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"Was Peirce a Genuine Anti-Psychologist in Logic?"

Claudine Tiercelin

- 1 Although Peirce clearly identified his own pragmatism with the two key ideas that it entirely grew out from formal logic (5.469) and that "every thought is a sign" (5.470),¹ the implications of such ideas for Peirce's attitude toward psychology, and, in particular, in its relations with logic and metaphysics, are still too seldom emphasized. As a result, and in about the same way as for Peirce's original views on vagueness, we do not get a perfect sense of what he was aiming at, if we look at his analyses through the traditional lenses and the classical dichotomies we have mainly inherited from Frege or Husserl, namely, in terms of such current oppositions as: how we *ought to* think according to logical rules, laws and norms, *versus* how we *do* think according to actual features and conditions of the real functioning of our human mind; norms *versus* nature, normative explanation *versus* natural description, objective causes or necessary rules of logical processes *versus* subjective or psychological reasons. Indeed, not only does Peirce share with his fellow pragmatists a general dislike of such dualisms, but the difficulty in stating, for example, what "psychologism" for him amounts to, is increased in his case² by the often idiosyncratic meanings he attaches to most of the concepts at stake in the debate such as: logic, logical rules and inferences, psychology, psychologism, norms, nature, naturalism, mind, consciousness, belief, disposition, doubt, affective states in general, etc.
- 2 As a consequence, it is often hard to determine not so much whether he changed his views over the years (Dougherty 1980; Kasser 1999; and Hookway 1992, 2000), as whether he was or was not a straightforward "antipsychologist," or rather a "weak" psychologist, whether one could reconcile some apparent tensions between naturalistic elements and almost transcendental ones (Goudge 1947), etc. In order to be fair to his very sophisticated views, one should give a detailed account not only of all such concepts, but also of all their intricate relations, and also, of course, of the major (and at times contradictory) influences exerted on Peirce by such authors as, Kant, Boole, Venn, De Morgan, Mill, Bain, the Scottish school of common sense, German

experimental psychology, several theoreticians of evolution, but also, and from the start, various (and at times opposed) scholastics (Ockham, Duns Scotus). Needless to say that such an account extends the scope of this paper.³ So, in what follows, I shall merely concentrate on a few concepts, influences and issues, so as to clarify Peirce's views, and to enlighten their extreme originality and contemporary relevance.

- 3 The very "raison d'être" of pragmatism was, from the start, to make sure of the *meaning* of the concepts we are using, and to check whether the distinctions we draw are real or merely verbal. So, before determining whether Peirce was or was not an anti-psychologist in logic, it is crucial to make one's ideas clear about what he means, at least by "logic," and by "psychology" itself.



- 4 As far as logic is concerned, it is important to remember – all the more so as Frege is supposed to be, together with Hossel, the champion of the condemnation of psychologism in logic⁴ – that, from a mere historical point of view, Peirce followed a different road than Frege's, namely, what Van Heijenoort used to call the semantic tradition (Boole, Schröder, Löwenheim) as opposed to the "syntactic" trend (Russell, Frege) (Van Heijenoort 1985): Peirce insists more upon such semantic notions as truth, validity and satisfiability of logical formulae than on syntactic notions such as demonstrability from a set of axioms or rules of inference. His treatment of the quantifiers together with his correct definition of validity for the sentential calculus constitute major achievements (Tiercelin 1991a: 187).⁵ But it is also crucial to note that he gave a twist to this semantic tradition by proposing a very idiosyncratic *semiotic* version of logic (Tiercelin 1991a: 187-213). Compared, for example, with Boole's or Schröder's own semantic treatments of formal logic, Peirce's approach is distinctive in placing logic within the broader context of a general theory of meaning, understanding and interpretation, a theory of how signs function, which enables him to classify different sorts of sign in a natural way. Thus, Peirce's joining the semantic trend is not merely a matter of chance or of following a certain tradition; rather, it is because of his having *philosophical* reasons to rest his semantic approach in logic upon a semiotic perspective.
- 5 Indeed, Peirce does not take logic in a narrow sense according to which formal logic, would be constituted by the deductive part of logic, whereas, in a wide sense, it would embrace the theory of logic as semiotic: namely, the general theory of signs, or the study of anything whose function is to represent something (4.373).⁶ Logic is always viewed from a *philosophical* and *ontological* perspective.⁷ This explains, *first*, why Peirce, who called himself "an Aristotelian of the scholastic wing, approaching Scotism, but going much further in the direction of scholastic realism" (5.77n) or "a scholastic realist of a somewhat extreme stripe" (5.470) was, from the start, an admirer of the scholastics (Tiercelin 1993a, and 2006: 158) and also very severe with Kant's "most astounding ignorance of the traditional logic, even of the very *Summulae Logicales*, the elementary schoolbook of the Plantagenet era," considering that "the debonnaire and degagé fashion" Kant treated logic, was very much responsible for his "most hasty, superficial, trivial, and even trifling" examination of the relation of his categories to his "functions of judgment" (1.560 and 2.31). While admitting that the medieval thinkers showed "a beastlike superficiality and lack of generalizing thought" in their writings on

logic (1.560) and "set up their idle logical distinctions as precluding all physical inquiry," (6.361) he also praised "the minute thoroughness with which they examined every problem that came within their ken," (1.560) and the fact that "their logic, *relatively to the general condition of thought*, was marvelously exact and critical." Indeed, "*their analyses of thought and their discussions of all those questions of logic that almost trench upon metaphysics* are very instructive as well as very good discipline in that subtle kind of thinking that is required in logic" (1.15, 1905; my emphasis), and he said that his reading of the medievals "stimulated" him in his early (Kantian) inquiry "into the logical support of the fundamental concepts called categories," (1.560) and in the constitution of his early Semeiotic and thought sign theory (Tiercelin 2006: 158-9).

- 6 Secondly, Peirce never clearly separated formal logic from semiotic.⁸ *Semiotic* is but another name for *logic*, but a logic which is in close connection with mathematics as well as psychology and ontology. Indeed, and this is somewhat paradoxical: the more signs become specified, the less semiotic appears as an autonomous science, since it is the whole of logic (hence of logic in its most formal part too) which is then defined as semeiotic (Fisch 1986: 338-9; and Tiercelin 1991b). With some hesitations first, admitting he is a bit ambiguous in his use of the term of logic, "at once the name of a more general science and a general branch of that science" (Ms 751), Peirce ends up identifying logic with Semeiotic. Of course, although logic is now semiotic through and through, it does not constitute *the whole* of Semeiotic. It is only what is called cenoscopic (Ms 499), formal (NEM IV: 20), general (1.444), normative (2.111), speculative (Ms 693), or "the *a priori* theory of signs" (Ms 634), "the quasi-necessary, or formal doctrine of signs" (2.227), "the pure theory of signs, in general" (Ms L 107). And this is why, besides cenoscopic semeiotic, there are, or more exactly, *may be* idioscopic studies as various as the idioscopic sciences themselves: physics, biology, geology, anthropology, psychology, medical science, music, politics, etc. Peirce clearly says he hopes for such a thing in 1909 (Ms 634) and views himself as "a pioneer, or rather a backwoodsman, in the work of clearing and opening up what I call semeiotic, that is, the doctrine of the essential nature and fundamental varieties of possible semiosis," finding "the field too vast, the labor too great, for a first-comer" (5.488. See Tiercelin 1995: 38-9). Yet, such enthusiastic claims should be qualified: 1) The semiotic which is established in 1867 has logic as its starting-point. 2) When semiotic is developed in the 1868 papers, into a semantical theory of knowledge, in virtue of which not only thought is a sign, but man itself is a sign (5.313), it surely means already, some extension of semiotic to other domains, the framing of some possible new model of the mind, but such a theory's first aim is to prove that, without it, the validity of the laws of *logic* would be "inexplicable." 3) When Peirce declares he wishes to develop a semeiotic study of other branches than logic, he also reminds that the reasonings involved there must be capable of being submitted to logical study. Such is precisely the case of psychology (Tiercelin 1995: 39-40):

Of course psychologists ought to make, as in point of fact they are making, their own invaluable studies of the sign-making and sign-using functions – invaluable, I call them, in spite of the fact that they cannot possibly come to their final conclusions until other more elementary studies have come to their first harvest. (Ms 675)

- 7 4) Although the somewhat elastic frontier between the various fields of knowledge seems to allow for a general theory of signs conducted by other researchers than logicians, one may wonder whether – and to what extent – Peirce really considered the

question, since it is so obvious to him that everything that has been achieved until then in that direction was done by logicians (Whately, Mill, Boole, Ockham) that it seems natural to view them as the best group of researchers to pursue the task. Thus, even if "a piece of concerted music is a sign, and so is a word or signal of command," and if "logic has no positive concern with either of these kinds of signs," "it is not likely that in our time there will be anybody to study the general physiology of the non-logical signs except the logician" (Ms 499). 5) Finally, is it not strange that the so-called father of such a generalized semiotic, who was not particularly stingy about grand projects, should have only taken as one of his major works – which he hoped to be as successful in the 21st century as Mill's *System of Logic* – a "System of Logic considered as Semeiotic" (Ms 640, NEM III: 875), i.e. a book dealing, not with the whole field of semeiotic, but with the only logic or cenoscopic semeiotic? As a consequence, one can hardly speak of a "Peircean Semiotic," thereby meaning a branch of which Peirce would have explicitly delimited the range of application or forgiven in advance any kind of extrapolation. On the contrary, it is quite clear that Semiotic was always viewed by Peirce in relation with logic (which, incidentally, is one point of departure from Saussure. See Tiercelin 1991b and 1995: 40-1).

- 8 3. So the basic distinction to be made in logic is not between a "narrow" and a "wide" domain. Rather it is, *between logic and mathematics*. However, it is a distinction which is not grounded on a division between two specific domains, since mathematics is not defined by its *objects* (space or quantity) but more generally as *the science of necessary reasoning*. Again, this is a wider use of "mathematics" than we are used to. Indeed, for Peirce, all *a priori* reasoning – both our everyday practice of "necessary reasoning" and the more rigorous practice of professional mathematicians – counts as part of mathematics.⁹ Now, if "formal logic is nothing but mathematics applied to logic" (4.263; cf. 3.615), there is more to mathematical logic than mathematics, and that is precisely *logic*. Hence the real opposition between logic and mathematics lies between the theoretical or observational aspect of inference, on the one hand, and its practical or operational part on the other. The mathematician *practises* deduction (2.532, 4.239, 4.124 and 4.242), reasons deductively, whereas the logician *studies* deductive reasonings and arguments. In the footsteps of his father, Peirce characterises mathematics as "the science which draws necessary conclusions" (3.558 and 4.229), while logic, by contrast, is "the science of drawing necessary conclusions." This, incidentally, makes mathematics a "pre-logical science" which is in no need of logic, for a theory of the validity of its arguments: those are acritical and evident, "more evident than any such (logical) theory could be" (2.120).¹⁰ Hence, the respective aims and methods of logic and mathematics are very different: Peirce's apparent anti-logicism should rather be interpreted as a difference of *attitude* according to the position that is being adopted. From the mathematician's standpoint, the instrumental value of the *calculus* is decisive, because he is only interested in finding the simplest and shortest way to get to the result (4.239). Logical constructions are superfluous here (3.222). But from the logician's point of view, it should be clear that his end "is simply and solely the investigation of the theory of logic, and not at all the construction of a calculus to aid the drawing of inferences" (4.373). Therefore, the mathematician's and the logician's purposes are incompatible. The calculus is an important tool of reasoning, *but it is only a tool* (3.322, 3.364, 4.424 and 4.553), or a "special system of symbols" for treating deductive logic. When Peirce criticises logicians like Boole and Schröder for being excessively mathematical, it is because they attempt to draw metaphysical conclusions

from logical calculi whose merit consists in the ease with which calculations can be performed with them, rather than in their ability to reveal the semantic structure of arguments and propositions.¹¹ But he is also convinced of the possible plurality of symbolic systems, applied to deduction itself, and above all of the superiority of his logical graphs compared to an algebra of logic (4.617. See Engel-Tiercelin 1991a: 190). In other words, the logician is not interested in reaching conclusions, but in *theories* about their relations to premisses (4.239, 4.370, 4.481 and 4.533). Hence the natural purpose of logic is "to analyze reasoning and see what it consists in" (2.532).

- 9 The business of logic lying in the "analysis and theory of reasoning," (4.134. Cf. 1.417, 4.242 and 4.373) this has decisive consequences. It means first that the realm of logic is widened so as to cover not only *deductive* reasonings but *inductive* and *abductive* seasonings as well; this is crucial for understanding Peirce's conception of logical and *scientific inquiry*. It also means that the aim of analysis as opposed to that of a calculus will be guided not by simplicity but, on the contrary, by complexity (as may be seen from the numerous steps involved in the graphic presentation), in order to reach the most basic and irreducible elements. It is precisely here that semiotic gets into the picture, for the business of semiotic is to explain "the gist" (2.532) or the "essence of reasoning," through the various functions exhibited by different signs, in order to discover the nature of arguments (1.575 and 4.425). Again, that logic should be concerned with reasoning makes it, more and more, a *normative science* (1. 577), and even a branch of ethics (1.611, 1.573, 1.575, 5.35 and 5.130), for every reasoning is the product of a deliberate and self-controlled thought (1.606; 5.130) "with a view to making it conform to a purpose or ideal" (1.573). Logical criticism should apply to *that* type of reasoning alone; this is also a consequence of the principles of pragmatism, according to which all thinking is a kind of conduct (5.534), so that reasoning is a kind of deliberate conduct, for which a man can be held responsible. Such a *normative* conception of reasoning is particularly decisive to understand the basic features of Peirce's theory of assertion as well as the principles governing inductive and abductive reasonings in the methods of scientific inquiry. (1.615) Finally, and not surprisingly, such a definition of logic as a science of reasoning implies an appeal of some sort to *psychology*. But, more precisely, in what sense?



- 10 Peirce's views on psychology and its relationship to logic are often taken to be, not only complex, but "puzzling, confusing, sometimes paradoxical, sometimes apparently contradictory" (Cadwallader 1975: 184). Indeed, "On the one hand Peirce often said that logic was not based on psychology and constantly criticized logicians who based their logic on psychology [...].¹² On the other hand Peirce seemed to contradict himself, for he also made statements which appear to say that logic should be based upon psychology."¹³ Cadwallader's hypothesis "to account for this apparent contradiction in Peirce's statements concerning logic and psychology has two components. The first involves a distinction between facts and theories of psychology, a distinction he pointed to in the *Minute Logic* (2.210). The second, also noted in the *Minute Logic*, involved the reconceptualization of the classification of the sciences. Both components seem necessary to clarify Peirce's views on the relationship between logic and psychology" (Cadwallader 1975: 184-5). This is true to a large extent, but somewhat more complex

too (see Tiercelin 1993a: 29-41, and 2006: 184). Six aspects of his position, at least, should be considered. In a nutshell:

- 11 1) First of all, it is undeniable, as Cadwallader was one of the first scholars to analyze in detail (1975: 168ff), that, throughout his entire life "Peirce wove psychology into all of his interests." In 1898, he noted that his "interest in philosophy grew out of his intense curiosity about cosmology and psychology" (4.2). "In fact, at one-point – when he apparently was putting pressure on President Gilman of Johns Hopkins to grant him a salary increase and perhaps to give him the unfilled chair in 'mental science,' as William James once referred to it (Fisch & Cope 1952: 363) – Peirce threatened to resign his position at Hopkins and said, 'Upon leaving the University I shall bid adieu to the study of Logic and Philosophy (except experimental psychology)' (*ibid.*: 279)," (see Cadwallader 1975: 166-7.)¹⁴
- 12 2) As can be seen from his very early texts, Peirce was absolutely against psychologism in logic, if it meant that logic should be based on or derived from any psychology in the (mainly Anglo-Scottish or German) sense of introspection, association, intuition, *sense data*, consciousness, *Gefühl*, faculties, etc.¹⁵ Generally speaking, the gist of the 1868 Papers is to ruin all the Cartesian and Lockean myths of intuition, introspection and "inwardness," the so-called foundationalist value of first principles, to show the irrelevance of a distinction between the internal and the external views of the mind, and to develop a basically externalist (inferential) conception of sensations, emotions and cognition in general, which is very close to what Wittgenstein will later on develop (Tiercelin 1993a, 1993b, 2000, 2005a and 2012) and will be more and more positively enhanced by Peirce, both on the epistemological and metaphysical levels, through his *social* conception of logic and his *dispositional* account of mental properties (Tiercelin 1993a, 1993b, 2005a).¹⁶ Peirce was very much opposed to the German introspective tradition based on such criteria as self-evidence or to their view that the ultimate test of valid inference is an immediate, instinctive feeling of rationality. Sigwart is associated with such a "*Gefühl-criterion*" (5. 85, 2. 232, 2. 210, 5. 329), as is Schröder (one of Sigwart's followers, according to Peirce (5.85)), who defines "logical consequence as a *compulsion* of thought" (3.432; original emphasis). Peirce also refuted the view, made popular by Stuart Mill, that logic-theoretic grounds were wholly borrowed from psychology: "Logic is not the science of how we *do* think; but in such sense as it can be said to deal with thinking at all, it only determines how we *ought* to think; nor how we ought to think in conformity with usage, but how we ought to think in order to think what is *true*" (2.52; original emphasis). In so doing, Sigwart "escapes the necessity of founding logic upon the theory of cognition. By the theory of cognition is usually meant an explanation of the possibility of knowledge drawn from principles of psychology [...] it is indeed a vicious circle to make logic rest upon a theory of cognition so understood" (3.432). Pearson was to be later on accused too of holding a theory of cognition "in which he fell into the too common error of confounding psychology with logic" (8.144. See Cadwallader 1975: 184-5). In other words, knowing how the mind works has no place in logic: "I contend that that propedeutic that is wanted for logic has no more to do with the psychological theory of cognition than logic itself is concerned with the psychical process of thinking. Even less if there were room for less" (2.63). So, by contrast with the "German theory of logic," supposing a non-cognitive faculty as final authority, Peirce claimed his linkage with the "English" or "objective

conception of logic" (2.185), which made the criterion of logicality state the condition of its own testing (2.153. See Tiercelin 1993a: 56-118).

- 13 3) However such anti-psychologism did not imply that certain *facts* of psychology had not to be taken into account, nor that Peirce would have been that hostile to a kind of project such as Dewey's, of a "natural history of thought" (cf. Dewey 1904: 220). On the contrary, Peirce found it necessary, both, not to use the "untrustworthy" psychology of introspection and to verify, for instance, that the deduction of categories was in keeping with "empirical psychology," as he writes in "On a New List of Categories" (1.545-559).¹⁷ If "all attempts to ground the fundamentals of logic on psychology are seen to be essentially shallow" (5.28), psychological information can be useful (2.710). "Logic does rest upon certain facts of experience among which are facts about men, but not upon any theory about human mind or any theory to explain facts" (5.110). However, as has been noted, the matter was made more complex, about 1902, by Peirce's reconceptualization of some of the sciences and their interrelationships" (Cadwallader 1975: 184; and Calcaterra 2006: 41-3). More on this below.
- 14 4) It is quite clear that Peirce had nothing against experimental psychology (in the sense of Wundt or Fechner),¹⁸ of which he was himself (even before W. James)¹⁹ an actor (Cadwallader 1975: 173),²⁰ and which he never gave up (Fisch & Cope 1952: 292).²¹
- 15 5) In order to understand the complexity of Peirce's position on psychology and, in particular, on the presence of both (often taken as contradictory), transcendental, or idealistic or normative elements on the one hand, and naturalistic elements on the other hand,²² it is also decisive to realize that Peirce developed a very original conception (partly inherited from his interpretation of the theories of evolution) of normativity and of the relations between norms and nature which allowed him to see logical laws and norms more as emerging from nature than as radically distinct from it, in the sense of a kind of natural logic and thereby to avoid, both subjective idealism and reductive naturalism (Tiercelin 1997). A few brief remarks are here in order.
- 16 1. First, it is true that Peirce is prone to a mixture of idealism and naturalism, as can be seen, for example, in his evolutionary cosmology, which has some strongly Schellingian accents, reminiscent of the fact that he was "born and reared in the neighborhood of Concord, at the time when Emerson, Hedge, and their friends were disseminating the ideas that they caught from Schelling, and Schelling from Plotinus, from Boehm, or from God knows what minds stricken with the monstrous mysticism of the East" (6.10). Peirce admits that "some cultured bacilli, some benignant form of the disease was implanted in (his) soul, unawares, and that now, after long incubation, it comes to the surface, modified by mathematical conceptions and by training in physical investigations." In such a project, ethical and religious considerations seem often to be on the same footing as logical or epistemological considerations. Cosmological speculations finally culminate in an evolutionary ideal, the course of evolution being described as "the growth of concrete reasonableness." Peirce evokes the power or efficacy of ideas (1.213), going so far as to say that there are "ideas in nature which determine the existence of the objects" (1.213). The growth of reason is seen as that of the *Summum Bonum* achieved through an esthetic contemplation of nature (1.615). Matter is "effete mind." Again, one of the main reasons for the introduction of tychism – the element of chance and indeterminacy (or firstness) in Nature –, in Peirce's synechistic (or continuous) metaphysics, is his opposition to materialism: one must prevent mind from being reduced to a simple illusion of the

material system (6. 61), which is often directly linked to religious ideas (6.613, 6.61 and 4. 611. See also Tiercelin 1997: 37).

- 17 2. However, it would be completely inaccurate to underestimate Peirce's intention to build a *scientific* metaphysics, namely,²³ not so much to follow a systematic or architectonic model (6. 604-608), or an empiricist model, or particular rules and methods, but rather, a form of life and duty: to reach the idea, by pursuing a disinterested life devoted to inquiry, that reality does exist, is as it is, independently of what anyone may think of it, although everyone is destined to discover it sooner or later, so long as he is rational, and places his efforts within those of a *community* of research: *Reality* (and its discovery) is the central concept of Peirce's *scientific* and *realistic* metaphysics, thus inseparable from some *normative* vision of rationality (Tiercelin 1997: 38).
- 18 3. Such a normative vision is precisely conceived as an *ideal*, an intellectual hope to reach, through the categories displayed by logic, a better understanding of what Cournot called "the idea of the order and reason of things" (1975, Tome II, Ch. XXV: 476); "Every attempt to understand anything – every research supposes, or at least *hopes* that the very objects of study themselves are subject to a logic more or less identical with that which we employ" (6.189). In that respect, and importantly, for Peirce, the only appeal that seems to be made to psychology remains subordinated to the categories, i.e., to logic. Hence, even if it is true that "the only possible way to explain the laws of nature and uniformity in general is to suppose that they are the result of evolution," and that "an evolutionary philosophy of some kind must be accepted" (6.604), yet, Peirce's cosmology or rather cosmogony (6.33) must remain formal enough and keep away from of any clearcut or reductionistic form of naturalism. In other words, if one is rational enough, and scientifically minded, he cannot fail, in the long run, to discover that reality is such as it is, namely, the growth of some concrete reasonableness which is finally following the action of love (agapism), the Golden Rule (6.288):

The agapastic development of thought is the adoption of certain mental tendencies, not altogether heedlessly, as in tychasm, nor quite blindly by the mere force of circumstances or of logic, as in anancasm, but by an immediate attraction for the idea itself, whose nature is divined before the mind possesses it, by the power of sympathy, that is, by virtue of the continuity of mind. (6.307)
- 19 Hence, Peirce's metaphysics leads, very naturally, to the idea of a living cosmos, mind and matter being viewed in a monistic way: "The one intelligible theory of the universe is that of objective idealism, that matter is effete mind, inveterate habits becoming physical laws" (6.25). The universe is not like the one described by the mechanists: it is animated by final causes, worked from within by concrete reasonableness. However, radical indeterminacy remains the dominant character of evolution. "Hence, the essence of reason is such that its being can never be achieved. It must always be in a state of beginning, of growth" (1.615. See also Tiercelin 1997: 40-1).
- 20 4. This is how the law of *habit* becomes the law of *mind*. Which means that, to a certain extent, the laws of logic *are* indeed a product of evolution, which is itself the growth of concrete reasonableness. And yet, logic and norms are not reduced nor reducible to nature. Why and how?
- 21 Precisely because of Peirce's very subtle conception of norms and rationality, worked out at length²⁴ and integrated into the doctrine of the so-called normative sciences,

which are part and parcel of science itself (5.39).²⁵ Logic being a normative science, makes it a particular problem of *ethics*, in turn, dependent upon *esthetics* (2.197), since the basic problem of ethics is not right or wrong, but "what I am deliberately ready to accept, as the statement of what I want to do" (2.198), which makes it a science of *ends*. Logic thus, very naturally, depends on it, since it too has to do with thinking as a deliberate activity and with the means to reach that end which is a valid well conducted reasoning. This explains why it is "impossible to be completely and rationally logical except on an ethical basis" (2.198), and why, too, both logic and ethics, in turn, depend on *esthetics*, which is the analysis of the end itself, and of the ideal one would be willing to accept and to conform to. Perfectly in keeping with the pragmatist theory of inquiry and with the view of reasoning as "thinking in a controlled and deliberate way" (1.573), logic is but "the theory of the establishment of stable beliefs" and "the theory of deliberate thought." There can be good and bad reasonings which may be submitted to criticism, for which we may be held responsible, since they are deliberate and controlled, and since, for a pragmatist, the way one thinks cannot be distinguished from the way one conducts oneself (5.534), thus from the way one is guided by a purpose or an ideal (1.573), i.e., that of the discovery of reality. Now, "being deliberately ready to adopt the believed formula as a guide for action" (5.27) must lead one less to a search for origin than to the determination of the norms and ideals that are to be chosen for the *future* conduct (5.35; 5.461), – which, incidentally, means that rationality should not be *reduced* to action nor to its practical consequences, for such a determination requires an endless exercise of self-criticism, becoming itself a kind of habit: "If conduct is completely deliberate, the ideal must be a habit of feeling which has developed under the influence of all a series of criticisms and hetero-criticisms; and the theory of deliberate formation of such habits of feelings is what should be meant by *esthetics*" (1.574).

- 22 There is indeed "a deep line of thinking" (Tiercelin 1997: 43) in such a Peircian conception of logic as a normative science, resting in the end on ethics and esthetics: if the phenomena of reasoning are, finally, in their basic traits, parallel to those of moral conduct, it is, because "reasoning is, essentially, just as moral conduct, a thought submitted to self-control" (1.606), is indeed, a reasoning (and not a mere inference) in so far as it follows rules or norms which we are able to judge, approve or disapprove. And yet, it forces upon us, which suggests that there is, in the norms themselves, something irresistible, which seems *self-evident*, as if they were imperatives or prescriptions which we follow, while lacking mere *deontological* power. Indeed, on the one hand, it looks as if the laws of logic do not owe their normativity to the existence of some type of special facts, of the laws of Being-True, describing some reality of which they would be indicative truths. On the other hand, the laws of logic are not mere psychological features of a system of beliefs which an agent has: rather, to claim that logical norms are normative means they belong to norms of *rationality*, that they are the rules that must be followed by an *ideally rational agent*; hence it is not so much a feature that a system of belief or an agent does in fact have, as a trait that governs our interpretation of a system of rational beliefs and behaviours of individuals. In other words, if we did not suppose that a subject or agent had some traits of "optimal" rationality, we *could not* interpret him. In that sense, rationality is not a datum, a given, an empirical fact which we could discover or not in a creature. It does not follow that we could not describe some creatures (humans, animals, machines) as being more or less rational or irrational. But even then, our various ascriptions of rationality are

relative to the norms of rationality which we accept: logical norms are inferential norms, governing what we *can expect* an agent to believe, *if he* has certain beliefs (for example, that he has no contradictory beliefs. See Tiercelin 1997: 44-5). Such an account teaches something important about Peirce's views on logic, psychology, norms and nature. In defining logic as the theory of the establishment of stable beliefs and as a normative science, Peirce shows that logic is concerned as much with beliefs and norms as it is with logical truths, thus avoiding both a straightforward Platonist (or Fregean) position and a psychologistic or naturalistic one.

- 23 In terms close to what Quine, Davidson or Dennett have now made familiar, Peirce takes it that we most often adopt a principle of charity, according to which the agent whom we interpret, has beliefs which are, according to our own standards, in general, true. Norms are due to the very truth of the agent's beliefs – otherwise, one could not understand their functioning as norms, namely, that they seem to have some kind of necessity (and self-evidence). In that respect, truth is not only a descriptive property of a statement or of a belief, it is also a normative property:²⁶ the fact that someone has a belief presupposes that one accepts such a belief as true, even if that belief turns out to be false. This close link between belief and truth – which was well formulated by Moore's paradox: one cannot say "I believe that *p* but *p* is false" – is expressed by Peirce when he stresses that it is somewhat redundant to say *p* is true and to believe that *p*.²⁷ As a consequence, the rationality of a system of beliefs obeying logical norms is not for Peirce a fact: neither a transcendent fact, in a Fregean sense, nor a natural fact, as psychologists think, when they try (cf. Mill or Bain) to reduce the laws of thought to the laws of human psychology and the latter to natural laws. Being norms, logical truths and rules cannot be deduced from or reduced to factual propositions bearing on the nature or constitution of individuals. However, their being so "irresistible" or self-evident is explained by evolution: it is so because they are the product of certain mental habits or dispositions which are the product of evolution, of that long history of interactions with our cultural peers, punctuated by habit-changes, through which they finally became reinforced or strengthened. This also explains why there is only a gradation between a "cerebral" habit, a belief, and a full-fledged judgement, why, in the long run, such habits which are "the logician maintains, [...] all adapted to an end, that of carrying belief" (3.161) become identical for everyone, and finally come to play a normative role, by *detaching* themselves from what has been previously believed (3.160-361). Briefly put, although the logical laws find their origin in mental operations, they rest on psychological acts which acquire, in relation to their origin, an autonomy and independence which detach them from it, and enable them to play the role of leading principles of the conduct of reasoning. At a certain time in inquiry, one no longer cares about knowing how one came to certain conclusions by such and such inferential acts (1.56). In that respect, our logical beliefs may well be the product of evolution and come from feelings of approval or disapproval which we feel after a long history of relationships with our peers. However, from the fact that such a general capacity to have referential systems and to approve them (or to view them as norms) has grown, ("we outgrow the applicability of instinct") it does not follow that one may derive the *content* of the inferential rules themselves from some evolutionary history. As far as such rules state certain ideals of thought and action, their origin becomes opaque, and it is such opacity which constitutes their normativity and rationality.

- 24 I hope Peirce's conception of logic is now clearer and that we understand better both its relation to psychology and the nature of Peirce's supposed radical

"antipsychologism." Indeed, logic is neither a science which would or could describe *directly* the processes of natural reasoning, as if one could merely transpose the rules of logic on the level of psychology, nor a science able to codify anything which were totally distinct from the steps of reasoning, as if logic were a pure abstract game of arbitrary rules. In that respect, Peirce avoids deriving the logical contents from some acts of the mind (and would consequently oppose, a straightforward naturalistic or evolutionary account of rationality or logic), but he also avoids a Fregean type position whose major well known difficulty is to leave unexplained the way in which logic can simply be *applied*.

- 25 6) The sixth element which helps us to make our ideas clearer about Peirce's complex views on such issues is also an important one. As a matter of fact, Peirce thought that, for Kant and most writers of the classical age, it was not so decisive to separate logic from psychology, in so far as, for them, logic, viewed as "the science of the forms of thought in general" was, despite its ambiguities, hardly different from "a logical analysis of the products of thought" (W1: 306 and MS 726). He always insists on relying on what is classically referred to (e.g. by Kant) as either "psychology proper" or as the "physiology of the mind" (1.579), "meaning an account of how the mind functions, develops, and decays, together with the explanation of all this by motions and changes of the brain" (8.303) to throw light on such phenomena as doubt, habit and belief and he even calls the general science of signs a "physiology of forms" (MS 478). Habit, "a general rule operating in the organism" (W4: 249) was indeed a concept of central concern to Peirce not only in his famous 1878 paper "How to make our ideas clear" (5.388: 410), which demonstrates how habit is "the very market place of psychology" (7.367), but also how psychology (covering habit, doubt, belief, sensation, emotion, the various kinds of (abductive, inductive, deductive) inferences, but also the physiological analyses of habit, that "general rule operating in the organism" (5.594 and W4:39), of "protoplasm," of the various stimulus to action, to perception together with the psychology of learning) is fully integrated into pragmatism, and throughout Peirce's life (Cadwallader 1975: 170), as the 1891-93 *Monist* series ("The Law of Mind" (6.102-163), "Man's Glassy Essence" (6.238-271)), or his unpublished *Grand Logic* (1893) and the 1898 *Cambridge Lectures* (7.468-517) clearly show.
- 26 As a consequence, one may safely conclude that Peirce's antipsychologism never went so far as to deny *all* facts of psychology. On the contrary, since logic is a *positive* science – contrary to mathematics, which is a science of pure *hypotheses* – it may, or even must, take into account certain facts (such as doubts, beliefs, etc.) or certain indubitable observations concerning mind: "Formal logic must not be too purely formal; it must represent a fact of psychology, or else it is in danger of degenerating into a mathematical recreation" (2.710. See Tiercelin 1991a: 191). However, if such observations are indeed psychological, they must not be interpreted as observations to be made *only* by empirical or experimental psychology. They pertain to our everyday phenomenology or, rather, "phaneroscopy." Indeed, "they come within the range of every man's normal experience, and for the most part in every waking hour of his life" (1.241), and are such that they constitute "the universal data of experience that we cannot suppose a man not to know and yet to be making inquiries" (4.116). Among these universal data is the fact that every reasoning is governed by an aim ("holds out some expectation" (2.153)), proceeds by iconic constructions, and assumes certain belief-habits which operate like leading principles or rules of inference, etc. Otherwise, logic would be confined to a grammar limited not only to abnormal but to non-

scientific or irrational men (5.438-63 and 5.502-37). Thus, when Peirce claims the possibility and the duty for logic to account for such psychological facts, it is because "under an appeal to psychology is not meant every appeal to any fact relating to the mind" (2.210).²⁸



- 27 After sketching the basic components of Peirce's views on logic and psychology, which, hopefully help to clarify Peirce's complex attitude towards psychologism and antipsychologism in logic, I would like to suggest, briefly, as a conclusion, how and why such an original approach has positive impacts and is still relevant today. Indeed it is because of such a wide-ranging definition of such concepts as logic, psychology, but also normativity, rationality, nature, habit or mind, that Peirce considered he had the right tools to conduct original inquiries in several areas:
- 28 1. In logic and semiotic, first, Peirce went through the analysis of the various kinds of signs involved in reasoning and of the various modes of inference. From 1867 until the end, Peirce considered that the various analyses of Semiotic should take account of three levels (terms, propositions, arguments), this level being itself decomposed, for terms, into icons, indices and symbols, for propositions, into true, false and doubtful, for arguments into deductions, inductions and abductions, while admitting that "the relation between subject and predicate, or antecedent and consequent, is essentially the same as that between premises and conclusion" (4.3) so that, finally, the distinction between terms, propositions and arguments turned out to be less false than useless, (2.407n1 and 3.175) since the basic relation was the illative relation (CP 3.175 and CP 2.44n1). On the three types of inferences, and in particular on abduction (Tiercelin 1993b, 2005b), and deduction (see Hintikka 1980 for his famous distinction between the corollarial and the theorematic), the importance and relevance of diagrammatic reasoning and of formal images or icons in deduction,²⁹ Peirce made fantastic contributions: by stressing the structural (and not only psychological) necessity of icons in reasoning, he showed a fundamental aspect of deduction, often omitted by the cognitivist models inspired by a Fregean-Russellian view of logic; namely, that our reasonings are structurally governed by semantical rules, and that it is thanks to such rules that people build what Ph. Johnson-Laird (1983) calls "mental models" of the premisses, and look for models of the conclusion (Tiercelin 1991a: 61-4, and 1995). Again, Peirce's concern with iconic procedures in reasoning is also related to his effort to think of formal logic within a semiotic which remains sensitive to the semantic (symbolic and iconic) aspects of logic, thus entertaining the possibility of an iconic logic (Hintikka 1980) and stressing the necessity of associating symbolic and iconic procedures (see Peirce's efforts towards a graphical or algebraical presentation of formal logic). Hence a fine balance between some connexionist views of cognition – the account of the formal structures of perception, of icons, of the importance of slow thinking – and a rather classical cognitivist approach – his criticism of associationism, of images conceived as pictures, his account of representation within the framework of a mental language, etc. Peirce seems to have been aware of one of the still major concerns in cognitive science: how to find a third way, mid-way between a classical symbolic account and a connexionist view, finally too close from associationism, which,

while bringing a remedy to their respective defects, would be able to reconcile both approaches (Tiercelin 1995)?

- 29 2. Peirce quickly realized too what a revolution the medievals had accomplished in the domain of the reflexions between thought and language, and that it was in their works (more, finally than in Locke's representationism)³⁰ that he was most likely to find the rhetorical means he needed to work out what he had himself called, following, beside the medievals, the inspiration of both Kant and Boole,³¹ a "logical analysis of the products of thought."³² The scholastics too had "the habit of thinking in signs" and knew that thought "is of the same general nature" as a sign, as Peirce wrote in 1871 about Ockham in the *Frazer's Review of the Works of Berkeley* (W2: 472): hence a possible extension of the sphere of logic from the too narrow Kantian and psychologically ambiguous sphere of "concepts" to symbols (W2: 56), a fine distinction between Grammar (and the traps of ordinary language) and logic (W2: 56), so as to avoid "any intrusion of the psychological in the logical" (W1: 164) and the ambiguities of the Kantian "faculties," while preserving the benefits of a Formal Grammar which Peirce never objected to identify with "an art of judging," with Kant's *Transcendentale Elementarlehre*, with an *Erkenntnistheorie* or even with epistemology (2.206. See Tiercelin 2006: 163-4):³³ a confirmation that Peirce's antipsychologism was never as strong as Frege's or Wittgenstein's: at least, it did not imply that the theory of knowledge should be discredited because of its compromissions with psychology. If Peirce abandoned the issues about the foundations or origins of knowledge, it was to concentrate on the problem of its justification.³⁴ How is synthetical judgment in general possible? On what is grounded the validity of the laws of logic? In leaving to a Formal Grammar the task to analyze the relation between thought and meaning, Peirce followed the Modistic inspiration, and announced, in a way, Husserl. But, contrary to Husserl, if such a Grammar was to study what must be true of all the representamen in order that they may embody meaning (2.229), it did not concern the mind as consciousness (were it transcendental), but thought in general.
- 30 3. Finally, if Peirce's sophisticated analyses are still so relevant today, it is because of the wide ranging model of the mind they suggest, not only through the thought-sign theory, but more generally, through a naturalistic though non reductionist approach of intelligence, normativity and rationality, mind and matter, norms and nature. Indeed, it is crucial to see what the neutrality of the new model of the mind allows: If it is true that "thought and expression are all one" (1.349), "so that it appears that every species of actual cognition is of the nature of a sign," then "it will be found highly advantageous to consider the subject from this point of view, because many general properties of signs can be discovered by a set of words and the like which are free from the intricacies which perplex us in the direct study of thought" (7.356).
- 31 It is just as crucial to see that mind, for Peirce, is never reduced to a first person point of view: consciousness is superfluous, subjectivity is synonym of mystery ("man's glassy essence"), of error (5.313), and incompatible with logic being grounded in the social principle.³⁵ Like Parfit, Peirce believes that survival counts more than identity, or that identity is as much present in one's books than in one's petty self or any physiological unity (7.584-5): it is a unity of symbolization (7.592-594), public and not private (7.592). The adoption of such an external or a third person stance (which has, at times, functionalist accents and is not far either from some Dennettian remarks on "intentional systems") explains why Peirce took very seriously the hypothesis of

thinking *machines*³⁶ (while pointing the limits of such a model too), and also considered that "thought is not necessarily connected with a brain. It appears in the work of bees, of crystals, and throughout the purely physical world, and one can no more deny that it is really there, than that the colours, the shapes, etc of objects are really there" (4.551). Mind cannot be reduced to the brain (see Peirce's ironical remarks on the the psychologists' s attempt to reduce mental states to purely neurological states (7.366)): it is exemplified by Thirdness, or a triadic relation (1.537), i.e. a relation which, contrary to a rude dyadic relation such as is proper to the phenomena of automatic regulation (1.220 and 5.473), involves some meaning (1.343 and 8.331), intentionality, or final causation (1.269 and 1.538), thus showing the inexhaustible character of meaning (1.343), a category which is precisely wide enough not to be limited to the *human* mind (as the example of the sunflower testifies, which is a purely generic manifestation of nature itself). Peirce took the natural/artificial distinction to be just as inadequate as the mind/matter distinction. Indeed, "what we call matter is not completely dead but is merely hidebound with habits" (6.158).³⁷ Thus there is no need to see a basic difference between a machine that works upon a logical design and an instrument of experimentation such as a cucurbit: both are the same in so far as they are instruments of *thought* – that is to say as soon as we consider what they are intended for. Hence there is no difference in nature but only in degree between simple instruments that may be held as mere continuations of organic activity and such perfectionate mechanisms, which we are perhaps too quick in judging revolutionary or raising fundamentally new problems concerning the mental.

- 32 Even if one is at times tempted to take such views as deeply idealistic, they should rather be taken, as I have shown elsewhere (Tiercelin 1998b), as part and parcel of Peirce's deep metaphysical conviction of an affinity between mind and nature (6.307 and 6.315), which it might be worth while exploring further through some more recent models such as the ones provided by Ellis, where logical principles as mere rational idealizations of our systems of beliefs, (Ellis 1979; see Tiercelin 1997) or the various teleosemantic projects (Millikan 1984; and Dretske 1988. See Tiercelin 1998a). But to a certain extent too, the most faithful (and maybe also the most insightful) model Peirce was trying to pursue was the one which Murphey already suggested (1961: 46), and which was also put forward by Nozick (1997: 112), namely, the "middle course" suggested (but abandoned by Kant) as an explanation of the links between our logical categories and the domain of empirical experience. Indeed, this might explain why Peirce could feel he was the spiritual son of Kant: for Kant was a "somewhat confused pragmatist," and "the thing in itself" was "something to abjure from the bottom of one's heart." But all the same: Kant had seen "the inseparable link which exists between rational knowledge and rational finality" (5.412). So why not follow his suggestion of a "system of preformation of pure reason" a system which, mid-way between a purely empiricist and an *a priori* starting point, might nicely explain how intelligible norms can somehow emerge from our empirical nature? I offer this as a possible clue to Peirce's description of his own intellectual development as that of "a pure Kantian," who was simply forced "by successive steps," into Pragmatism.

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NOTES

1. The following abbreviations will be used in this article for Peirce's works: CP, followed by volume and paragraph number, stands for *Collected Papers of Charles Sanders Peirce*, ed. Charles Hartshorne, Paul Weiss, and Arthur W. Burks, 8 vols., Cambridge, Mass., Harvard University Press, 1931-58; W, followed by volume and page number, for *Writings of Charles S. Peirce: A Chronological Edition*, 8 vols., ed. Peirce Edition Project, Indianapolis, Indiana University Press, 1982-2010; MS, followed by manuscript number and page number, for the unpublished manuscripts in the Houghton Library of Harvard University, as catalogued in *Richard Robin's Annotated Catalogue of the Papers of Charles S. Peirce*, Amherst, University of Massachusetts Press, 1967, and "The Peirce Papers. A Supplementary Catalogue," *Transactions of the Charles S. Peirce Society* 7, no. 1, 1971. References preceded by NEM are to Peirce's *New Elements of Mathematics* ed. by C. Eisele, Mouton, The Hague, 1976, 4 vols., by volume, tome and page number.
2. "There is indeed no consensus among philosophers as to what psychologism amounts to," M. Kusch notes (1995: 5) who identifies no less than eleven psychologistic schools for the period 1866-1931 in Germany (1995: 93-119).
3. I have tried to do this on several occasions. See in particular Tiercelin 1984, 1985, 1986, 1991a, 1991b, (1993a: 27-118) and (1993b: 14-28).
4. "Always separate sharply the logical from the psychological, the objective from the subjective" (Frege 1884: x).
5. For a good account of Peirce's approach to quantification, see Martin 1980; and Thibaud (1975: 84ff).
6. Cf. 1.192, 1.227, 1.444, 1.529, 2.93, 2.227, 4.9, 6.129 and 5.488. On Peirce's insistence on the "formal" character of semiotics, see NEM IV: 20-1 and 54.
7. Engel-Tiercelin 1985; see also Burks (1943: 188).
8. Tiercelin 1991a, 1991b and (1995: 37-8).
9. Hence, any proposition can be looked upon as a mathematical theory and used for mathematical reasoning. Therefore philosophy may be rendered mathematical (MS 438). See Hookway (1985: 182ff).
10. For a good account of the acritical character of mathematics, see Hookway (1985: 183ff).
11. Peirce was not himself completely immune from the Platonism which he denounced, especially in his philosophy of arithmetics. There would be a lot to say here about the way Peirce uses his Scotistic realism as a better candidate than Platonism for a convincing realistic approach to mathematics. See Tiercelin 1993c, and 2010.
12. E.g.: "logic does not rest upon psychology either much or little" (Ms. 633), "my principles absolutely debar me from making the least use of psychology in logic" (65.157), and "the Logician is forbidden to appeal for support to Psychology Proper" (Ms. 645). "Sigwart [...] makes the fundamental mistake of confounding the logical question with the psychological question" (5.85). See also Peirce's frequent criticisms of J. S. Mill – e.g., 2.47.
13. Cadwallader (1975: 184-5): "Thus, two versions of notes for a lecture in a series of 60 lectures are entitled 'Physiological and psychological basis of logic' (Ms. 745). These notes might well have been written by a physiological psychologist last week. Although these are the clearest such

statements in that they specifically use the phrase 'psychological basis of logic,' Peirce's statements concerning the nature of logic abound with statements linking logic to psychology: 'logic is the theory of thinking' (Ms. 634), 'The real laws of logic are implanted in the human mind, and an absolutely bad argument would violate the laws of mind' (Ms. 413), 'In its broader sense, logic is the science of the necessary laws of thought [...] also of the laws of the evolution of thought' (1.444), 'I [...] make the business of logic to be analysis and theory of reasoning,' (4.134) 'Logic may be defined as the science of the laws of the stable establishment of beliefs' (3.429)."

14. While in the middle of the nineteenth century the *philosophical* approach was in Europe, the most important, attempting, in the footsteps of the Cartesian tradition, to relate physiology to psychology (cf. Alexander Bain's *The Senses and the Intellect* or Spencer's *Principles of Psychology*), in America, one popular tradition (though with little direct input into academic psychology) was phrenology. Peirce, while a teenager, had the "bumps" on his head read by a phrenologist (Ms. 1555). "One of phrenology's close relatives, physiognomy – and especially that of Lavater – was one of the sources of Peirce's interest in psychology" (Ms. 1606. See Cadwallader 1975: 169-70).

15. See W1: 63, W1: 164-7, CN 1: 23-37, CP 1.310, CP 2.40-43, CP 2.47, CP 585, CP 5.157, CP 5.244-9, CP 5.265, CP 7.376, CP 7.419-25, CP 8.144, MS 633 and MS 645. Cadwallader (1975: 170-1): "The dominant psychology in America was a blend of theology and philosophy and in the hands, for the most part, of the minister-college presidents. Such psychology as there was, typically, was taught by the minister-presidents of colleges. Representative works of this period are those of Laurens P. Hickok (1798-1888; president of Union College), *Rational Psychology* (1849) and *Empirical Psychology* (1854), and of Francis Wayland (1796-1865; president of Brown), e.g., *The Elements of Intellectual Philosophy* (1854). Peirce appears to have been the first writer in America to begin tolling the death knell of the "old" psychology as the psychology of Porter and McCosh was later to be called. See Peirce's Review of Porter's *The Human Intellect* (*The Nation*, 1869, 8, 211-3), or his Review of James Mill's *Analysis of the Phenomena of the Human Mind* (edited by John Stuart Mill) (*The Nation*, 1869, 9, 461-2)." Peirce castigated those of the Scottish and English "schools" for failing to follow the lead of Wundt and other German psychologists in their attempts at "a systematic course of observations and measurements" (461) and "to put psychology upon a basis like that of the physical sciences" (462).

16. So I fully agree with Calcaterra stressing that "the methodological criterion of externalism is one of the most recurring aspect of Peirce's philosophy," and that "its implications are different in relation to the various contexts he applies to. In particular, externalism constitutes both an alternative option to psychology as an analysis of the mind based on introspective criterion, and an approval of experimental psychology à la Wundt. In addition, it may represent a methodological and theoretical perspective calling for an approach to the normative level of rationality that is quite different from Kant's definition as it is envisaged in his own formula of "anti-psychologism" (Calcaterra 2006: 36-7).

17. See Cadwallader (1975: 169-70): "From perhaps 1860 onwards, one can see an increasing focus on psychological topics in Peirce's writings."

18. Peirce was apparently the first in America to grasp the significance of the "revolution" operated by Wundt (1832-1920) and Fechner in Germany. He started reading Wundt as early as 1862 (Ms. 326: 1, 8.196 and 7.597).

19. "Peirce, rather than James, should be considered 'America's first modern psychologist'" (Cadwallader 1975: 173-4). In particular James, "published nothing in the nature of a psychological experiment until 1881." Cadwallader claims to have also "presented evidence that Peirce's 1877 psychophysical experiment was the first in that or related psychologic traditions and suggested that, at least on the basis of a comparison with obvious alternative candidates and an examination of the most like sources of earlier published experimental studies, that Peirce was the earliest American experimental psychologist" (1974: 10, and 291-8).

20. See "On the Theory of Errors of Observations" (1873) in which Peirce relates behavioral errors to neural errors. In 1875, Peirce obtained two grants from the National Academy of Sciences. One, for the study of color and the other, for for the *comparison of sensations*. See "Note on the Sensation of Color" (*The American Journal of Science*, 1877, 113 (3rd series, 13), 247-51) and his only published book, *Photometric Researches* (Leipzig, Wilhelm Engelmann, 1878. Vol. 9 of *Annals of the Astronomical Observatory of Harvard College*). In 1884 Peirce and J. Jastrow published their important paper "On small differences of sensations (*Memoirs of the National Academy of Sciences*, 1884, 3, 73-83 (7.21-35)). "It is clear that Peirce founded the experimental tradition in psychology at Hopkins, as Jastrow, who was Peirce's student at Hopkins before Hall arrived, explicitly stated" (Cadwallader 1975: 175-6). See Jastrow 1914, and 1916. Beside Jastrow, Peirce had others as students and/or members of his *Metaphysical Club*, who became prominent as psychologists: John Dewey, J. McKeen Cattell, and Christine Ladd-Franklin. Not only did Ladd-Franklin's interest in logic stem from her contact with Peirce, but Cadwallader has found evidence that "her interest in visual processes in general and color processes in particular" had also to be linked to Peirce's (Cadwallader & Cadwallader 1974).

21. And of course, see the 1868 papers, the 1878-79 papers: "How to Make our Ideas Clear" and "The Fixation of Belief." In addition, see 8.196, 7.597, MS 891, MS 919-30, W3: 111-37 and W3: 382-493.

22. Here I partly disagree with Hookway: "Perhaps the most distinctive feature of his philosophical system [...] is, from his earliest work, a total repudiation of naturalism, and a defence of epistemology (Grammar and Logic) as a prior philosophy" (Hookway 1984: 2).

23. See Tiercelin 1999, and 2003.

24. See Tiercelin (1993a: 335-84).

25. While being "positive," since their assertions (in logic, ethics or esthetics) rest on facts of experience which force themselves upon us (5.120), the normative sciences are not practical sciences – indeed, Peirce is eager to separate ethics from practical or "vital" concerns, (see, for ex., Peirce's first *Cambridge Lecture* (1898) in Ketner & Putnam 1992) – because their object is analysis and definition. So they are the purely theoretical sciences of purpose, of purely theoretical purpose (1.282).

26. Such views have been developed by Engel (1991: 306-20).

27. See 5.416. For a more detailed presentation of Peirce's position on truth (and its proximity with Ramsey), see Tiercelin 1993b, 2005a, and 2014.

28. On the complexities introduced by the growing importance of phenomenology or phaneroscopy in Peirce's new classifications of the sciences, and its implications for psychology, see the nice remarks by Cadwallader (1975: 185-6) and Calcaterra (2006: 42-3).

29. 2.247, 3.434, 4.127, 2.278, 4.530-5322, NEM.IV: 318, 3.363, 2.279, NEM.IV: 38, 47-9 and 288, and NEM.III, II: 749.

30. See W1: 172-4. Short (2004: 216).

31. On the importance, then, of Boole who, like him, "plainly thought in algebraic symbols" and did not regard "thinking as consisting not necessarily in talking to oneself," see Tiercelin (1993a: 42-6). See NEM 3/1: 161, 191, 227, 298 and 313-314, and W1: 404. Indeed, in Peirce's use of signs, there is, first, the habit or even reflex of a mathematician, which will lead him to think in diagrams, with one regret only: not to be able, because of the "great cost of the apparatus" that would be needed, to think 'in stereoscopic moving pictures' (*ibid.*). Thus, from the outset, Peirce's use of signs is linked with something more than practical convenience: it is the idea that one can raise such a usage into a method; this is why he wrote that "by pragmatism is meant a philosophy which should regard thinking as manipulating signs so as to consider questions" (NEM.III.I: 191).

32. For more details on the nature and aims of this project, see Tiercelin (1993a, in particular 27-57).

33. So logic could be said (as early as the *New List*, dated 1867) to treat of second intentions as applied to first" (W2: 56). On the advantages of such a view, the adoption of the formal (unpsychological) method of abstraction made possible by the various uses of Okham's theory of suppositio, and the way in which it provides a systematic analysis of the sign-relation within the framework of a radical "semiotization" of the mental, but also, in turn, of an irreducible "mentalization" of the sign, from which he may safely draw the unpsychologistic implications of the view that "we have no power of thinking without signs" (W2: 213), see Tiercelin (2006: 165-8).

34. Such an attitude is, in my view, typical of the pragmatist attitude towards knowledge and, as a corollary, towards scepticism, as I have shown in Tiercelin 2005a.

35. If we wish to analyse mental phenomena, the best way to do it is to look without more than within (be it a self or a brain), namely into signs and semiotic activity (7.364, 7.583, 5.283, 5.314, and 6.344). On Peirce's emphasis on the superfluous character of a self or of a consciousness, see 5.462, 7.572, 8.225, 5.237, and 1.673.

36. Very early, Peirce saw not only what practical lessons but what philosophical and methodological lessons could be learned from a comparison between not so much the thinking as the reasoning process of the machine and that of man. "Precisely how much of the business of thinking a machine could possibly be made to perform, and what part of it must be left for the living mind, is a question not without conceivable practical importance" (NEM.III.I: 625, NEM.III.I: 629-30, NEM.IV: 354, 2.56-59, 5.440, and 5.480). On all these points and on the possible links between Peirce's semiotic model of the mind and contemporary approaches in artificial intelligence and cognitive science, see Tiercelin 1984, (1993a: 223-57), and 1995. More recently, see Skagestad 2004.

37. All matter is really mind, (6.301) "not completely dead, but merely mind hidebound with habits" (6.158). See 6.255, 6.256, 6.262-264, 6.274, 1.402, and 6.36.

ABSTRACTS

The aim of the paper is to try and make one's ideas clearer about such concepts as "logic," "psychology," "mind," "normativity," rationality," as they were conceived by Peirce, in order to elucidate his genuine position as far as the relationship between logic and psychology is concerned, whether he was or was not a straightforward "anti psychologist" in logic, and from such analyses, to make some suggestions about the contemporary relevance of Peirce's original views on such issues.

AUTHOR

CLAUDINE TIERCELIN

Collège de France

claudine.tiercelin[at]college-de-france.fr