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C.S. Peirce: Pragmatism and Logicism

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Abstract.— This paper has two separate aims, with obvious links between them. First, to present Charles S. Peirce and the pragmatist movement in a historical framework which stresses the close connections of pragmatism with the mainstream of philosophy; second, to deal with a particular controversial issue, that of the supposed logicistic orientation of Peirce's work.

1. Pragmatism, Analytic Philosophy and Peirce

American pragmatism has commonly been seen as something parochial and outside the mainstream of philosophy. Among European philosophers pragmatism is often understood as an 'American way' of dealing with knowledge and truth, but as something alien to the general discussion. As Rorty noted, although philosophers in Europe study Quine and Davidson, "*they tend to shrug off the suggestion that these contemporary philosophers share their basic outlook with American philosophers who wrote prior to the so-called linguistic turn.*" [Rorty 1990, 1]

It was not so in the first decade of our century. In the World Congress of Philosophy at Heidelberg on 1908 the pragmatist movement held a central position in the debates [Elsenhans 1909]. With the ascent of logical empiricism in the 1920s pragmatism began to fade from the philosophical scene, as if pragmatism had exhausted its creative potential [Bernstein 1992, 815]. The dispersion of the Vienna Circle and the Second World War moved the center of philosophical discussion from Europe to the United States. In my view, that transplantation of the Vienna Circle was successful owing to the common ground established by the general pragmatist orientation of American academic philosophy in the previous decades. Analytic philosophy in the hands of European *émigrés* took over the departments of philosophy in the American universities of the fifties. With few exceptions [Nagel 1956, xii; Murphy 1991], a deep affinity between analytical philosophy and the pragmatist tradition has been commonly overlooked. Not only were many of the issues and basic ideas common, but both movements — in a broad-brush philosophical approach — shared similar goals, similar views about the relation between philosophy and science and about how philosophical work had to be conducted.

In recent years there has been an increasing amount of scholarship trying to understand both pragmatism and analytic philosophy as different aspects of one broad philosophical attitude. In my view, a key source for developing an integrated study of both currents is to be found in Charles S. Peirce (1839-1914), the founder of pragmatism, who was interpreted by Karl-Otto Apel as the

milestone in the semiotic transformation of transcendental philosophy into analytic philosophy [Apel 1972, 1981, 1993]. Very recently, von Wright said along these lines that Peirce “*may in fact be counted another founding father of analytic philosophy —alongside Russell and Moore and the figure in their background, Frege.*” [von Wright 1993, 41]

In this ‘flashback’ process, it is even possible to discover a continuous tradition within American thought, which has its beginnings in the work of Peirce, James and Dewey, and flourishes in Quine, Putnam and Rorty [Putnam 1990, 267]. Instead of viewing the analytic movement as representing a sharp rupture with pragmatism, the most recent resurgence of pragmatism suggests that there has been on the contrary a continuity between both movements [Bernstein 1992, 823]: the later one can be understood as a refinement, as a genuine development of the earlier movement.

The figure of Charles S. Peirce has an ever increasing relevance in very different areas of knowledge [Fisch, 1980], and his influence is still growing [von Wright 1993, 41]: in astronomy, metrology, geodesy, mathematics, logic, philosophy, theory and history of science, semiotics, linguistics, econometrics, and psychology. In all these fields Peirce has been considered a pioneer, a forerunner or even a ‘father’ or ‘founder’ (of semiotics, of pragmatism). It is very common to find general evaluations like Russell’s: “*beyond doubt [...] he was one of the most original minds of the later nineteenth century, and certainly the greatest American thinker ever.*” [Russell 1959, 276], or Umberto Eco’s: “*Peirce was [...] the greatest American philosopher of the turn of the century and beyond doubt one the greatest thinkers of his time*” [Eco 1989, x-xi]. Popper described Peirce as “*one of the greatest philosophers of all times*” [Popper 1972, 212] and Putnam called him “*a towering giant among American philosophers*” [Putnam 1990, 252].

Factors which have increased the growing interest in Peirce’s thought are his personal participation in the scientific community of his time, his valuable contribution to the logic of relatives, and his sound knowledge of the philosophy of Kant as well as of the Scholastic tradition, in particular Duns Scotus. It should be noted that the interpretation of Peirce’s thought and its evolution from his early writings in 1865 until his death for many years provoked wide disagreement amongst Peirce scholars. In part this was caused by the fragmentary presentation of his work in Peirce’s *Collected Papers*. In more recent years a deeper understanding of the architectural nature of his thought and of his whole evolution has been gaining general agreement [Hausman 1993, xiv-xv; Houser 1992, xxix]. In the last decade the basic coherence and undeniable systematization of

Peirce's thought has been widely recognized by the Peircean scholarship [Santaella 1993, 401].

Christopher Hookway has characterized Peirce as a traditional and systematic philosopher, but one dealing with the modern problems of science, truth and knowledge from a very valuable personal experience as a logician and an experimental researcher in the bosom of an international community of scientists and thinkers [Hookway 1985, 1-3]. Moreover, it has been held that the best approach for understanding Peirce is to see him as an analytic philosopher *avant la lettre*, anticipating the intersubjective 'linguistic turn' in philosophy with his general theory of signs [Hookway 1985, 141; Bernstein 1992, 814]. Although Richard Rorty detected the similarities between Wittgenstein's *Philosophical Investigations* (1953) and the philosophical framework of Peirce thirty years ago [Rorty 1961], academic philosophy in the English speaking world has virtually neglected the study of Peirce and pragmatism. It may be even said that Peirce's thought has been rediscovered by Continental philosophers (such as Popper, Habermas, and Eco) and reintroduced by them into the world of philosophical reflection.

In Peirce's work there is not only a parallel development of themes found in the work of Frege, Russell or Wittgenstein, but also the framework for an integrated theory of culture [Hookway 1985, 120]. Peirce saw the pursuit of truth as a corporate task rather than an individual search for foundations. This framework "*not only challenges the characteristic Cartesian appeal to foundations, but adumbrates an alternative understanding of scientific knowledge without such foundations.*" [Bernstein 1983, 71-72]

In this sense — as Debrock highlighted — Peirce's thought offers suggestions for tackling some of the most stubborn problems in contemporary philosophy, but in particular he may help us to resume a philosophical responsibility which has been largely abdicated by much of 20th century philosophy [Debrock 1992, 1].

2. Peirce and Logicism: Logic, Mathematics, and Continuity

In this framework, the second goal of my paper is to explore tentatively the issue of how the relation between Peirce and logicism has been understood, as a way of throwing some light on the essential harmony of Peirce's thought. I will summarize the recent debate between Susan Haack and Nathan Houser about that issue, but trying to present a more historical perspective. Peirce's work has sometimes been understood as a forerunner in some substantial areas of Whitehead and Russell's *Principia Mathematica* [Collected Papers 3.43-4n.; Weiss 1934, 400; Nagel 1939, xvii; Eisele 1979, 12;

Haack 1993, 34-5], but scholars who seek to classify Peirce under the label of logicism find it extremely difficult to accommodate his exact words.

Justus Buchler, in his seminal work on Peirce, noticed some — at least apparent — contradiction between Peirce's words about the relation between mathematics and logic and what Buchler called "*Peirce's attempts to derive arithmetic from logic*" [Buchler 1939a, 224]. Richard Dedekind, "*one of the principal logico-mathematicians of Peirce's day*", regarded mathematics as a branch of logic. Peirce opposed that claim arguing that both disciplines have widely divergent aims. Peirce provided in defense of his position the distinction — which he says was intended by his father Benjamin, a well known Harvard mathematician — between mathematics as the science that *draws* necessary conclusions and logic as the science of *drawing* necessary conclusions [Collected Papers 4.239, 1902][Kent 1987, 72][Murphy 1961, 229].

The mathematician draws consequences, the logician studies and classifies the conditions under which these consequences are drawn. Far from mathematics being a branch of logic, it is almost [...] the only science which stands in need of no aid from a science of logic [Collected Papers 2.81; c. 1902][Buchler 1939a, 221]. Mathematics — *Peirce wrote in the same year 1902* — has no need of any appeal to logic. [...] Just as it is not necessary, in order to talk, to understand the theory of the formation of vowel sounds, it is not necessary, in order to reason, to be in possession of the theory of reasoning [Collected Papers 4.242 c. 1902]. The aims of both sciences are very different: while the function of logic is the 'analysis and theory of reasoning', the function of mathematics is 'the practice of it' [Collected Papers 4.134].

Buchler concluded that Peirce's studies toward defining traditional mathematical relations in terms of 'logical', and deriving mathematical propositions from a small set of analytic propositions, were an important contribution, "*foreshadowing modern logic and culminating in the work of the Whitehead-Russell Principia Mathematica*". In support of that claim Buchler mentioned Lewis's account of Peirce's work along these lines in *A Survey of Symbolic Logic* [1918]. Buchler eschewed the apparent inconsistency by explaining that "*although mathematical propositions may be derived from logical propositions, the process of derivation is on this view itself a 'mathematical' process, with a mathematical criterion of validity independent of logical analysis*" [Buchler 1939a, 224], but at last he had to assert that Peirce's thought "*on the foundations of mathematics and logic does not form a systematic body of opinion*" [Buchler 1939a, 227 and 1939b, 215].

Peirce's approach to this relation between philosophy,

mathematics and logic may be better understood recalling his own words in the *Cambridge Lectures* (1898):

metaphysics must draw its principles from logic, and that logic must draw its principles [...] from mathematics. [Peirce 1992, 123]

According to Peirce, mathematics is an observational science, and mathematical knowledge depends on experience, on the construction, manipulation and observation of diagrams, created by the human mind [Gouge 1950, 56; Haack 1995]. As Hilary Putnam suggested, it is fascinating that Peirce and Frege,

the two inventors of predicate calculus disagreed on so fundamental a metaphysical issue, Frege seeing logic as totally nonempirical and Peirce seeing logic itself as involving something like mental experimentation with diagrams. [Peirce 1992, 72]

It is possible to achieve greater clarity on this question through the recent debate between Susan Haack and Nathan Houser on Peirce's disputed commitment to logicism. After providing an impressive set of texts from Peirce, Haack concludes that Peirce was and was not a logicist, because logicism is a two-fold doctrine: Logicism is a formal thesis (Mathematics, at least arithmetics, is reducible to logic) and an epistemological thesis (Logic is more basic, and epistemically foundational for mathematics). Haack claims that Peirce resolutely rejected that epistemological logicism, but sympathized with the formal thesis, with the reducibility of at least arithmetic to logic. Houser, on the contrary, doubts that Peirce was a formal logicist and holds that if the reducibility of a part of mathematics to logic is accepted that logic would be epistemically prior to mathematics, or which would be the same, that it is not possible to disentangle both faces of logicism [Houser 1993; Haack 1993].

According to Haack, the explanation for Peirce's apparent sympathy with the formal thesis and his clear repudiation of the epistemological thesis "*lies, at least in part, in an ambiguity on Peirce's use of the term 'logic'*" between 'logic' meaning "*mathematical formalization of necessary reasoning*" and 'logic' meaning "*theory of reasoning*" [Haack 1993, 45]. But, in my view, the key to understanding Peirce's position should be traced back, first, as Haack and Houser realized, to Peirce's classification of the sciences [*Collected Papers* 4.134, 1895], and second, to the acknowledgement of two different mathematical traditions.

During his life, Peirce made many attempts to work out a general classification of the sciences, understood as an epistemic ladder of the sciences [*Collected Papers* 1.180ff; Kent 1987, 71-72], as the different "*branches of endeavor to ascertain truth*" [Peirce L75].

The mature Peirce established a clear-cut distinction between formal logic as a mathematical branch of the science of discovery and pure theoretical mathematics as the most abstract of all sciences [Collected Papers 4.244, 4.263, c.1902; 1.180, 1903; 1.52, c. 1896]. According to Peirce's classification of the sciences, there is a hierarchy in human knowledge: mathematics is at the head and logic occupies a subordinate position [Haack 1993, 48].

Reasonings of pure mathematics are perfectly evident and have no need of any separate theory of logic to reinforce them. Mathematics is its own logic. [Peirce L75, draft A, 29-33]

Logic is not a foundational science, but a normative one. Human reasoning is not a Cartesian search for foundations, but a cooperative and fallible activity of inquiry, which has no need of any such foundations [Bernstein 1992, 814]. In particular mathematics, the highest type of human reasoning, requires no foundation; as Goudge wrote, the only thing from which mathematics can be 'derived' is our native capacity for thinking rigorously, "*our natural power of reason*" [Collected Papers 4.242] or "*a natural instinct for right reasoning*" [Collected Papers 2.3] [Goudge 1950, 58].

Peirce did not seek to *reduce* mathematics to logic. Reductionism was not an aim of Peirce's conception of scientific inquiry, nor did he think that mathematics need appeal to logic to ascertain the validity of its reasoning, "*for nothing can be more evident than its own unaided reasonings*" [Collected Papers 7.524, n.d.; Kent 1987, 72]. This leads us to the second reason that may enable us to understand better Peirce's position in a historical framework. As Grattan-Guinness has highlighted, Peirce belongs to a mathematical tradition ("*algebraic logic, rooted in French revolutionary 'Logique' and algebras and culminating, via Boole and De Morgan, in the systems of Peirce and Schroeder*") really different from 'mathematical logic' of Frege, Whitehead and Russell where the logicist project was pursued [Grattan-Guinness 1988]. The contrast is striking:

the algebraic logicians, following Boole, applied mathematics to logic and drew upon algebras for their mathematical background whereas logicism entailed the application of logic to mathematics and took its main lines out of mathematical analysis. [Grattan-Guinness 1990, 297]

Putnam has noted that the standard historiography of modern logic tends to stress the importance of Frege, dismissing "*the entire Boolean school — of which Peirce was, in a sense, the last and greatest figure.*" [Putnam 1990, 252-260]

This biased account blurs the differences between both traditions, making them really difficult to grasp the contrast between them.

Instead of looking for a reduction of mathematics to logic Peirce, especially in his later period, realized that the idea of continuity was “*the keystone of the arch*” of all his thought, as he wrote to William James on 25 November 1902 [*Collected Papers* 8.257]. “*Of all conceptions continuity is by far the most difficult for philosophy to handle*”, Peirce said in the opening words of his eighth Cambridge Lecture entitled *The Logic of Continuity* [Peirce 1992, 242]. His reflections on continuity stem from mathematics and geometry, but he extended the principle of continuity to the human mind and the universe, as a reply to the inadequacy of mechanistic scientific explanations:

the universe is not a mere mechanical result of the operation of blind law. The most obvious of all its characters cannot be so explained. It is the multitudinous facts of all experience that show us this; but that which has opened our eyes to these facts is the principle of fallibilism. [*Collected Papers* 1.162]

The idea of continuity, which is the “*leading idea*” of differential calculus and of all the useful branches of mathematics, and which has a decisive role in scientific thought, is the master key which unlocks the arcana of philosophy [*Collected Papers* 1.163].

As Hausman has stressed, in Peirce’s thought the idea of spontaneity and radical creativity is interwoven with his view on continuity:

Both continuity and spontaneity are constitutive of the universe through the function of infinitesimals [Hausman 1993, 190].

In that general framework of an evolutionary realism the search for a logicist foundation for mathematics would appear as totally doomed to failure.

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