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Causation as Indexical Semeiosis: Flaws in Mechanistic Biological Method

Original Study

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Abstract. The concept of causation is widely regarded as a dyadic relation necessary for scientific inquiry, and as a basic component in discussions of biological mechanism, or of the same in other sciences. A re-examination of causation in view of Peirce's Semeiotic shows that causation might more usefully be understood in terms of his Indexical Semeiosis analysis. By so proceeding, this hypothesis could yield useful experiments that show promise for removing some antinomies in sciences that are currently treated according to Necessitarian presuppositions.

Keywords: Peirce's Semeiotic, biological mechanism, causation, indexical semeiosis

Are many branches of science research, considering every type from natural to social to artistic[1], currently stuck within a background context for thought that is due for some important revisions? This present theoretical framework is often described under the heading of deterministic, necessitarian approaches such as Materialism or Mechanism or Physicalism. By using components developed by the theoretical physicist and logician Charles S. Peirce, one can seek improved comprehension using some methodological features currently neglected within deterministic foundations of contemporary science.

1. MECHANICAL SUPPOSITIONS IN SCIENCE

No doubt there are objections that Peirce was a philosopher, and not a physicist. That interpretation has been popular since the 1930s when scholars associated with university departments of philosophy initially took the lead in publishing Peirce's writings in volumes such as *Chance, Love, and Logic* (1923) and *Collected Papers* (1931 ff.). The fashion in the Victorian period for identifying persons who were objective researchers was "man of science." The identifier "scientist" arrived later.[2] At the time of Peirce's career, "philosopher" had a meaning different from current labels. A philosopher in the nineteenth century often was in effect what now would be described as a "theoretical experimental scientist." Figures regarded as philosophers by Peirce and contemporaries were persons such as Faraday, Humboldt, Darwin, Maxwell, Helmholtz, and the like. Within Peirce's System of Science, the discipline he labelled Philosophy was described as a theoretical practice among experimental sciences as opposed to being a merely speculative activity consisting of organized but untested guesses.[3]

The notion of cause is a popular component of current deterministic frames concerning many areas of contemporary science. Examination of this concept will serve as an entry point for illustrating advantages that Peirce's results might provide. We will outline an alternative hypothesis for the processes of causation, a proposal

1 But, it is often stated that "art is not scientific." May this be an open question for the moment?
2 The nineteenth century unfortunately was not a time of encouragement for women in science. Notable exceptions were Lady Lovelace (colleague of Charles Babbage in Computing), Florence Nightingale (Nursing), Madame Curie (Physics), Christine Ladd-Franklin (Logic and Psychology—Peirce's student at Johns Hopkins), and Victoria Lady Welby.
3 See pp. 35-57 in Peirce (2009 [1891]); Scott 2006.

that is based upon Charles Peirce's development and presentation of Semeiotic, the scientific study of Semeioses. A guide to Peirce's Semeiotic, as based on his logic of relations, is found at "A Survey of Semeiotic as Practice of Reasoning" (*SPR*) earlier in this journal (see *Bibliography*).

There is no intent to survey the literature or history of analyses of causation, nor to develop a text-by-text examination of Peirce's studies of that topic. The aim is to provide a revised understanding of causation arising from Semeiotic that could be tested as a method and employed in an *Interdisciplinary science experimental setting*. What is such a setting? It involves the procedure of research that begins with a predesignated question that is open to input and experiment from any discipline or branch of study using mutually recognized terminology, established principles, and shared objective methods.

2. CAUSE HAS A SLEEPER

Humans routinely think in terms of cause and effect. The practice appears to be well entrenched in our everyday activities. Typically, when facing a problem, we use that concept to exercise expectation and control, either to produce a desired state of affairs (effect *E* is desired, so find cause *C* that will produce *E*) or *E* is not desired (so find the *C* that is causing the unwanted *E*, then eliminate *C*, thus eliminating *E*). These two patterns, once established in a given instance of reliable causation, are conceived, when accurately specified, as expectably dependable across time, including presently, toward the future, and toward the past.

Such a result shows that, in addition to observation of the *reality* (on the sense meant, see *SPR*, pp. 1–2) of the possible *Cause component C*, and the reality of the possible *Effect component E*, there is a third reality present, namely: the law-like general *Causation Relation* that *C causes E* (abbreviated $C \rightarrow E$). If those three conditions are not present nor active, over past, present, or future occurrences, there is no causation relation between component *C* and component *E*. There might be a temporal relation wherein *C* happens earlier, however the *post hoc ergo propter hoc* fallacy (Copi 1978, 97) reminds one that temporal priority relation *C* precedes *E* (that is, $C \leftarrow E$) alone does not establish a causation. A somewhat similar failure is present if, in a particular case, *C* is only conjunctively related to *E*, as in "*C&E*." According to the table in *Diagram i*, within the truth-functional calculus (where ":=" means "is designated as," "¬" := propositional denial, "⊃" := material implication, and "&" := conjunction), we can display the additional conditions required to establish causation:

	C	*E*	*C*	→	*E*	:=	(*C*	⊃	*E*)	&	(¬*C*	⊃	¬*E*)
1.	t	t	t	**T**	t		t	t	t	**T**	f	t	f
2.	t	f	t	**F**	f		t	f	f	**F**	f	t	t
3.	f	t	f	**F**	t		f	f	t	**F**	t	f	f
4.	f	f	f	**T**	f		f	t	f	**T**	t	t	t

Diagram i: Experimental Conditions for Efficient Causation Relation

On these considerations, we can see that a proposed *Causation Event* does not incorporate a relation based merely upon the presence of two items—item *C*, item *E*—because a noticed event *C* can be present along with a noticed event *E*, in instances that are not examples of Causation: for example, "A tree fell in Canada" (*T*, selected as *C*), occurring concomitantly or some unit of time later, by a "An auto accident in Montana" (*A*, selected as *E*). Here we have event *T* chronologically (or concomitantly) related prior to event *A*, but there is no Causation Relation present, hence the situation described is not a causation, which consists of the triadic relation involving co-relates "*C, E,* $C \rightarrow E$." That is, chronological relations, as well as conjunctive relations, are not the same as causation relations, as the *post hoc* fallacy reminds us. One can also notice that the mere event that an observer *notices*, in this case, both *T* and *A*, adds nothing eventually to *establishing* an objective causation.

Thus, $C \rightarrow E$ is recognized as the Causation Relation whenever (guided by *Diagram i*) through experimental logical processes (basically Peirce's ADI sequence, preceded by an appropriate pre-designated question, see *SPR*, pp. 8–10), lines 1 and 4 are jointly found as true through objective experiment, and lines 2 and 3 are likewise found to be false. That is, arising from the Pre-designated Question, the mere guess (Abduction), that "Event *C* and event *E* might be a causation" (a resulting hypothesis H) alone is premature; there remains the experimental steps of deducing the consequences of H (using the principles in *Diagram i*) followed by executing an experiment designed on that basis (Induction step), all of which is Peirce's ADI procedure. These considerations show that the status of reality for Causation, as well as other relations, is conferred after a proper experimental ADI process has succeeded, the result of which is the described relation. Such processes occur in everyday activities as well as in laboratories (compare Scott's book, *Life as a Laboratory* [2006]).

On the basis of these considerations we can see that a genuine causation involves three components: *C*, *E*, and a proper causation relation $C \rightarrow E$. Furthermore, in terms of Peirce's Semeiotic, such a phenomenon would be an Indexical Semeiosis. When an empirical causation is established after a successful experimental procedure, the resulting form, expressed in Peirce's Semeiotic, would be an Indexical Semeiosis,

$$E \text{——o Ic í——} (C \rightarrow E)$$
$$\mathbf{r}$$
$$|$$
$$C$$

Diagram ii: Causation as Indexical Semeiosis

where *E* is the Object of a triadic Indexical Semeiosis Ic, wherein the Representamen is *C* and the Interpretant is the relation $C \rightarrow E$. That is, the desired object *E* can be produced by *C* in the context of the causation relation $C \rightarrow E$. (Notice that sentence describes a triadic semeiosis relation joined in a triad.) Another form is

also validated when *E* is replaced by ¬*E* and *C* is replaced by ¬*C*.

It is rather common to read accounts wherein scholars omit overtly cognizing that there is a relation *C* → *E* when considering the possibility that there might be a causation process present between observed event *C* and observed event *E*. Most likely the reason is that such investigators have a background large-scale hypothesis (unexamined contextual background theory) that relations are not real (or at most, only dyadic causations are real), therefore there is no need for a model such as *Diagram ii*, because on the basis of the mechanicalistic background theory, *Diagram iii* would model all the factors involved in generic causation (where **P** is "produces").

C **P** *E*

Diagram iii: Causation as a Plain Dyadic Relation

While something like this arrangement is assumed by a scholar employing the supposition that relations are not real, it cannot stand in view of a scientific examination of the manner whereby understanding of a real Causation Relation is developed through an experimental process: Experimenter witnesses *C* and witnesses *E*. These observations are not enough to establish *C* → *E*, that *C* (aside from simply being noted as an observation) also means, via a relation, that *E* will happen (or has happened or can be so expected in the future or has been active in the past). As observations, there are many other events concurrent with *C*; temporal concurrence is not enough to conclude that *C* → *E*, for there are many candidates for the consequent besides *E* (or for *C*, for that matter). To find a proper causation connection between C and E, a double-bind experiment must proceed which will or will not select the relation *C* → *E* in conformity with *Diagram i*. Once that has happened, *C* → *E* is established as a real relation, and with that additional resource, *Diagram i* is instantiated, and thereby we have an objectively true meaning present through the semeiosis Ic. We can now understand that *E*, *C*, *C* → *E* comprise a real semeiosis relation established through confirmed experiment. That is, if one observes (*Diagram i*) the **r** of Ic, through the **í** which is *C* → *E*, that will enable one to comprehend that the **o** (which is *E*) will be produced. Moreover, the relation is general such that one can have reliable expectations concerning relevant (analogical) cases in the past, present, and future.

Thus the properly developed Semeiosis type applicable for genuine efficient causation events is the structural format of Peirce's Indexical Semeiosis type (*SPR*, p. 11) exemplified in *Diagram ii'* below—where "*Index* Ic" is added to remember the basic indexical structure is a triadic relation Ic in which the three co-relates are *E*, *C*, and the relation (*C* → *E*).

Index

E——**o** Ic **í**——*(C → E)*

r
|
C

Diagram ii': Overtly Labelled Index

Thus, it appears that causation may not be a mechanistic dyadic feature after all. It would seem to follow, then, that all attempts to view communicative events fundamentally as cases of *Diagram iii* (*C* **P** *E*) will fail, whereas analyses, based on principles of Semeiotic similar to *Diagram ii'*, will be effective accounts of causation. This particular result may support some useful alterations of method within various sciences.

Peirce appeared to proceed according to *Diagram iii* in his earlier essays relevant to causation (see Interdisciplinary Seminar on Peirce (*ISP*) 2018, 30 ff.); however, once he added the distinction between self-conscious and non-self-conscious interpretants (discussed in section 3 below), that change produced the more effective form of Indexical Semeiosis shown in *Diagram ii'*. That is important because the change adds the applicability of the importance of relational co-relates (such as *C* → *E* in the cases discussed) into Semeiotic analysis as a common method for scientific study applicable in *Natur-, Geistes-, Kultur-Wissenschaften*. One might conclude that those distinctions about compartments of science could eventually fade away.

3. IMPORTANT CONSEQUENCES OF INDEXICAL SEMEIOSES

In his later career Peirce discovered a little-noticed, but pivotal component within Semeioses in scientific methods, especially including those that are Indexes. The Interpretant function within a semeiosis may appear in two different sub-patterns (Ketner 2022, p. 1):

> Contemporary examples provided for Interpretants within Semeioses typically presuppose interpretants that involve self-consciousness. In developing the concept of Interpretant, the modern founder of Semeiotic, Charles Peirce, was careful to avoid specifying the interpreting function in a Semeiosis as *exclusively* being an *Interpret-er, a self-conscious human in other words*—Isc. He hypothesized that interpreting functions other than those provided by a self-conscious agent could also serve as the interpreting component in a semeiosis.[4] It is sometimes assumed that any candidates for interpreting functions other than humans would also be self-conscious: perhaps an inter-galactic visitor or a fully self-conscious artificial intelligence. This

4 For example, Peirce to Welby 14 December 1908 in Peirce 2001 [1903-1911] (ed. Hardwick), p. 31, p. 81 and elsewhere; see other references to "interpretant" in the concordance of that volume.

> essay explores the possibility that Interpretants that do not include self-consciousness—Insc—may also be observed in nonmechanistic semeioses within phenomena examined by various objective research disciplines. For such semeioses to be present, Insc Interpretants should be identifiable in contexts that lack self-consciousness, but which include some minimal level of consciousness. Pre-cognitive levels of neurological phenomena provide various settings in which the difference between Isc and Insc semeioses can be explored; physics is another possible source of such examples.[5]

Examples of Indexical semeioses are widely recognized by scholars of communication-relevant phenomena. However, causation phenomena, researched within contexts similar to mechanistic biology, that could profitably be better analyzed as Indexical Semeioses, are left to lead to deterministic puzzles or antinomies (Ketner 2022, p. 5) the result being that any possible alternative strategy is not pursued. Two examples reviewed in *SPR* (pp. 13–15) might be relevant: the discussion of (N) Neurorepresentamens (an analysis using Insc) and in (H) the basic steps toward establishing a connection observed among Hummingbirds (Insc progressing to Isc, then eventually to a mini-cultural Symbolic Semeiosis). Use of Insc in the N example suggests that the Interpretant function in that case is the hard habit within the immediately surrounding biological/aerodynamic system.

The H example also suggests a possible pathway wherein Indexical Semeioses can flow from a neuro-cellular setting (Insc) toward a cultural Symbolic Semeiosis setting (Isc) that in turn develops into a Symbolic Semeiosis, the interpretant of which is a shared soft habit just developed (mutual recognition of "Tail Spread"). That is, in an earlier semeiosis—in which the Insc interpretant is a hard habit of the aerodynamic system (tail-spreading)—followed by the presence of a second bird that eventuates in a cultural symbolic semeiosis between the two birds via a symbolic semeiosis incorporating a mutual Isc (Ketner 2024, p. 118). The cultural development between the two birds probably also involves Iconic semeioses that might connect with Mirror Neuron capabilities in the birds; they might also exhibit a learning ability based upon the steps of ADI (another process Peirce explicated within Semeiotic).

4. WHAT ADVANTAGE IS GAINED BY SUCH STEPS?

a. Perhaps we have shown that causation processes are not dyadic relations, as it has been widely supposed. If this analysis is successful, there are many issues in various sciences that might be beneficially revised along those lines.

b. If it is correct that non self-conscious Indexical Semeioses are viable aspects of consciousness without a connection to self, that are present in settings below the capacity of self-consciousness, then a pathway is possible for neuronal processes to flow, via Semeiotic analyses (instead of mechanistic analyses), into cognitive processes, without encountering Descartes's Mind/Body chasm, or without violating Peirce's NonReduction Theorem, now vindicated. This might mean that Semeiotic analyses could prevent the kind of blockages (Fusion problem, Mind/Body antinomies) that emerge from analyses based entirely on mechanism or necessitarianism.

5 Examples are shown in Beil and Ketner 2006.

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