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Peirce's Root Metaphor within his Experimental Study of Semeiosis

Peirce proposed that semeiosis is a natural phenomenon, as real as potential energy or magnetic fields or chemical processes. His study of that real natural phenomenon he labeled *Semeiotic*—Max Fisch's essay (1986, 321–355) is definitive on this point. Peirce's semeiotic, then, is the scientific study of such *Semeioses*. That comment is parallel to similar remarks such as: "Physics studies magnetic fields" or "Mathematics studies relational structures and processes." Because semeioses are real, we do not create them—we *do* make guesses about their nature that are then objectively tested by means of experiments within the zone of reality in which the guess is relevant.

Stephen Coburn Pepper (1942, 84 f.) was an insightful thinker of the mid-twentieth century who proposed a guiding principle that he designated as *root metaphor*. It is a tool useful for comprehending large-scale hypotheses, which, within various disciplines, are also known as *theories*. A root metaphor offers a *guiding* analogy tentatively useful in the process of abduction through which one makes guesses that can be tested using objective techniques. Did Peirce employ such a probing tool? I think he did and suggest that his guiding analogy was Scientific Experimentation (see Scott 2006).

If indeed experimentation is Peirce's root metaphor, he explored it deeply in what has been called his System of Science (see Peirce 2009 [1891 f.], 45–56). I will attempt to outline here how such an approach could give us insight into the question of a proper method for semeiotic, the scientific study of semeioses.

An experiment begins with a *Predesignated Research Question*. This is important because without that feature, we are unable to designate tests or observations relevant to our project. Moreover, in order to perform an experiment, a researcher must be capable of stating a question, and of communicating that to research colleagues. This can be done with a question mark in the typical way, but it can also take the form of a declarative statement presented within an acknowledged context of wondering if the statement is true or false.

In order for a question genuinely to come under consideration by human persons, several capabilities and skills must be in place. Such a person must be able to communicate with other persons, have a typical set of sensory abilities, and

have a modicum of reasoning ability. This set of capacities Peirce placed under the heading of *Common Sense* (Peirce 2009 [1891 f.], 245–258; Ketner 1972, 106–148).

If the question at hand is to be studied scientifically researchers must possess some other features that Peirce listed as *Scientific Intelligence*. Persons so described are capable of learning from experience, and adopt the objective method wherein experimental tests are resolved based upon real outcomes aside from any prior preferences or biases for results on the researchers' part. Adhering to preconceived or pre-preferred results is not scientific or objective, but amounts to following or enforcing egotistical or selfish desires. Moreover, Scientific Intelligences must practice a set of character traits Peirce outlined as *The Will to Learn* (1992 [1898], 170 f.); among these are honesty and ethical behavior within the given scientific community wherein the goal is cooperatively to achieve an accurate answer for the predesignated question as guided by the real conditions in the world.

Typically, an experiment is designed using a modeling technique. The purest version of this is found in mathematics, which Peirce regarded as the most basic science, the method of which includes abduction (guessing a hypothesis), experimental design, and observation of experimental results. He thought mathematicians developed models of hypotheses divorced from actual existential conditions in order to explore whether one set of hypotheses could be reliably transformed into another set of hypotheses according to objective transformation procedures. That is, through experiment, a mathematical form *Gamma* may be found to transform objectively into another mathematical form *Lambda*. This means that if we have an actual instance of *Gamma*, we know that *Lambda* is likely to be a reasonable actual consequence. Mathematically, we don't need to know that *Gamma* (or *Lambda*) is to be found in the existing world; but this science does offer the possibility that if something in the existential world is found to be analogous to *Gamma*, then we *might* also find in actuality something as yet unnoticed there that is analogous to *Lambda*. Now we can look for that existential instance of *Lambda* within the matter under study. Such a method Peirce described as *Diagrammatic Thought*. That modeling technique applies both to abstract items as well as existential items. Consider this example of diagrammatic thought in action.

Lacking an expensive large wind tunnel, an engineer tasked with providing an aeronautical drag profile of a new automobile body design developed an accurate onequarter size wooden model of the car body, then pulled it submerged, under controlled conditions, through a local swimming pool at various speeds. Sensors on the model provided information about water flows over the car which, by using water/air fluid-flow equivalence equations, were translated to results in terms of air flow. Later tests with a prototype full-size auto driven in air showed

the water method to be dependable. By that approach developmental expenses could be minimized.

Thus far, in his analysis of Scientific Experimentation, we have noticed Peirce discussing the role of questioning as initiator of research, as well as Common Sense abilities and the appropriate Character Traits of Scientific Intelligences who would be capable of performing genuine experiments. Next in his system of science, he treated issues relating to experience, purposes, standards of control, reasoning, and careful communication with clarified terminology. These subtopics he placed under the overall topic of *Philosophy*, or equivalently under his preferred name (derived from Jeremy Bentham* 1962 [1843], 83n): *Cenoscopy*. At this point it is easy to misunderstand his efforts, so pardon if you will, a momentary *Brotzeit Gespräch über Philosophie*.

Peirce was not a philosopher in the sense that term is employed today within academic circles. He *was* a philosopher in another sense widely found in nineteenth century usage. What might that be? And how can we translate that into contemporary expressions that more accurately describe Peirce's research? Someone recently said: *The meaning of a term is found in its use*. That is not a bad principle. So, who were described as philosophers in the nineteenth and early twentieth century? Prominent examples come to mind: Michael Faraday, Clerk Maxwell, Charles Darwin, Antoine Lavosier, Hermann von Helmholtz, Heinrich Hertz, Joseph Henry—the phrase "and many of their colleagues" can be applied alongside those leading names. What relevant qualities are shared by these persons? They were all experimental scientists, but especially working at the edge of scientific research attempting to improve the *large-scale hypotheses*, that is to say *theories*, of their discipline. It is in that sense that Peirce was a philosopher. Thus, to avoid confusion, let us designate him as a scientific theorist whose special interest was improving the large-scale hypotheses about methods of science. Moreover, Peirce's understanding of "science" is similar to *Wissenschaft*; it is very dissimilar from "technological science." If one combines *Wissenschaft* with some other word designating a narrower area of inquiry—consider *Kulturwissenschaft*—we would be announcing our goal to develop large-scale tested hypotheses that are mutually supporting—theories in other words—about *Kultur*. Peirce, the methodologist, might probably say that in this sense of science—*Wissenschaft*—the term simply

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* Thus Bentham: "*Coenoscopic* . . . from two Greek words, one of which signifies *common*—things belonging to others in common; the other *looking to*. By *coenoscopic ontology*, then, is designated that part of the science which takes for its subject those properties which are considered as possessed in common by all the individuals belonging to the class which the name ontology is employed to designate, *i.e.* by *all individuals*."

means that we adhere to the analysis of Scientific Experimentation that he presented within his System of Science as we perform research. Hence, Peirce is not appropriately considered to be a philosopher in the contemporary academic sense of the term. What would be the more accurate self-description of his research?

Ende Brotzeit Pause!

Using the tools and abilities outlined thus far in our survey of the experimentation root metaphor, and with commonsense logic, we study phenomena of our normal experience that is available for such consideration without employing any special instruments for extending our common abilities. *That* is what Peirce meant by *Philosophy* or Cenoscopy. Note that it is a science because it proceeds by Experimentation.

What? An experiment in *Philosophy*! This would be the cry of someone who subscribes to the fashionable contemporary notion that philosophical study is a part of the humanities, and as such, does not perform experiments. Let us try an experiment in the science of philosophy/cenoscopy.

A New Mercedes: Hannelore, a noted young scientist, orders a new Mercedes from the local dealer, who promises to have it delivered on the driveway at her home the very next morning. She awakens eager to see the new purchase. She finds on her drive a large stack containing every component of a new red Mercedes, carefully boxed and labeled. She calls the selling agent and complains that her new car has not been delivered. "But you have every component of the thing," says the agent. Hannelore correctly replies, "Yet I don't have the car—you left out the real relations."

It is an inescapable fact that we have experiences: perceptions, memories, dreams, visions, imaginings. We could make a long list. Using the tools for experimenting we have noted, we could—at this point in our sequence, if we admit experiences of any kind at all for consideration—consider the following predesignated question "In all such common experiences of any kind, are there any features that are invariant across that whole sweep?" His name for such invariant features was *Indecomposables*. Thus, Peirce began the study of what he called *Phaneroscopy* (see Bisanz 2016). His term "Phaneron" applies to any experience of any kind that can come before our unaided consciousness. By using some aspects of diagrammatic thought and some basic commonsense logic, Peirce noticed that in all our phanerons, one finds three invariant, indecomposable relational forms. Some experiences strongly exhibit monadic forms; properties are a good example: "That item *is red*." Other experiences strongly show dyadic relational forms; human society provides instances: "*Susan* hates *Robert*." Yet other cases show triadic form more prominently: "In *Bayern* there is a *social understanding* of the

blossom named *Edelweiss*." He also noticed that all three of these patterns are in every phaneron, but in various particular examples such as those mentioned, one of those three forms is more prominent. Peirce quickly saw that through combining forms from these three types by linking one part of a relation with a part of another relation, more complicated relations could be developed. For example: *There is a dog in the park* (monadic); *Susan owns a dog* (dyadic); *The park dog and the Susan dog are the same dog* (linking parts of two relations, in this case via identity); therefore, we may conclude by commonsense logic that *Susan's dog is in the park*. This linking of parts, wherein two available connectible features are joined, Peirce called *Bonding*. One might ask, are there relations other than just these three? Yes, for example, this quadradic structure: "*Bob* sold *his car* to *Tom* for *50 Deutsche Mark*." [Das Auto war ein Trabant.] However, Peirce noted, one needs only the forms for the first three invariant types plus bonding to be able to express the forms of any relation of quadradic or higher "adic" level. Thus, two triads, and one bond linking the two, produces a quadrad; adding one more triad and one more such bond will yield a pentad, *und so weiter*. Peirce saw another feature: because a bond always "absorbs" two connection points, one cannot construct a triad from any combination of interlinked bonds involving only monads and dyads. A simple tabulation establishes that point (Interdisciplinary Seminar on Peirce 2011). This line of thought shows that, without using special instruments, one may find invariant relational features in any kind of experience one might have: In phanerons one finds monadic, dyadic, and triadic forms; one notices that bonding is possible; one observes that triadic forms cannot be constructed using bonding plus resources of only monadic and dyadic forms; yet bonding of triads can produce relations having external structures of quadradic or higher "adicity." This means that the first three adicities plus bonding are complete resources for producing the external form for any adicities greater than three. Thus, we have just outlined how, within phaneroscopy, Peirce developed his three *Cenopythagorean Categories*. That result is obtained by experimenting using diagrammatic thought and commonsense logic, and it is an experiment that any other scientific intelligence can repeat without any special instruments for extending experiential capabilities.

We now come to Normative Science, which consists primarily of Esthetics, Ethics, and Semeiotic. Because I want to focus on experimentation in Semeiotic, a summary of esthetics and ethics will be delayed, out of order, until the end of the essay.

Communication in science comes to the front in Semeiotic. How shall we understand communication? If we apply phaneroscopy to communication, perhaps

the first thing that we will notice is that triadic forms are prominent. For a simple starting analogy, I will employ the notion of radio news broadcasting. In such a successful communication, there is some *Transmitting* feature, a *Message* feature, and a *Receiving* or comprehending feature. From the standpoint of phaneroscopy, we observe that a triadic relation is involved. There are three features within the relation of broadcasting of some particular newscast declarative sentence—for example, "The Danube River Dam has burst." The successfully comprehending reception of such a broadcast is an instance of **Semeiosis**. Note that a sequence of only physical causes from electromagnetic transmission to electromagnetic reception by a radio is *NOT* a semeiosis *(broad-sense sign)*, but instead is a chain of dyadic events, an extended chain of connected efficient cause *plain signals*.

What the communication is "about" Peirce named the **Object** of the semeiosis. The aspect of the communication that, within the semeiosis, represents the Object to the Interpretant, Peirce named the **Representamen**. And for the receiving/comprehension factor he preferred **Interpretant**—namely, that feature within the semeiosis functioning to interpret or comprehend or understand the Object through the Representamen. Thus, for this example, the Semeiosis (SIGN in the broad sense) is the triadic relation involving: (a) the broken river dam, (b) the spoken remark, and (c) one or more comprehensions of that remark. The remark is a Representamen (SIGN in the narrow sense) of the Object—the actual currently broken river dam. The Interpretant is the comprehending function for the Representamen in regard to that Object.

But can't we have communication using only causal (dyadic) relations, perhaps by way of signaling? Such is an oftenheard remark. At this point, a sample experiment in semeiotic is needed. We can use one suggested by Walker Percy (1975, 203, 292), a leading novelist, essayist, and late colleague of Charles Peirce's science of semeiotic (see McDonnell 2005, Perkins 2011, Samway 1995). But first some careful consideration of terminology is needed. A *Plain Signal* is a causeandeffect phenomenon. What do we mean by "causal relation"? Here the meaning is this: we are speaking of an efficient causal relation in which one factor is the Cause and another factor is the Effect; and such a causal relation holds, if and only if, when the specific Cause is present, the specific Effect will appear, *and* when the Cause is absent, the Effect will *not* appear. Now we can conduct Percy's experiment. Here is how you can repeat it for yourself.

Walk up to a series of strangers within your language community, then say to them singly, "I admire your garments." That statement by you is the proposed Cause. If communication is causal, then there will be one specific, invariable Effect response from each of the strangers. But you will find that the responses are

not invariable. That is a typical hypothesis-disconfirming logical structure found in everyday living, namely: If ***this*** then ***that***; on test, ***that*** is *not* the case; hence, ***this*** is not the case. You may then conclude, by commonsense logic, that "It is not true that communication is an efficient causal process."

To this conclusion the cause-favoring objector might reply: "We have here a case of a presently unnoticed causal factor; we will find that factor in the future, and then you will see that the item is causal after all. Therefore, we can ignore this experiment."

The objector's remark is a Counterfactual of the Future, which is parallel to *Counterfactuals of the Past*, for example: "If Caesar had not crossed the Rubicon, Rome would not soon after have been governed by a dictator." Of course, the fact is that Caesar did cross the river, therefore our imagination of the opposite is merely a figment, not a reality, a statement of what we *don't* know.

Counterfactuals of the Future can be exemplified in this manner: "If, in the future, we *might* gain some knowledge of an overlooked causal factor we do not now have, our present failed experiment will be seen as non-decisive. Therefore, let us ignore the failure of the current experiment and look for the missing cause." Basically, these two counterfactual reasoning patterns are examples of the general fallacy of an *Appeal to No Evidence*, whereby one erroneously argues that because we lack evidence, from that lack, some positive conclusion can be established.

The objective answer: "Let us be guided by the best evidence we have at the moment, while allowing, as we always do in science, that future experience or research may require revision of previous results." That is, until we have any additional relevant evidence, the dogmatic demand that such *will* be found is not at the current moment a relevant piece of evidence. Thus, Peircean *Fallibilism*—the principle that on-going scientific method is self-correcting—squashes Counterfactuals of the Future.

Semeiotic has three component sub-sections: *Speculative Grammar*, *Critic*, and *Methodeutic*. Again, due to time restrictions, I will focus on Speculative Grammar. Remember, as one begins from the first topics of Peirce's outline of experimental science, previous results are cumulative as one progresses to studies later in his list. After all, that is how science proceeds over time.

Speculative Grammar offers a basic set of common terms for scientific intelligences to employ in their study of semeioses. As we have already noticed, the most basic is the concept of *Sign*. Let us carefully recall that there are two important yet different senses of this term that must be kept in mind. ***Sign*** *in the relational sense* is equivalent to *Semeiosis*, the process whereby one item, known as the Object, is represented by another item, the Representamen, to an interpreting function,

the Interpretant. ***Sign** in the narrow sense* is equivalent to the item that represents some aspect of an Object to an Interpretant, that is to say, *Sign* narrowly considered is equivalent to *Representamen*. Keeping track of these different possible meanings of SIGN will avoid some serious confusions.

Notice that semeioses are relational; this fact means that we will need a logic of relations. *Semeiotic presupposes a logic of relations*. And what is a *Relation*? Relations can be discovered through experimentation. The reliable general outcome of a proper objective experiment is a *Fact*. Thus, gravity is a fact. The object of a proper description of such a fact is a Relation. Peirce regarded relations as a type of reality in addition to the ordinary sense of "real" ascribed to material items. Within Peirce's proposal, "Real" means "whatever is the case independently of researcher's desires, hopes, or other egocentric considerations."

If a lonely and thirsty cow-boy, crawling weakly on the parched desert of the Llano Estacado, sees a jug of water on a rock just ahead, but lacks the strength to reach it, and to place some of that water in his mouth, Peirce would say that the cow-boy (or girl) will die for lack of a real relation, namely: That particular water *in* that particular cow-person's mouth. A logic of relations—whether a commonsense version or a more elaborated version such as that in Peirce's graphical logic—is required in order to deal adequately with various features of semeioses. Graphical logic comes later in Peirce's system, but we already have a commonsense logic of relations at hand from work within Phaneroscopy.

Thus, given the above outlined considerations, several objective properties of semeiosis activities can be immediately delineated:

i. Communication is a semeiosis.

ii. Semeioses are triadic relational structures, and as such cannot be constructed from (or reduced to) combinations of dyadic and monadic forms alone. Of importance here is the fact that bondings of dyads to dyads produce only another dyad. A further implication arising from (*ii*) can also be stated: No proposed explanation for a given semeiosis can succeed if the explanation is composed exclusively of only dyads or monads: at least one triad will be needed.

iii. However, from combinations of triadic, dyadic, and monadic forms (along with bonding), relational forms of any adicity can be constructed, thus some important examples: two triads and two bonds produce a dyad; three triads and three bonds produce a triad, two triads and one bond produce a quadrad.

iv. Of particular importance is the fact that an explanation is also a communication, and hence is a semeiosis. Therefore, by commonsense logic, it follows that if one wants to understand a given communication, which is a semeiosis, one will need another semeiosis for understanding the prior one. Peirce expressed

this early in his career (1868) as: Every sign must be interpreted in another sign. With the improved terminology of his later career, this means: If one wants to properly interpret/understand/explain a given *Broad-sense Sign (Semeiosis)*, at least one other *Sign in the broad sense (Semeiosis) will be required.*

v. At this point, one can begin to distinguish between different kinds of semeioses. The most basic types are Iconic Semeioses (*Icons*), Indexical Semeioses (*Indexes*), and Symbolic Semeioses (Symbols). Leaving aside numerous other types, here is a brief tabulation of the three fundamental types of semeiosis within semeiotic:

Icon semeiosis: The Interpretant functions by way of a similarity or analogy between the Representamen and Object (example: "That leaking gas smells like rotten eggs");

Index semeiosis: The Interpretant functions by means of comprehension of an efficient causal relation between Object and Representamen (example: "I see smoke there so there may be a fire");

Symbol semeiosis: The Interpretant functions by means of a habitual connection between Representamen and Object (example: "Seppel gave a fresh *Edelweiss* to Hannelore").

We are reminded that *plain signal* names a strictly dyadic phenomenon that is not a semeiosis—such a signal can well be conceived as an Index *minus* its Interpretant.

Walker Percy listed some additional basic principles of semeiotic in his ironic self-help manual, *Lost in the Cosmos* (1983, 83–126 as well as 1975, 159–188; see also Interdisciplinary Seminar on Peirce 2011 and 2015).

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Turning back to Esthetics and Ethics, Peirce devoted considerable effort toward those studies; they provide necessary background conditions for objective experimenting. So here is a brief outline as promised.

Esthetics in Peirce's sense, would include studies of the arts, but it is more general than that factor alone, being the study of goals and purposes as these particularly apply to the activities of communities of scientific intelligences. If we remember the four methods of resolving doubt that Peirce described in "The Fixation of Belief" (Peirce 1998 [1877 f.], 7–31), the Esthetics of the Method of Tenacity would be to preserve one's current beliefs no matter what experience might occur; of the Method of Authority, it would be to ensure the research question is solved as the Authority prefers; for the *a priori* Method, the solution should agree with custom or fashion. In the case of the Fourth Method, the Method

of Science, resolution of the doubt should be guided by tests against reality, as conducted in a community of scientific intelligences, such tests being cumulative over time. One could say that the esthetics of scientific method is, in Peirce's sense, a scientific community's guiding purpose to resolve doubts in accordance with the realities of the Cosmos. This they do not accomplish through voting, or expression of preferences, or mere consensus, but through experimentation such that, guided by reality instead of ego, the community *converges* toward an accurate understanding of the objects of their research. Mere agreement, mere consensus is not enough for science; it requires *converged agreement* wherein the convergence guiding factor is reality. The ideal goal of science for Peirce is that ultimate ideal state of properly and completely converged scientific experimentation—he named it *Concrete Reasonableness*. Do we have it completely now? No, but we are slowly approaching such a goal.

As considered by Peirce, *Ethics* would include moral theorizing, although he thought that such a study would move particularly slowly, and its results ought to be exceptionally secure before considering implementing social applications. For his larger sense of the topic, we could say it is the scientific study of control toward a goal or purpose. Again, consider the Four Methods. The Ethics of Tenacity would be whatever might assist someone in clinging to their present belief in face of new doubts; for Authority, whatever might help the authority enforce the goal of conformity upon those who are not conforming, which could range over physical force, threats, embarrassment, or tricky propaganda; in the case of an *a priori* Method, means for strengthening group unity through advertising or friendly persuasion, among other factors, would apply. The Ethics of Science principally revolves around controlling to maintain the conditions requisite for sound scientific experimentation and communication that avoids deceptions, sloppy inaccuracy, or various biases. Ethics in Science (see Ketner 1981) includes having good terminology and clear ways of communicating, standards for experimental operation, or avoidance of authoritarian and egocentric factors in research.

We could continue to explore the later parts of Peirce's System of Science, but scheduling interferes. Let me finish this exercise by drawing some preliminary inferences from the previous considerations concerning the make-up of a method for a scientific study of semeioses.

An elaborate objective theory of Semeiotic is not available at the start of research—instead, as a hoped-for large-scale scientific hypothesis, starting with common sense, it must be built up from a series of confirmed experiments that are later objectively linked to form larger-scale hypotheses. Historically, that process picked up momentum with Peirce, but it is still in its relatively early stages.

Persons who wish to join that research now will arrive at an interesting moment in its development.

One can notice an inverse technique: Start with a favored largescale theory not currently supported by experiment, then inquire with what phenomena it may be consistent. However, that is not a scientific procedure, being more likely a policy that is associated with methods of Tenacity, or Authority, or Fashion.

Semeiotic is rooted in commonsense abilities and experiments using commonsense logic. As such it is more than a list of Sign Types such as *Dicisigns* or *Hypoicons*. As a program for accumulating confirmed research, one can anticipate that ultimately it will be composed of sufficient resources to enable the study of semeioses within *any* context or discipline. If so, semeiotic when developed more fully could be a basic unifying interdisciplinary method of experimental *Wissenschaft*, inasmuch as semeioses are in every field of study from physics to biology to art (see: Kandel 2006, 2012, 2016; Murdoch 1987, Samway 1995, McLaughlin 2012, Beil 2004, Beil and Ketner 2003 and 2006, Interdisciplinary Seminar on Peirce 2011 and 2015).

To conclude, of what contemporary value is Peirce's experimental semeiotic? There has been a widespread assumption that experiments are for material sciences and the other non-material or "soft" sciences—*as well as* the arts—are experiment-free zones. Snow's remark (1961 [1959]) about the "two cultures" is a famous summary of that assumption. Some of us have been trying experimental semeiotic, we think it is productive in either of the socalled *two cultures*. In other words, we rejected the assumption and decided to try some experiments; and we think that approach is productive. Perhaps you would like to try it for yourself.

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