



The Classifications of Signs (I): 1867 - 1885



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Abstract:

The paper tracks the modifications Peirce brought to the classification of signs and its theoretical rational between 1867 and 1885. These changes are: (1) the shift from a grounding in speculative psychology to one in logic; (2) the integration of the three kinds of sign into the work of logic; (3) the consequent modifications brought to the criteria for each of the classes. These changes look forward to the progressive pragmaticisation of semiotic and hence, to the elaboration of its role in Pragmatism.

Keywords: Classification of Signs, Three Signs, History of sign classification

It is usual to date the topic of signs in Peirce's work from his first published paper, "On a new List of Categories", and while there is a pre-history of the paper, as well as of the topic, in the juvenilia and the preparatory drafts, it is convenient to respect this convention. The paper provides formulations for the topic in general, and a general schematic shape for his reflexions on it, that remain broadly the same for some forty years. In particular, the distinction Peirce adopts from the philosophic tradition, between conventional signs and motivated or natural signs, provides the basis for his division of signs into symbols, icons and indices which persists with striking stability throughout his writing.

However, this apparent continuity is misleading. As early as 1869, we note the explicit introduction of the principle of infinite semiosis; this is a significant refinement in the general thesis. In 1885, the relations among the three classes are reconceived and the criteria for membership of each are modified accordingly. Between about 1898 and 1903, pressures arising from the work in Pragmatism force technical adjustments that herald the introduction of new classes. In 1903, the premisses for sign-theory are recast in the terms of a phenomenology, and again, starting in 1903, Peirce experiments with classificatory hypotheses designed to integrate the new "kinds" of signs he has come to distinguish. Thereafter, the divisions proliferate; between 1904 and 1909, although the original division of icon, index, and symbol is usually given special status by Peirce, it now takes its place among sixty-six divisions (or, theoretically, more). These proliferating divisions all arise from the pressure of different parts of his philosophy — the need, for example, to distance sign-theory from idealism, and the equal but apparently contrary need to distance it from nominalism. Signs are real, and really continuous, pervasively throughout the universe; they are also really operative in the

world as well as being a metaphysical condition of our capacity to know that world.

This suite of three essays charts these changes through a close reading of the key writings in which they occur.

On a New List of Categories — 1867

K.-O. Apel argues that the "New List" proposes an "answer to Kant's problematic", an "interpretation, rather than a refutation of Kant" (Apel, 1981); this is the substitution of the "critique of meaning" for the "critique of knowledge" (pp. 34-36). It proposes a list of categories which, like those of both Aristotle and Kant, is a general speculative theory of the conditions of true synthetic propositions. The analysis of the proposition into its "subject" and "predicate" is not, Peirce argues, the significant issue (this may count as his first move against formalism); what is fundamental to an account of the proposition is its function as a representation. As Apel puts it, "the three fundamental categories [*are derived*] from the function of sign representation as the unity of all forms of synthesizing sense data for a consciousness." (Apel, 1981, p. 38, emphases added). The crucial move is here: the categories are derived from the postulate of representation; representation does not rest on them as a ground derived independently of it.

I distinguish "Representation" from "representations" ("signs" is a later usage in Peirce's writing; see below. However, in order to clarify this preliminary discussion, I shall use "sign" to name the things that descriptive semioticians study.). Representation is the metaphysical category that is presupposed in the empirical reality of signs in the world. Presupposed, it therefore counts as the transcendental condition of possibility of signs, in the same way that facticity counts as the transcendental condition of possibility of real events and things, and quality, as that of the qualities distinguished in perception. Notice the absence of the "mind" from this account: the brain may be an empirical condition for signhood, but it is not a transcendental one. Bearing in mind this distinction, all Peirce's work on signs will yield two sorts of outcomes: on the one hand, it will yield empirical descriptions of signs and sign operations, and on the other, these descriptions will feed into Peirce's account of this category. Thus, for example, given a certain description of signs, scientific laws — the generalisations arrived at as a result of inquiry — are themselves signs. Adequate, or true, generalisations being the purpose of representations on Peirce's view, the category comes to be understood as the category of "generality", or of "law", and Peirce will treat these as synonymous with "Representation". Yet any sign is provisional, its representations have hypothetical status until and unless no further reasonable doubt can arise. Truth is not the ground of

representation, but its desired outcome in the long run.

The general objective of Peirce's semiotic is therefore to elaborate the postulate of the metaphysical category of Representation, and the description of signs as they really operate helps to do this. But descriptions of signs also serve in the analysis of scientific representations, and must therefore have some capacity for precision. The classifications of signs provide the framework for such descriptions. The signs that we bump into, so to speak, are of one or another of the three kinds; if they are symbols, they are one or another of the three sub-kinds, terms, propositions, and arguments.

What is it, to bump into a sign? Two traditions in semiotics have given opposite answers to this question. Commenting on Peirce, the structural linguist Emile Benveniste insists that we need to be able to tell the difference between signs and other sorts of stuff (Benveniste, 1969). This is an ontological requirement that Peirce repudiated. Instead, anything at all can be a sign, whether it be a colour, or a sound or some other elementary percipium, or whether it be some physical event such as the movement of billiard balls or the influence of the moon on the tides, or even a social event such as a revolution. The difference between signs and other things does not consist of a difference of stuff; it inheres in the difference between "first" and "second intentions". This is a functional difference rather than an ontological one. A colour is a colour is a colour; but it may also be the sign of a chemical reaction. When we *take it as* the sign of some other thing, it functions as a second intention. To say so is equivalent to saying that it acquires an object and that it gives that object to be interpreted. Second intentions are defined by their function — to represent first intentions — and representation is defined as a process of transforming a first intention into an interpretable form. This process is termed mediation.

Second intentions - representations - are the matter of logical, hence philosophical inquiry; they give the domain of logic:

Logic is said to treat of second intentions as applied to first. It would lead me too far away from the matter in hand to discuss the truth of this statement; I shall simply adopt it as one which seems to me to afford a good definition of the subject-genus of this science. Now, second intentions are the objects of the understanding considered as representations, and the first intentions to which they apply are the objects of those representations. (W2:4,56; CP1.559)

Signs are not names of individua, but of classes, and classes are established by what Peirce terms comparison. Indeed, signs are not "names" at all; signs just are the comparisons. The use of the term "sign" is a generalisation that covers the second-

intentional status of comparison, placing what will become Peirce's "semiotic" at the centre of his solution to the problematic of the first philosophy, the synthesis of sensuous impressions in a cognitive unity (W2:4, 49; CP1.545).¹

The categories will be derived from a formalisation of the presuppositions of this synthesis. Pure attention - which will become the task of the index - is distinguished from predication - which will become the task of the symbol:

That universal conception which is nearest to sense is that of *the present, in general*. ... But ... the act of *attention* has no connotation at all, but is the pure denotative power of the mind, that is to say, the power which directs the mind to an object, in contradistinction to the power of thinking any predicate of that object ... Before any *comparison or discrimination* can be made between what is present, what is present must have been recognized as such, as *it*, ... (W2:4, 49; CP 1.547); secondary emphases added)

However, the unity of apprehension is given neither by one nor by the other taken apart. The understanding reduces the manifold of experience to the unity of their work together:

The unity to which the understanding reduces impressions is the unity of a proposition. (W2:4, 49; CP1.548)

A proposition always has, besides a term to express the substance, another to express the quality of that substance; (W2:4, 52; CP1.551)

Unity is then analysed as the effect of "comparison":

Empirical psychology has established the fact that we can know a quality only by its contrast with or similarity to another. By contrast and agreement a thing is referred to a correlate ... (W2:4, 53; CP1.552)

The occasion of reference to a correlate is obviously by comparison. (W2:4, 53; CP1.553)

Peirce discovers that there are three grounds of "comparison": one is the concurrence of some quality, the second is "opposition", and the third is the "imputation" of some character. The distinctions among these three grounds will become the basis for the division of signs. However, in a characteristic move, Peirce desists from the temptation to provide a general definition before he has gathered some facts. These facts are examples (W2:4, 53; CP1.552); the comparison of "b" with "p", the opposition of the murderer with the murdered person, the imputation of a shared character of the word *homme* with the word "man", will become, respectively, the "icon" (here termed the "likeness"), the index, and the symbol (W2:4, 55-56; CP1.558).

These are examples of "comparison", and there follows a further list of examples of "representation". They are parallel, and this parallelism achieves a translation from the terms provided by psychology to those Peirce is intending to establish, the transcendental account of Representation through the empirical account of representations.

This translation has further implications. The act of pure attention occurs *prior* to comparison:

Before any *comparison or discrimination* can be made between what is present, what is present must have been recognized as such, as *it*, ... (W2:4, 49; CP1.547)

That there is something, the postulate of *presence*, is a presupposition of *representation*, but the act of attention that posits presence appears to be pre-semiotic. At this point, Peirce's argument rests on a dualism that distinguishes what is there from our coming to know it, attention from comparison, presence from representation. Max Fisch has argued persuasively that the "New List" is fundamentally nominalistic on these grounds, and that it is not until the so-called "anti-cognition" series of 1868-9, and the Berkeley review of the same period, that Peirce moves to a realist metaphysic. In order to achieve this, he will have to address a technical difficulty in sign theory: he will have to find a way for the act of pure attention to count as a sign. This will become the definition of the index, and the solution will be achieved by the logical work of the 1880s.

However, the implications of the argument already point beyond nominalism. In order to see how, let us ask what exactly can be meant by a "first intention". Is it the object of the pure act of attention? Or is it on the contrary the object of a representation? Peirce argues explicitly for the latter interpretation. The nominalism of the argument has comparison start, or stop, at "qualities" — i.e. at predicates — and appears to have no bearing on the discernment of subjects, which are "substance". Yet this does not answer the question — the semiotic question *par excellence* — how "the present, in general" yields the subjects of propositions. The answer is supplied by the phenomenological terminology that Peirce has adopted from Hegel. The "it" is not an object until and unless *it re-presents*. There is no originary singular, it is always already two. Peirce writes "Before any *comparison or discrimination* can be made between what is present, what is present must have been recognized as such, as *it*, ...(W2:4, 49; CP1.547). Note "*re-cognized*", then note that the sentence is structured by an apparent solecism. The preposition "between" normally requires a complement constructed of *two* substantives; here it has only one. The difficulty is clarified by an insight due to Gilles Deleuze:

repetition presupposes difference. Peirce's sentence shows that "what is present" is subject to internal splitting. This is the structure and the dynamics of re-presentation. Subjects are produced by difference, and difference is the condition of re-cognition, and hence, of comparison.

It follows that the first intentions of all signs, even of indexical signs, are always already re-presentations. This will become hereafter an unshakeable premiss in Peirce's work on signs: the "object" of a sign - its "first intention" - has the same structure as, and therefore is, a sign. Only then, when he can establish this on a metaphysical basis, will he be able to claim that "the whole universe is perfused with signs".

Insofar as there is tension between the nominalistic and the realistic implications of this argument, it will be resolved very simply in Peirce's later work: he will drop the reference to "substance" and "being"; and he will give up the reference to "empirical psychology", which presumes some metaphysical stuff — say, the mind - required to account for the mediation of the world with human knowledge. The outcome will be a list of categories that is through and through derived from Representation.

There are three grounds of comparison, of representation; or, mediation happens in three ways; or, there are three kinds of signs. It is usual to consider the inclusion of the three classes as delineating the scope of semiotic, and to consider this scope as firmly established from the beginning, that is, from this move in the "New List". But Peirce's gesture is more ambiguous than this, because almost immediately, icons and indices are relegated outside the scope of philosophy.

The objects of the understanding, considered as representations, are *symbols*, that is, signs which are at least potentially general. But the rules of logic hold good of any symbols, of those which are written or spoken as well as those which are thought. *They have no immediate application to likeness or indices, because no arguments can be constructed of these alone*, but do apply to all symbols. (W2:4, 56; CP1.559; secondary emphases added)

This move is a frequent feature of Peirce's semiotic: he delineates a domain far larger than the one he thinks he needs for his purposes, then delimits a pertinent and useful class of objects within that domain. The pattern of this move can be described as being the opposite of a certain deductive use of examples, usually called "illustration" in the manuals. Illustration starts from a definition, then uses that definition to determine the selection of examples. Here, by contrast, Peirce uses exemplification *stricto sensu*; he starts from the ordinary use of language, then asks a specifying question that will establish the technical stipulation: these things seem to be what we mean by

"comparison", what are the special features of the sub-class of "comparison" to which "the rules of logic" pertain?

In order to answer this question, and hence, to restrict "representations" to the signs which constitute arguments - this being the effective definition of the "symbol" in this paper - Peirce mobilises certain presuppositions concerning the scope of logic. As Christopher Hookway points out, the scope of logic is restricted to - or by - the class of synthetic propositions (Hookway, 1985, p.17). Accordingly, this restriction specifies the symbol and excludes from the scope of logic those signs - the icon and the index - that have been excluded from it.

What is it about the icons and the indices that puts them, so to say, beyond the pale? In some very significant respects, all three kinds of comparison are alike: all three depend upon a "mediating representation"

... which represents the relate to be a representation -

note this moment, because it is this that takes the sign as sign, or as "second intention" -

- to be a representation of the same correlate which this mediating representation itself represents.

(W2:4, 53; CP1.553)

Mediation; taking the sign *as sign*; taking it as sign of something; taking the two signs as referring to the same object. Note, then, that "comparison" does not refer to a perceptual act on the unmediated data of the real; in particular, it does not refer to a Lockean account of the building up of inductive generalisations from the sense-impressions made by individua. "Comparison" is what occurs when we interpret a sign, and to do so, produce another sign of the same object. Take the example of the bilingual dictionary, which is crucial in this regard:

... suppose we look up the word *homme* in a French dictionary; we shall find opposite to it the word *man*, which, so placed, represents *homme* as representing the same two-legged creature which *man* itself represents. (W2:4, 53; CP1.553; original emphases)

The particularity of Peirce's claim here should be noted: signhood depends upon there being *two* signs of the same object, and this example is exemplary of that claim. But note, that the sameness of the object is established by the conventions of dictionaries - "we shall find opposite it the word *man*, which, so placed ...". A bilingual dictionary is a genre; not only the rhetorical constitution of its text — glosses of exemplary usage, quotations, the distinction and classification of senses — but also its typography and its

layout are designed in order to provide the conditions for an inference of this sort. The technical representational means of the dictionary represent the relation between the two words; or, the dictionary is the interpretant of each to the other.

The "mediating representation" is the interpretant; the mechanism described thus far does not make the difference between icons and indices, on the one hand, and symbols on the other. All are representations, and hence, all are of the third category. Peirce moves, therefore, to make distinctions within this category. The distinction he makes is this: those representations "whose relation to their objects is a mere community in some quality" are termed likenesses (=icons); those "whose relation to their objects consists in a correspondence in fact" are termed indices; but those "the ground of whose relation to their objects is an imputed character" are called symbols (W2:4, 56; CP1.558). The three classes are distinguished by the *grounds* of their claim to be representations, and to be representations of what they represent. Only one ground is of relevance to logic: it is "imputation", that is, *thought*. This harks back to a very old philosophical tradition. Icons and indices are "natural" signs; only symbols are human and intellectual. It is as if, though all signs arise from "comparison", though all signs by definition are "second intentions", though all signs by definition arise from the work of a mediating interpretant, only some signs are "pure thought".

Icons (likenesses) and indices are *signs*, yet, in the "New List", Peirce sets them aside, as if they were not sufficiently sign-like for philosophy to have any truck with them. Let us consider their defects. The relation of an icon to its object is "a mere community in some quality", as if this kind of sign were not sufficiently disentangled from its object, or perhaps, as if the shared qualities between sign and object meant that the sign was in some way qualitatively object-like, not thought-like. The issue here is that pure thought is not counted as having sensory qualities, yet icons, which are representations, function as such because of their sensory qualities. It will be exactly this feature that Peirce will seize upon in his later work, when he gives to iconicity a crucial role in logic. I shall return to this point below. At this point, it is enough to refer to Robert Innis' insight: if Peirce needs a theory of signs to account for perception, then that theory must account *for the perception of signs* (Innis, 1994).

A different point is at issue in the case of the index: its relation with its object "consists in a correspondence in fact"; its *differentia specifica* makes it more fact-like than sign-like, and indeed, Peirce will often say that an index would continue to be an index whether or not it was interpreted as a sign, or, in other words, it would have the same properties whether it functioned as a first, or as a second intention. The condition of this

boundary is nominalistic: while the distinction between first and second intentions is a formal and a functional distinction, not a distinction of properties, the distinction between symbols and the other two kinds of signs is a metaphysical distinction, holding between thought and its others, and is grounded in ontological assumptions.

Notwithstanding their exclusion from the scope of logic in the "New List", Peirce nevertheless provides examples of both the icon and the index: their exclusion is included. His first example of a relation of simple iconism is the likeness of the letters p and b; his first example of an index is the murder (W2:4, 53; CP1.553). In the same paragraph, the second list of examples gives a portrait, for the likeness, and a weathercock, for the index. The examples from the second list recur regularly in Peirce's later work, in a move that simply includes them with the general class of signs. The examples from the first list do not recur. Yet the issue raised by the example of the murder does not simply disappear; it becomes central to the deployment of the theory of indexicality in Peirce's account of scientific experiment (cf. Eco & Sebeok, 1988).

Both icons and indices will come to be fully included in the signs required by logic, and both will be used, substantively and instrumentally, to solve problems in Peirce's philosophy. As we watch Peirce move to theorise this inclusion, we will see a shift in the criteria used for making several distinctions. Firstly, pure thought, or "reason", will cease to define the scope of logic as Peirce defines logical notations and their constitutive signs as technical instruments. Secondly, it will follow from this that symbols cannot be set off against the other two kinds on the basis of their ground in thought or their special fitness for the work of logic. Thirdly, therefore, the criteria for the classes of signs will be forced to change.

Yet boundaries lie both outside and inside that which they bound. The problem associated with the ambiguous zone in which some things both are, and are not, signs, will not be perfectly solved by the inclusion of icons and indices. The boundary itself will move, and the zone will become much narrower, more like a trip-wire that things can tumble over in an inattentive moment; this is the very boundary that must constitute them as signs - as "p" is constituted as "p" and not "b", and hence acquires its functions in a given system of marks through the operation of the line of writing:

Suppose we wish to compare the letters p and b. We may imagine one of them to be turned over on the line of writing as an axis, then laid upon the other, and finally to become transparent so that the other can be seen through it. In this way we shall form a new image which mediates between the images of the two letters, inasmuch as it represents one of them to be (when turned over) the

likeness of the other. (W2:4, 53; CP1.553)

This is the boundary of semiotic, where signs fade into mere marks, the very one that Aristotle excludes as non-semantic when he excludes the *phonè*. Yet not "the very one", for these marks are marks of writing, they are not speech, they do not issue forth to express a soul, a subject or the objects it knows. They are empty shapes, constituted as signs by their diacritical relation with one another, and by the utterly a-semantic line of writing. As a mark left by an event, in the form of a bullet-hole, or a corpse, or the turning of a weathervane, come to count as fully semiotic in the category of the "index", so do written marks which, in and of themselves may not be "semantic", come to count as signs when the philosopher embarks upon a technical manipulation of pieces of type, and when the logician turns to the semiotics of a formal notation. Such signs are not defined by their thought-content, by the thought-space of their emergence, or by their function in the making of arguments. To accommodate them, Peirce will cease to define them on the criterion of "imputation", and will use the term "convention".

Dictated by the *topos* of thought, a project to regulate thought, Peirce's engagement with the sign hypothesis will not be dictated *to, by* "thought". The boundary of semiotic will shift depending upon whether he is writing philosophy - conducted under the sign of reason - or logic - conducted under the sign of the *tekhnè* .

Both the displacement of pure thought, and the interest in the technical design of signs, are consonant with the progressive pragmaticisation of semiotic, for it is pragmatism that will knit together the empirical with the metaphysical aspects of Peirce's work.

The position taken in the "New List" is subject to a significant modification in a review Peirce wrote in 1885 of Royce's early work, *The Religious Aspect of Philosophy* (W5:33; CP8.39-54). The review clarifies the connection between fallibilism and formal logic. Peirce will claim that the inclusion of icons and indices - these latter, especially - provides the solution to an otherwise insoluble problem in transcendental metaphysics.² Peirce states his explicit disagreement with Royce on two major issues, one being his thorough-going Hegelianism, and the other, Royce's dismissal of Peirce's own pragmatic account of truth as the end of inquiry.³ As he was to do in his review of Royce's later work, *The World and the Individual* (CP8.100-131), Peirce invokes the technicalities of formal logic to explain the source of Royce's defective arguments; just as Hegel overlooks the role of secondness in cognition, so does Royce fail to acknowledge the encounter with the real, and hence, cannot account for error:

Dr Royce's main argument ... is drawn from the existence of error. Namely, the subject of an

erroneous proposition could not be identified with the subject of the corresponding true proposition, except by being completely known, and in that knowledge, no error would be possible. The truth must, therefore, be present to the actual consciousness of a living being. (W5:33, 223; CP8.41)

Peirce cannot accept that "the truth" is so present; it is the horizon of inquiry. Instead, acts of cognition do encounter the real, and in that encounter, discover doubt and error. Such moments of doubt do not produce positive contents; they have a purely negative effect (Misak, 1991, p. 83). Royce's argument, Peirce continues,

is drawn from Formal Logic, for Formal Logic it is which inquires how different propositions are made to refer to the same subject, and the like. (W5:33, 223; CP8.41)

But Royce, like all the German metaphysicians, fails to draw on the most recent advances in formal logic, and Peirce laments that such writers have not, as one would suppose they might, "postponed their venturesome flights into the thin air of theology and the vacuum of pure reason, until they had carefully tried the strength of every part of that logical machine on which they were to depend."

We must not, therefore, wonder that Dr. Royce's argument from formal logic overlooks one of the most important discoveries that have lately resulted from the study of that exact branch of philosophy. He seems to think that the real subject of a proposition can be denoted by a general term of the proposition; that is, that precisely what it is that you are talking about can be distinguished from other things by giving a general description of it. Kant already showed, in a celebrated passage of his cataclysmic work, that this is not so; and recent studies in formal logic have put it in a clearer light. (W5:33, 223; CP8.41)

On the basis of these "important discoveries" made in "recent studies" in formal logic, Peirce proposes a solution to the logical problem that he discerns in Royce's work:

We now find that, besides general terms, *two other kinds of signs are perfectly indispensable in all reasoning*. One of these kinds is the *index*, which like a pointing finger exercises a real physiological *force* over the attention, like the power of a mesmerizer, and directs it to a particular object of sense. One such index at least must enter into every proposition, its function being to designate the subject of discourse. (W5:33, 224; CP8.41) (secondary emphases added)

This solves the problem, because

If the subject of discourse had to be distinguished from other things, if at all, by a general term, that is, by its peculiar characters, it would be quite true that its complete segregation would require a full knowledge of its characters and would preclude ignorance. But the index, which in point of fact alone can designate the subject of a proposition, designates it without implying any characters at

all. (W5:33, 224; CP8.41)

and Peirce then goes on to argue that the function of the index distinguishes "dates and position", and therefore dispenses with the Kantian intuitions of time and space; they can be construed as the effects of semiotic operations.

Peirce's critique is directed both at a metaphysics that deals only with the thin air of pure reason, and at the version of "formal logic" that that metaphysics relies on. Modern formal logic is proposed as a corrective. Within the recent research in modern formal logic, it has been shown that logic cannot deal exclusively with "general signs", that is, symbols; it needs "two other kinds", and Royce would not have made the philosophical error for which he is taken to task had he understood one of these, the index, "which designates [the subject of a proposition] without implying any characters at all". But remarkably, Peirce does not complete his assertion, that "two other kinds of signs are perfectly indispensable for all reasoning". The second kind, the icon, is quite dispensable in practice in the argument he is having with Royce, which bears on the Hegelian tendency to "ignore the Outward Clash". The *philosophical* significance of iconicity is not clarified for some years (1903, q.v.).

The important discoveries, the recent studies, which Peirce mentions here are referred, by Peirce himself, to two of his own publications, the *Studies in Logic by members of the Johns Hopkins University*, 1883, edited by Peirce, in which O. H. Mitchell introduced a system of quantification into a formal notation⁴, and Peirce's own "On the Algebra of Logic: A Contribution to the Philosophy of Notation" (W5:30 CP3.359-403), dated 1885, where he also refers to Mitchell's work. In this latter paper, Peirce counts quantifiers as indices alongside the pointing function, and he uses the icon to analyse the diagrammatic function of notational syntax. It is in this paper that Peirce first modifies the semiotic of the "New List" and it is on the basis of his deployment of it here that the modified hypothesis will be brought to bear, as it is in the 1885 Royce review, on the problems of philosophy.

Peirce introduces his aims in "On the Algebra of Logic" as follows:

In this paper, I purpose to develop an algebra adequate to the treatment of all problems of deductive logic, showing as I proceed what kinds of signs have necessarily to be employed at each stage of the development. I shall thus attain three objects. The first is the extension of the power of logical algebra over the whole of its proper realm. The second is the illustration of principles which underlie all algebraic notation. The third is the enumeration of the essentially different kinds of necessary inference; ... (W5:30, 165; CP3.364)

It is the second of these objects that commands attention; this is the first time Peirce applies his theory of signs to the analysis of a notation. What is remarkable about it at the outset is that a notation is a rule-governed system of arbitrary signs. To investigate its semiotics is therefore very like what Saussure was to do with natural language some thirty years later. But note, that if a notation is a system of rule-governed arbitrary signs, all the signs of the system conform to Peirce's original definition of the sub-class of symbols: if, in a notation, there are no "natural" signs, then "imputation" will not suffice to demarcate the class of symbols, and Peirce will be forced for the first time to acknowledge the possibility, that some examples of each class are not "pure"(W5:30, 163; CP3.362).

Just why Peirce decided to take the step of providing a semiotic description of his algebra can be speculatively explained by referring to some passages from George Boole's (1854) *An Investigation of the Laws of Thought*. This is a major text in the development of mathematical logic, and it states the paradigm within which Peirce was working. For my purposes, the most interesting thing in Boole's work is that following a first, introductory chapter on the "Design of the work", its second chapter is devoted to "Signs and their Laws." Notice first of all that "Language" is conceived to be an "instrument", "not merely a medium for the expression of thought" (p. 24), but that the differences between particular "natural" languages are deemed to be irrelevant to the logician, who seeks to discover in their commonality and their universality "some deep foundation of their agreement." This deep foundation he takes to be "the laws of the mind itself." In order to investigate this foundation, Boole will take it to be some universal form of language; he proposes "to give expression in this treatise to the fundamental laws of reasoning in the symbolic language of a Calculus" (p.5). If "Language" is the general instrument of thought, this particular language is the special instrument of the method of logic. It can be investigated so as to identify its elements, and "to seek to determine their mutual relation and dependence" (p.24). "The notation of the science of Number" (p.6) has "a peculiar and exclusive fitness for the ends in view" (p.5), so to investigate the instrument of human reason is to "inquire in what manner [its elements] contribute to the attainment of the end to which, as co-ordinate parts of a system, they have respect" (p.24). Boole's view of the relation of method, instrument, and the object of inquiry is the classic positivist one: "the laws [of reasoning] are such as to suggest this mode of expression, and to give it" its peculiar fitness to reveal the laws of the mind.⁵

Now notice that the focus on instrument and method means that for Boole, certain

metaphysical problems are in practice irrelevant. Firstly, it makes no difference whether "Language is to be regarded as an *essential* instrument of reasoning, or whether, on the other hand, it is possible for us to reason without its aid" (p.24). Whichever of these doctrines one adopts, "the results obtained" from the actual investigation "are formally equivalent" (p.25). This is because the logician is investigating "the laws of signs", and that "the immediate subject of examination is Language, with the rules which govern its use." Ultimately, although Boole claims to be investigating the laws of the mind, the ontology of mind, or its transcendental condition, "is beside the design" of his work. Secondly, he can afford to be agnostic about "a dispute as to the precise nature of the representative office of words or symbols ... in the processes of reasoning. By some it is maintained, that they represent the conceptions of the mind alone; by others, that they represent things" (p. 26). This is a version of the dispute between nominalism and realism; but again the logician declares that "The question is of no great importance here, as its decision cannot affect the laws according to which signs are employed" (p. 26). With these two declarations of irrelevance, Boole sets aside the topics which Peirce has used most explicitly to introduce semiotic. What is "impertinent" is *a-topical*, not on the agenda. Boole has marked for us the boundary conditions for formal logic as a specific discipline, and these boundaries are drawn so as to mark it off from metaphysics. Broadly stated, these are the rules of the genre.

The quotations from Boole serve to show that the classic topic of "representation", mobilised by Peirce to theorise cognition or inquiry, and the topic of "signs" are not coextensive. The topic of representation is the topic whereby the constitution and knowledge of objects are investigated; classically, and even under the anthropological generalisation of Kant, "cognition" is cognition by a subjective instance. Peirce inflects this historically with "inquiry", making true knowledge statements dependent on the long-run, rather than on individual apprehension. Representation is inflected accordingly, but is still designed to deal with the mediation between acts of knowing and the test of experience. Entrained by this topic are the problems of the ontology and the metaphysics of the mind and its objects. Such questions as these do not need to be decided in order to do the new logic; nor, if we were to believe Boole, can this new logic contribute to any metaphysical doctrine concerning them. But this is where Peirce will part company with the new paradigm.⁶ For him, the problem of "representation" continues to matter, and he will pursue the technically conceived topic of "signs" in order to bring it to bear on philosophy. Eventually, at the turn of the century, this will result in Peirce's retrieval of phenomenology as the foundation of substantive ideas, but even then, he will insist that phenomenology rest on logic, rather than the other way

around. Boole makes the distinction between the two topics quite clear in the very first sentence of his second chapter: the logician considers language as an instrument; as such, he investigates its elements, their systematicity, its fittedness to its end. This, he says, is wholly different from considering language merely as "a medium for the expression of thought." (p. 24).

Another way of stating the difference between the topic of "representation" and the topic of "signs" is this: insofar as "representation" is involved in the metaphysics of the mind and its objects, the question of "representation" is the question of its content. What does a representation represent, and is it true? Implied is a "why?" question: to ask why we have, or produce, representations is to seek the nature of the human in its capacity for true knowledge, and to ask why we might investigate representation is to seek the *telos* of philosophy itself. By contrast, the rhetoric of instruments and methods is the rhetoric of a technology: to ask "why?" of an instrument is to ask what pragmatic need it meets. Then again, to ask "how?" of representation is to seek the transcendental conditions of knowledge. To ask "how?" of signs is to inquire into the techniques of reasoning and the rules of a system; this is Boole's question, and after him, Peirce's.

I wish to call attention to another point of interest in Boole's project. He writes that "The elements of which all language consists are signs or symbols. Words are signs" (p. 25). However, they are not the only sort of sign. "Arbitrary marks, which speak only to the eye, and arbitrary sounds or actions" are also signs, and "In the mathematical sciences, letters, and the symbols +, -, =, &c., are used as signs ...". He then invokes a distinction between "signs" and "symbols": in the conventional usage of mathematics, "the term 'sign' is applied to the latter class of symbols, which represent operations or relations, rather than to the former [i.e. the 'letters'], which represent the elements of number and quantity." But he proposes to overlook this distinction, and uses "sign" as an overarching category, stipulating its usage by means of the definition. "A sign is an arbitrary mark, having a fixed interpretation, and susceptible of combination with other signs in subjection to fixed laws dependent upon their mutual interpretation." (p.25). Notice that the laws of interpretation are governed by the systemic relations of the signs among themselves; this is a crucial issue in the Saussurean paradigm, and one which, I have no doubt, derives directly from the practices and techniques of formal logic. Boole's decision to use "sign" in this way is a theoretical synthesis that disregards two conventional boundaries. One is the distinction between "numbers" and "operators", and the other is the distinction between numerical notations and so-called natural, that is discursive language. These two oversights together construct the site for a general

semiotics by constructing its theoretical object. This object classifies together, as "language", what we would standardly think of as two quite distinct instruments, "numbers" and "words"; it also classifies together, as "signs", this first grouping with such things as the operators and "arbitrary marks ... arbitrary sounds [and] actions."

It is Peirce who will take up the suggestion of this extension of the category of "sign", not Boole; he construes this category as his category of representation. Then, in place of the no-longer useful distinction between "signs" and "symbols", "marks", "numerals", "letters", and so on - all of which would count as discrete classes under the classical terminological regime - he elaborates a classification or "division" of the class into three - all of which count as sub-classes of the overarching "sign", - the symbol, the icon, and the index.

This is the familiar classification; yet it is changed.

Of particular interest is the fact that the "rules" for deriving the three classes in the "New List" are significantly modified. Recall that in the "New List", the theory of signs is based on a kind of speculative psychology, and derives from a procedure whereby Peirce teases out the presuppositions of "comparison." He shows that of the necessary elements of "comparison", there are only three possible combinations, and these combinations give the three classes of sign. They are distinguished on the criterion of whether or not the reference to a ground can be "prescinded" from the reference to an interpretant; if it can, a pair of relates remains, and then a further distinction according to the internal constitution of this pair is made (W2:4, 55-6; CP1.558). The procedure at work in "The Algebra of Logic" shares some features with the older account, but it is significantly different: it has, itself, been formalised. "A sign is in a conjoint relation to the thing denoted and to the mind (W5:30, 162; CP3.360)" - that is, it is a triple relation. The relates can combine in only three ways without violating the rules of the definition, and each of these ways is a kind or class of sign. There are two "degenerate forms" of this relation, in which pairs of terms "are in dual relations which constitute the triple relation" (W5:30,163; CP3.361); "a plural character or conjoint relation is to be called degenerate if it is a mere compound of dual characters."(W5:30, 162; CP3.359). This idea of degeneracy is borrowed from geometry, while the analysis of the constitutive relations of the class in general, to give the sub-classes, is a direct application of the relative logic. The derivation of the classes of signs has thus been taken out of the speculative psychological framework that governs the problematic as stated in the "New List", and provided with a vocabulary and an analytical syntax that suits its new setting in formal logic.

Peirce sets up his introduction to the topic of signs first by saying what he means by a "relation", then by showing why the concept of "sign" is properly analysed as a three term relation. Then he derives the classes, and goes on to illustrate them. The examples fall neatly into two series, those that are standard in his previous treatments of "representation," and those that he introduces for the purposes of this paper. In the table following, the latter are marked with an asterisk. The figure shows examples from the two texts dated 1885.

Table 1

	1867	1885
Index	(murder) weathercock diagram	natural signs physical symptoms pointing finger *demonstrative and relative pronouns *letters on a geometrical diagram *subscript numbers in algebra
Icon	(b/p) portrait	*diagrams of geometry painting
Symbol	(man/homme) word proposition	general words speech any mode of conveying a judgment

There are some interesting adjustments to the standard examples in this paper. First, the "weathercock" disappears in favour of the "pointing finger." The pointing function inheres in the name of the class, and serves as a reminder of the "pure act of attention" of the "New List", which it brings into the scope of semiotic. Its connotations are those of the most elementary, spontaneous kind of sign-making, a natural sign; yet this paper classes it together with conventional, artificial signs such as those denoting algebraic operations. Furthermore, though the pointing finger be "the type of the class" (W5:30, 163; CP3.361), "natural signs and physical symptoms" also count as indices: our apprehension of the world is generated by the object or by us, *indiscriminately*. Which is to say that this most traditional of boundaries, between nature and culture — indeed, between the body and thought - has been breached. This is the lynch-pin of Peirce's realism; its significance cannot be overstated. The very nature of signhood itself changes in order to provide a genuine alternative to both idealism and nominalism.

The change in the definition of the index has consequences on the breadth of the class

of the symbol. In the 1867 paper, Peirce does not discriminate between the functions of words: they are all words, and all "rational" signs; in the 1885 paper, however, this class is restricted to "the main body of speech", and it explicitly excludes "demonstrative and relative pronouns", which are now examples of the index. The "words" that continue to be symbols are "general words", that is, predicate words. In the 1885 text, he generalises the proposition; it is now "any mode of conveying a judgment": this must include mathematical propositions at least. The "word" is losing its prestige as a general model for the sign, both because the class of "words" is now found to be heterogeneous, and because a variety of things are found to do jobs similar to that of "general", that is, "predicate" words.

The criteria for each class - and indeed for the classification as a whole - are adjusted to allow inclusion of the new examples. The crucial fact is that all the new examples fall into the classes of the index and the icon. Consider the criteria for the icon. The first is the standard one that subsists in almost all Peirce's expositions of the classification: the relation of sign to object "consists in a mere resemblance between them" (W5:30, 163; CP3.362). We might recall that it is for this reason, in the "New List", that icons cannot be sufficiently clearly disentangled from their objects, and again for this reason, that they have, themselves, sensory qualities, and hence do not count as pure thought. Yet it is for the self-same reasons that they are counted as signs in this paper: "icons are so completely substituted for their objects as hardly to be distinguished from them. Such are the diagrams of geometry" (W5:30, 163; CP3.362).

The range of the examples of iconicity is heterogeneous. Whereas the diagram is for us "the very thing", in the case of the painting, we seem to treat the painting itself as transparent, we do not operate on the painting, we dream, he says, its object. In the example of the painting, "icon" names a pure mental content that results from *forgetting* the difference between reality and representation; in the example of the diagram, "icon" names a representational technique that makes appear an abstraction that cannot appear without it. Indeed, in order to use icons such as geometrical diagrams, the material reality of the diagram must take on thinghood in order to permit the observation and manipulation of the relations it displays. In marked contrast with this, Peirce also uses the term "icon" to say what he means by the idea evoked by a predicate word. So a nominalist might ask whether the icon is a dematerialised mental content, or a material form governed by representational protocols. The realist response is to point out that the very inclusion of both in the same class implies a continuity between them. This continuity rests on their function as second intentionalities.

Nevertheless, problems remain. The investigation of the properties of a notation must make the explicit assumption that diagrams have both formal and material properties. Peirce's decision to use his semiotic to describe a notation allows him to focus on, instead of disregarding, the materiality of the sign, and to show that its formal properties are dependent on this materiality, whereas, when he philosophises "representation", as in the painting example, he continues to disregard the materiality of signs, the formal material differences of different languages, and to go on talking about pure mental contents. Is it the painting, or its object, that ceases momentarily to be a thing? Is a diagram a thing? or its object? What is it, to do with icons as he has instructed us in the "New List", to "represent them as representations"? What properties *distinguish them*, as signs, from their objects? I point out that the structural distinction between first and second intentionality cannot answer this question, because it cannot tell us why it is possible to manipulate diagrams and so on, whereas it is not possible to manipulate their Platonic abstractions, or the discursive formulation of their rules. (W5:30, 163-5; CP3.363) Nor, *a fortiori*, is it possible to manipulate the "dream" evoked by the painting. Icons as such dematerialise so readily in Peirce's philosophical work that the mere decision to bring icons into the fold does not explain how Peirce comes to acknowledge, or theorise, the formal-material thinghood of signs in general, or of the icon in particular.

To find an answer to this question we need to return to the criteria for indexicality. The familiar criterion of "real connection" also widens its meaning so as to apply to the new examples that are adduced. Certainly the letters on a geometrical diagram are really connected with the points that they label, as are algebraic subscripts: both depend on immediate contiguity. But "real connection" is only true of the demonstrative and relative pronouns in a restricted set of cases of oral discourse. Notice, then, that "real" covers *causality*, as in the case of physical symptoms, *spatial contiguity*, as in geometry, and *spatio-temporal connection* as in the case of the demonstratives. Now if we consider written, as distinct from oral discourse, spatial contiguity is hardly the question, and the guarantee of connection is made not by anything like space or time, but by the rules of connected discourse and some rather more formal rules of grammar such as the anaphoric and cataphoric determination of person and number and gender. If this counts as "real connection" in Peirce's account of indexicality, then "real" has again been dissociated from the "natural." There is a "reality" of the domain of operation of a language just as compelling as is physical space. This holds true also of the classification of quantifiers as indices: what they refer to is the universe of discourse, and this must be specified in order for the quantifiers to function. To learn a language is

to learn the rules that govern this sense of a "conventional real."

Now this is a consequence of extending the class of the index to particular signs in a notation, all of which, it is clear, are governed by precise rules and conventions. There is indeed a reality established by the conventions of such languages, and again, it is the reality of the material and formal medium on which a notation depends. The rules governing indexicals in, say, discursive language, are rules that make the particular occurrence of some indexical sign establish a referring relation with another particular occurrence of some sign. This class, then, also implies the thinghood - or the eventhood - of a sign. A long-term consequence of this will be that Peirce distinguishes between the rules of the material form of the sign itself (the type/token distinction) from the rules of its relation with its object.

So *where* and *when* an index occurs is what makes it indexical, but the where and the when are governed by rules, and these are rules that pertain to the materiality of the medium of the language. Notice, then, that both the icon and the index are rule-governed, once Peirce applies his classification to a formal notation. The crucial consequence of this is that it is impossible to specify the symbol by its conventionality. As Vincent Colapietro (1991) argues, it is the non-coincidence of "arbitrary" with "conventional" in Peirce's work that marks a major difference with Saussure. *All* the signs of the system are conventional; they are simply distinguished by different conventions governing the criteria of their functionality. Only the symbol is conventional *and* arbitrary.

Peirce adds further criteria to his specification of the index, and they are of the greatest interest. The first of these is that an index "denotes without describing." What this means is that an index has the capacity of establishing a referring relation, of installing something as object, without predicating anything of that object, save that it is there. It is this property in particular that he uses in his critique of Royce's account of error. It is a device for conferring objecthood on occasion; nothing is known of its objects save that they are objects, posited by virtue of the referring relation itself. This seems to be an uptake of Kant, in that it distinguishes the problem of the ontology of objects from the concept, or operation, of objecthood. But instead of relying on the mental representation of objecthood, Peirce says that objecthood is a function of certain rules governing certain signs in particular languages, on occasion.

The second criterion Peirce adds seems to be an implication of the first. In order to accommodate algebraic subscripts, he writes that they "distinguish one value from another without saying what those values are" (W5:30, 162; CP3.361). This is apparently

analogous to "denoting without describing", but if so, it construes "denote" in an altogether unexpected way. For whereas "denote" would ordinarily denote the relation of a sign with its object, its construal by "distinguish" reorients it to mean the relation of not-ness between two objects. Something is not something else. So, since both the thinghood of the sign and the thinghood of the object are mutually entailed in the definition of the index, this construal states the condition of possibility of something being a sign, of its being an indexical sign, or of its being the object of such a sign. Likewise, since the classification of signs is a "distinction of icons, indices and tokens", the same principle accounts for the possibility of being a member of one class of signs rather than another, and of being a sign as distinct, say, from a particle (W5:30, 162; CP3.359). Further, the condition of possibility of repetition, that is, of the difference of a sign from itself on two occurrences, must also be the same, since, as Peirce writes elsewhere, "it is not in the least necessary that the spots should be of different kinds, so long as each is distinguishable from the others" (CP3.423). It seems to follow, then, that difference is itself the *index of signhood*, and that the "index" is the theory of this principle.

The index is the theory of the principle which allows Peirce to distinguish signs from other sorts of three-way relations, and which allows him to distinguish each of the three terms of the sign relation, even though they are all of the nature of signs; for it is clear that this relation is construed through a diagram, and that the points of that diagram are relationally, but not essentially, distinct. It is also, necessarily but very quietly, this principle - the index of not-ness - that must be at work whenever Peirce alters his classifications, and whenever he considers particular examples for inclusion under them.

Likewise, the consequences of the development of iconicity that we have seen at work in this paper will become operative in the later work. The icon will become the principle of translation between languages. Only on some such principle as this can an algebra count as showing something important for logic in the propositions of natural language that the natural language expressions cannot show. The diagrams of geometry, the formal syntax of an algebraic notation, are manipulated in order to reveal formal, or abstract, relational properties that cannot be represented otherwise. Such diagrams can then be used to compare the properties of two objects that may not otherwise seem alike, for example, the type-face of p and b considered as spatially displayed forms. This is a technicized version of the issue of comparison and sometimes leads to metaphor. Generalisations that do not hold - misleading metaphors, inaccurate models,

mistranslations - can be subjected to the not-ness principle. In order for the index to be mobilised as the instrument of this test, it will be important for Peirce to investigate how the classes of sign work together. As he already begins to do in "The Algebra of Logic", he will discover why it is important not to seek pure examples of each class, but rather, to investigate his examples for their interaction.

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Notes

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1. The "theory already established" is a citation to the very first paragraph of Kant's Critique of Pure Reason: "There can be no doubt that all our knowledge begins with experience. For how should our faculty of knowledge be awakened into action did not objects affecting our senses partly of themselves produce representations, partly arouse the activity of our

understanding to compare these representations, and, by combining or separating them, work up the raw material of the sensible impressions into that knowledge of objects which is entitled experience?" (Kant, 1982, p.41, B1) ←

2. Compare Oehler's denunciation of "German idealism" and "the age-old German longing for the Blue Flower of ultimate foundations" with Peirce's attribution of Royce's error to "German metaphysics". This review gives textual justification, if it is needed, to Oehler's claim that "Peirce manages without a transcendental model of any kind, and is as far as can be from invoking one." (Oehler, 1986, p.54) ←
3. Royce later was won over to a kind of idealist pragmatism, for which he declared himself indebted to Peirce. ←
4. Mitchell's work was independent of Frege's, and almost exactly contemporaneous with it. Frege's system became canonical as a result of Russell's use of it. ←
5. Note the paradox of this claim that a particular formal notation is fit to reveal the commonality of all languages, and hence, the universal properties of mind. The history of this claim is the subject of Eco (1995). ←
6. This becomes a significant polemical issue for Peirce at the time when he comes to the end of his active contribution to algebraic methods in logic. His reviews of Schröder (CP3.425-455 , CP3.456-552) spell out this issue in some detail. ←