality through its own habits. For Peirce human habits of mind are affected and constrained by human interactions with nature. Due to this consistent constraint from the real world, the increase of the habits of mind entails an increase in knowledge of the real world. Habits in nature affect habits of the mind, which are more plastic and aim toward knowing the world. It is the nature of inquiry to attempt to form habits which correspond with and integrate with the real habits of nature. So although there is a gentle force at work on the level of habits of mind, the mind does not gain generality in isolation. The habits of the mind are developed in the context of the environment, in which the real world acts as a constraint on the habits of the mind, and the habits of mind aim at adaptation to that very environment from which they emerged as different continua. The mind's interaction with the world gives inquiry its purpose or goal since the environment can surprise one's habits, leading one to doubt and inquiry. To know, on this model, means to have a firm, but not absolutely firm, habit of the mind which corresponds to the habits in nature. It is to have a habit of the mind which does not lead to further doubt.[\[52\]](#)
- ¶54. So the growth of knowledge is the growth of the habits of mind or general ideas, but it is also a growth in the mind's integration with the environment. Knowledge is growing toward more secure knowledge which is less susceptible to chance associations in the mind and less susceptible to surprise from the environment. Thus inquirers are always gaining more knowledge of new laws. This is what we will call evolutionary adaptation or an integration model of knowing.
- ¶55. This model of epistemological-ontological evolutionary integration is the synthesis of two dynamic processes of habit-taking. The habits of the universe, occurring slowly and independently, constrain the habits of the mind, which aim to adapt their habits to their environment. This model of knowledge is very different from anything that comes before Peirce, and marks a key philosophical break with Cartesianism. Peirce moves away from such traditional notions of knowledge. First, given the continuum of the mind, knowledge must be the experience of an habituated association of ideas. Knowledge must be a relatively firm habit of the mind, which tends to associate certain ideas with one another. But this habit is not absolutely fixed, and so even habits of the mind are susceptible to chance, and thus to new ideas. No knowledge for Peirce then is permanent or unchanging, because no habit of mind is beyond the susceptibility to chance variation. Second, knowledge for Peirce is not merely having information, since one cannot have an idea simply. Rather one experiences ideas *as habits*, the associations of ideas which are more or less regular. This means that

knowledge is essentially a process because thought itself is a process. Third, the content of one's knowledge, i.e., the real world, is dynamic and one's interaction with it is dynamic. The real world is always capable of further chance, and consequently, is always capable of causing further surprise for the inquirer. Peirce's evolutionary idea of synechism suggests a theory of knowledge which grows in its affinity with the general, but changing patterns in the world. Thought is itself changing, and the object toward which thought aims is also changing. The goal of thought, if we can still call it knowledge, is adaptation.

- ¶56. On this model what is the positive meaning of knowing real generals in nature? We have seen what it is *not*. It is not knowing every instance or even every relation implicit in the continuum. It is not knowing every idea contained within another. Knowledge of real generals, for Peirce, must involve the integration of the knower and the known. But the knower does not reflect or possess representations of static objects of nature. For that is impossible. Rather successful inquiry enables the knower to predict, control, act in, and integrate with the real continua. Habits of thought integrate with the processes of nature. This is what it means to know the real generals in nature. Otherwise the vagueness of knowledge (due to thought as signs, and primarily based on abduction) would defeat our inquiry. But inquiry is not defeated. Inquirers can and do act successfully in a world governed by law.
- ¶57. If it were just the case that fallible methods were continually trying to understand a static universe, or if the mind itself were capable of becoming static in its understanding, then fallibilism would not be a permanent condition. But inquiry aims at integration with the infinitely vague continua of nature. Minds, as continua, are also infinitely vague. Thus inquirers cannot unpack all the relations which are present within their own ideas, or all the relations which are potential in the continua of nature. Their knowledge, therefore, must always remain vague, imprecise, and fallible.
- ¶58. Peirce's theory of inquiry is still one which aims at and achieves correspondence with the world. But it is not a correspondence of a static representation, which the inquirer has of the static world. Both knowing and the known are dynamic processes, and so when humans interact with nature successfully, it is an indication that they have a correspondence with the world. Such interaction indicates that the human habits of thought correspond with the habits in nature. But this is a dynamic process on both sides of the knowing relationship. The real world acts on inquirers in meaningful ways. The real world constrains their thoughts and habits of mind. But they know and learn about the real world through their habits of action and their habits of thought.

- ¶59. Adaptation and integration with the environment can be the only model for inquiry. The goal of each inquiry will depend on its purpose and upon the existing theories already at work. Inquiry, its subject matter, its goals, its methods, and its fallible conclusions evolve. There is thus no static or absolute standard for inquiry or knowledge. Instead the goal of inquiry is the very general standard of adaptation, which is essentially dynamic.

6. Conclusion

- ¶60. It is now evident that the implications of the hypothesis of synechism for Peirce's theory of knowledge are the following: (1) Peirce's theory of the growth of the continuum involves his theory of chance or tychism. Chance events can occur, and so no law is absolute. But due to the susceptibility of tychistic events occurring on any level of continua, one's knowledge of a continuum must be subject to change. (2) Real generals are habits which are of the nature of the continuum. The laws of nature are always somewhat vague. Thus, one's understanding can never be complete. (3) The tendency for a continuum to evolve into new or different continua, makes not just knowledge, but also methods, temporary and subject to change. For inquirers do not ultimately know what different kinds of continua will exist, and so they do not know if their present theories and methods will be adequate. Human knowledge and methods of inquiry must adapt to the changing environment. (4) The continuum at work on the level of mind means that the mind forms habits in its thinking, but that these habits are open to chance. Habits of mind are, in a sense, subject to tychism, just as any habit in nature is. Furthermore, these habits of mind, like all continua, are infinitely vague. Synechism has implications for the growth of knowledge and the doctrine of fallibilism on two levels. First, since nature is continuous, it lacks distinctness and precision. Knowledge of nature will always have a level of indeterminacy. There are regularities in nature, but there is also growth and change of these regularities, and so any knowledge that one has of a law of nature or a real general will be approximate. Second, on the side of the knower, synechism implies that one's ideas grow and change through time, as all other things do. Ideas share nature's properties of inexactness and growth, because ideas are part of nature and aim at evolutionary integration with nature. Knowledge is part of the same evolutionary process.[\[53\]](#)

END NOTES

1. Charles S. Peirce, *Collected Papers of Charles Sanders Peirce*, C. Hartshorne, P. Weiss and A. Burks (Eds.), Cambridge: Harvard University Press (1960), Vol. 1, ¶172.
2. Charles S. Peirce, *The Essential Peirce: Selected Philosophical Writings, Vol. I, (1867-1893)*, N. Houser and C. Kloesel (Eds.), Bloomington: Indiana University Press (1992), 313.
3. Charles S. Peirce, *Collected Papers of Charles Sanders Peirce*, C. Hartshorne, P. Weiss and A. Burks (Eds.), Cambridge: Harvard University Press (1960), ¶171.
4. *ibid.*, ¶175. This quotation continues,

The reality of things consists in their persistent forcing themselves upon our recognition. If a thing has no such persistence, it is a mere dream. Reality, then, is persistence, is regularity. In the original chaos, where there was no regularity, there was no existence. It was all a confused dream. This we may suppose was in the infinitely distant past. But as things are getting more regular, more persistent, they are getting less dreamy and more real.
5. *ibid.*, ¶172.
6. *ibid.*, ¶173.
7. *ibid.*, ¶174.
8. Some recent commentators, Hilary Putnam, Kenneth Laine Ketner (in Charles S. Peirce, *Reasoning and the Logic of Things*, H. Putnam and K.L. Ketner (Eds.), Cambridge: Harvard University Press (1992)), and Carl Hausman have sought to provide interpretations of the continuum, by which our discussion is informed. Ketner and Putnam, in their “Introduction: The Consequences of Mathematics”, 1-54; Putnam, from “Comments on the Lectures”, 55-102; and Carl R. Hausman, *Charles S. Peirce's Evolutionary Philosophy*, New York: Cambridge University Press (1993), 140-190.

9. Peirce was greatly influenced by Georg Cantor's mathematical definition of a continuum. See Cantor's *Gesammelte Abhandlungen mathematischen und philosophischen Inhalts* (Berline, 1932), 139-40. Cantor defines a "continuous series as one which is concatenated and perfect" (320). Peirce's conception of the continuum in mathematics, however, differs from Cantor's significantly. For a discussion of Peirce's development of his theory of continuity and the Kantian and Aristotelian influences on his changing conception see Vincent Potter, *Peirce's Philosophical Perspectives*, edited by Vincent M. Colapietro (New York: Fordham University Press, 1996), 117-123; Murray G. Murphey, *The Development of Peirce's Philosophy* (Cambridge: Harvard University Press, 1961), 260ff.; and, most recently, Robert Lane, "Peirce's Triadic Logic Revisited," *Transactions of the Charles S. Peirce Society*, spring, 1999, Vol. XXXV, No. 2, 284-311. Lane argues that Peirce changed his notion of the boundary of a continuum three times throughout his writings.
10. Charles S. Peirce, *Reasoning and the Logic of Things*, H. Putnam and K.L. Ketner (Eds.), Cambridge: Harvard University Press (1992), 159.
11. *ibid.*, 160.
12. "Infinite" has a double meaning for Peirce. First, "infinite" can mean by addition, and therefore, larger, or at least moving toward a limit. Second, "infinite" can mean by subtraction, and therefore smaller, moving toward a zero limit.
13. Charles S. Peirce, *Reasoning and the Logic of Things*, H. Putnam and K.L. Ketner (Eds.), Cambridge: Harvard University Press (1992), 160.
14. The dimensions for a line would contain infinite potential points; for a surface, infinite potential lines; for a solid, potential surfaces; for time, potential "nows"; for motion, potential impulses; for class, potential individuals.
15. Charles S. Peirce, *Reasoning and the Logic of Things*, H. Putnam and K.L. Ketner (Eds.), Cambridge: Harvard University Press (1992), 247.
16. *ibid.*, 248.
17. *ibid.*.

- [18.](#) [ibid.](#)
- [19.](#) [ibid.](#)
- [20.](#) [ibid.](#)
- [21.](#) Peirce relies on his logic of relatives to prove that the notion of the universal has the nature of the continuum. Ordinary logic deals with only the relation of similarity, “a relation, too, of a particularly featureless and insignificant kind”, whereas “the logic of relations considers the system, which is composed of objects brought together by any kind of relations whatsoever.” [ibid.](#), 156.
- [22.](#) [ibid.](#), 247.
- [23.](#) Charles S. Peirce, *The Essential Peirce: Selected Philosophical Writings, Vol. II (1893-1894)*, N. Housner and C.Kloesel (Eds.), Bloomington: Indiana University Press (1992), 2.
- [24.](#) Charles S. Peirce, *Reasoning and the Logic of Things*, H. Putnam and K.L. Ketner (Eds.), Cambridge: Harvard University Press (1992), 258.
- [25.](#) [ibid.](#)
- [26.](#) [ibid.](#), 263.
- [27.](#) [ibid.](#)
- [28.](#) Peirce can be interpreted as saying that actually matter evolves out of mind. Mind is potentiality and matter is actuality. Through evolution the former evolves into the latter. In some passages Peirce describes the world evolving out of the Platonic world of ideas and potentiality into accidental actuality. [ibid.](#), 258, 263.
- [29.](#) Charles S. Peirce, *Collected Papers of Charles Sanders Peirce*, C. Hartshorne, P.Weiss and A.Burks (Eds.), Cambridge: Harvard University Press (1960), Vol. 1, ¶170.

- [30.](#) Charles S. Peirce, *Reasoning and the Logic of Things*, H. Putnam and K.L. Ketner (Eds.), Cambridge: Harvard University Press (1992), 241.
- [31.](#) Charles S. Peirce, *The Essential Peirce: Selected Philosophical Writings, Vol. I, (1867-1893)*, N. Houser and C.Kloesel (Eds.), Bloomington: Indiana University Press (1992), 313.
- [32.](#) *ibid.*, 314.
- [33.](#) *ibid.*, 323.
- [34.](#) *ibid.*, 325.
- [35.](#) *ibid.*, 326-327.
- [36.](#) *ibid.*, 327.
- [37.](#) *ibid.*.
- [38.](#) *ibid.*, 329.
- [39.](#) *ibid.*, 327-329.
- [40.](#) Charles S. Peirce, *Collected Papers of Charles Sanders Peirce*, C. Hartshorne, P.Weiss and A.Burks (Eds.), Cambridge: Harvard University Press (1960), Vol. 6, ¶173.
- [41.](#) All continua are susceptible to tychistic deviations from law, although some continua are more susceptible than others. The continuum of the mind, for example, is more plastic and open to chance variation than matter. But matter too is still susceptible to chance, to some small degree. Charles S. Peirce, *Reasoning and the Logic of Things*, H. Putnam and K.L. Ketner (Eds.), Cambridge: Harvard University Press (1992), 260-261.
- [42.](#) Carl R. Hausman, *Charles S. Peirce's Evolutionary Philosophy*, New York: Cambridge University Press (1993), 193.

- [43.](#) See Susan Haack, [Fallibilism and Necessity](#), *Synthese*, 41 1979, 43. She argues that “the status of the truths involved should not be relevant to our liability to error.” But Peirce obviously does think that the susceptibility of chance in nature affects one’s ability to know and predict this law. Fallibilism does not refer solely to fallibility in the methods of inquiry; it refers to general susceptibility to doubt of any of one’s beliefs. But doubt, as we know, can be caused by a surprise from the environment and this surprise is not always caused by an ill formed belief, but can be caused by a variation of an otherwise law-like habit of nature.
- [44.](#) Charles S. Peirce, [The Essential Peirce: Selected Philosophical Writings, Vol. I, \(1867-1893\)](#), N. Houser and C.Kloesel (Eds.), Bloomington: Indiana University Press (1992), 274.
- [45.](#) These categories are abstractions from intelligible experience. Thirdness, which is habit and relation, is required for intelligibility. Therefore, when discussing the preintelligible categories of Firstness and Secondness, Peirce explains that one is abstracting from one’s intelligible experiences.
- [46.](#) Peirce explains the intelligibility of chance events. One would not be justified in hypothesizing chance events in nature if they are inexplicable, since to do so blocks the road of inquiry. And to suppose a chance event is to suppose something which departs from the regular explanations of things. But here Peirce explains that chance events can be understood when considered as a whole class of irregularities. He says,

For the only justification we can have for supposing anything we don’t see is that it would explain how an observed fact could result from the ordinary course of things. Now to suppose a thing sporadic, spontaneous, irregular, is to suppose it departs from the ordinary course of things. That is blocking the road of inquiry; it is supposing the thing inexplicable, when a supposition can only be justified by its affording an explanation.

But we may find a general class of phenomena, forming a part of the general course of things, which are explicable not as an irregularity, but as the resultant effect of a whole class of irregularities.

Charles S. Peirce, [Collected Papers of Charles Sanders Peirce](#), C. Hartshorne, P.Weiss and A.Burks (Eds.), Cambridge: Harvard University Press (1960), Vol. 1, ¶156-157.

[47.](#) Charles S. Peirce, *Reasoning and the Logic of Things*, H. Putnam and K.L. Ketner (Eds.), Cambridge: Harvard University Press (1992), 248.

[48.](#) Christopher Hookway illustrates Peirce's point when he says,

When we reason about a continuum—about time or a continuous process—we use existential quantifiers to pick out parts of the continuum and we reason about the relational properties of the elements that we refer to. So to speak, we find a relational structure in the continuum and that provides a focus of our reasoning. However, no one relational structure captures the nature of the continuum, and we cannot quantify over all of the elements of the continuum. The relational structures we reason about are, in a sense, determined by the nature of the continuum we are reasoning about, but they do not exhaust its character. . . . if we think of a process as continuous, then we believe that it will always be possible for us to produce more complex characterizations of relational structures which 'fit' or 'are determined by' that continuous process.

Christopher Hookway, *Peirce*, New York: Routledge (1985), 178.

[49.](#) Charles S. Peirce, *Reasoning and the Logic of Things*, H. Putnam and K.L. Ketner (Eds.), Cambridge: Harvard University Press (1992), 159.

[50.](#) *ibid.*, 258.

[51.](#) Due to synechism at every ontological level, each science will be ontologically connected to the other. All the laws of all the sciences, including physics, chemistry, biology, psychology, etc, have all evolved from the same evolutionary process. Each science is demarcated only roughly; it is only roughly distinct from the other sciences. Sciences are distinct enough, however, to require distinct methods. For Peirce's discussion of the evolution of the sciences, see "Architecture of Theories" (1891).

- [52.](#) Peirce's Belief-Doubt-Belief (BDB) model of inquiry describes beliefs as fixed when they do not lead to further doubt. In this model of inquiry, beliefs are none other than habits of action. But once we see the activity of the mind to be also habits, then we can see the B-D-B model of adaptation at work at the level of thought and ideas. If a belief leads to further doubt, then it is to be revised so as to adapt to the environment. If it does not lead to surprise and doubt, then the habit of mind will continue gaining strength by being repeated and consequently more fixed.
- [53.](#) This paper has benefited greatly from my conversations with and comments from Richard J. Blackwell. I am also grateful to Jerold J. Abrams, William Charron, and Eric Reitan, for reading and commenting on an earlier draft of this essay.

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