C.S.Peirce - A Life

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C.S.Peirce was born 1839 into the Brahmins of Massachusetts, admittedly but a provincial gentry at the time, but of formidable local import. His father was the distinguished Harvard Professor of mathematics - Benjamin Pierce, who wielded considerable power at the National level of the admittedly small scientific community which was what the States could boast of during the middle of the 19th century. The elder Pierce brought up his promising son as a genius, encouraging not only his scientific ambitions but also his philosophical, instilling in the impressionable youth the ideas that he was the equal, if not the superior of the great classical philosophers of the past. Such praise and such expectations must have encouraged the natural arrogance of the younger Peirce. He was a student at Harvard, and did poorly in fact, placing very low on the linear ranking of the students, the custom of which was usual at the time. Many explanations can be adduced to explain this paradox, and the usual ones center on the inadequacy of traditional school education to accommodate real talent and originality of mind, an explanation that curries favour with the great majority of people, whose own indifferent performance can thus be interpreted as an indication of superiority, or at least such explanatory schemes provide a palliative against bitter memories of humiliation. The author brings up the case of Einstein as another instance of genius being unappreciated at school, and speculates that similar neurological factors may be at play. However, the example is poorly chosen, as it turns out that Einstein did very well at school, at least in the subjects that interested him, showing that even old-fashioned pedagogy could recognize and encourage talent whenever encountered[1]. The author puts a lot of emphasis, as did Peirce himself in later age, on his neurological peculiarities such as manifested by congenital left-handedness. Peirce always claimed that he was deficient in imagination and that he had great problems in linguistic expression, defects that he derived from his peculiar neurological architecture. Such admissions invariably entail a significant amount of coquetry and should be taken with a grain of salt. A more mundane explanation could be that Benjamin Peirce took on the

[1] What decides the quality of schooling is not the pedagogical schemes that may or may not be in effect, but the intellectual and human qualities of the teachers themselves. Intelligent and knowledgeable teachers, with a firm command of their subjects, and a genuine interest in the minds of their charges, are the best guarantee of a successful educational system. It is a common misconception that teaching of the past was dominated by route learning more often than not imposed under threat of corporeal punishment and intellectual humiliation. It would be rash to deny the presence of many to us deeply offensive features in the teaching of the past, some of which were of course abominable, some maybe less so, as any effective pedagogical tradition needs to contain counter-intuitive elements. Interesting in the context is a certain correspondence course in chemistry which took pains to guide the student to self-discovery, and to which Peirce was subjected at a rather tender age, showing that progressive and sophisticated pedagogical initiatives are not the exclusive prerogative of the modern age.

major responsibility of his sons education, with the result that the latter simply ignored aspects that did not interest him. It is a rather big difference between failing due to lack of effort or lack of ability. Also, the motivation to perform on a uniform level was much less, as paradoxically modern schools with their emphasis on mediocrity have become far more competitive in the sterile sense than their much maligned predecessors, as ceilings on performances have led to a far more rigid system of scholarly promotion. Peirce could be rest assured, no matter what, that he would be allowed to continue an academic study, admittedly ultimately because of his fathers influence. Anyway the evidence available is far too scant to address this general question of poor scholarly performance in this particular case.

The intellectual awakening occurs at the end of your teens, if it occurs at all, and by your early twenties it might be at its most fervent, when you are receptive to many new ideas and when you set paths to which you will remain true the rest of your life. This is also the time of making life-long friendships, many of which will turn out to be crucial to your future career. Peirce was no exception. Early on he decided that logic would be his ambition in life, and he did lead an intellectually rewarding social life, participating in the debates of the Metaphysical Club, where later luminaries such as the future psychologist William James and the future Chief Justice Holmes did take an active part[2].

Philosophy and philosophical speculations did at the time enjoy high intellectual status, not to say the ultimate accord. William James was not, as one may be tempted to believe a psychologist who at the end of his life drifted into philosophy, but was always a philosopher, to whom psychology was but a digression. (Then it is quite another thing that he as a psychologist was first-rate, while only second-rate at best as a philosopher.) The reasons for that are not hard to divine. The 19th century saw the rise of universities and the concomitant professionalizing of education, creating what never existed before, namely a critical mass of educated people. The scientific revolution is usually placed at the 17th century, and the age of enlightenment during the next, but their practical applications and implications did not become manifest until the 19th century, when the real explosion of knowledge took place. A true revolution involves conflicts, not resoluble through compromise, one thing has to yield in order for one thing to prevail, and the supreme intellectual conflict of the 19th century was Religion against Science. This conflict has often been trivialized in modern recounting, presenting a picture of a conservative clergy trying in vain to stem the tide of modernity and progress to lead to a Brave New World here and now. In effect, a large part of the educated elite consisted of clergymen, many of whom did pursue scientific interests on the side[3]. And more importantly religious sentiments did play an important role also in the minds of the path-breaking scientists [4]. In fact it was an exalted age, taking issues with the fundamental questions. In fact a religious education applied to

[2] According to the author, there is some doubt as to the actual existence of such a Club, reminiscent of the Apostles in Cambridge, suggesting that it might simply have been a disingenuous retroactive invention of Pierce who later would revive it at Johns Hopkins. The absence of minutes and other documentations makes it hard to effectively quench such suspicions.

[3] The crucial role played by clergymen in the development of Natural History and Geology is well documented by such historian of science as Rudwick.

[4] The professed piety of a Darwin may to some extent been a concession to the conventions of the times

the intellect of a searching mind will ultimately instill a deep interest in philosophy often of an exalted nature. And indeed the age was noted an exalted one, in which literature, music and the arts, played a far more crucial role than they do nowadays. This was really the age in which Shakespeare attained his almost divine status, and it was assumed that any educated being should try his or her hands at writing poetry, the fruits of which along with those of the real bards, not infrequently were read out aloud. As to arts such as music and the visual, great store were set at technical accomplishment, and one suspects that among the educated classes the prevalence of accomplished performers on the piano say, or skilled draughtsmen were far higher than today. In addition to that one should consider the language competence which were not just confined to the classical and extinct but also included modern tongues. An educated American was expected to master both French and German, otherwise he was doomed to ignorance, because most scientific findings were presented in either of those two languages. In such an intellectual milieu philosophy did enjoy pride of place, in fact unifying the most diverse callings, such as science, theology and law. But not even philosophy was immune to the vagaries of fashion, and the most fashionable philosopher of the 19th century was Hegel, whom you either tended to hate or love,but to whose metaphysical ambitions you could not stay indifferent. In fact the latter history of philosophy entailed a violent reaction towards the grand metaphysical speculations of a Hegel, a reaction towards which Peirce would contribute significantly by his pragmatic approach[5]. Ironically the expulsion of metaphysics proved the downfall of the academic status of philosophy, which during the 20th century fragmentized into technical subdisciplines, and rather than being at the vanguard of scientific exploration it became reduced to playing a subsidiary commenting role of pedantically trying to make sense of discoveries the scientists were too busy making. Such tendencies were of course already discernible far earlier, but only defined as such by hindsight.

At the time of Peirce coming of age, academic positions were still relatively few and far between, especially in the United States, although at the second half of the century many excellent institutions of higher learning would be established on German models. Peirce's relations with the upcoming President of Harvard - Eliot, were not the best making a natural academic career at Harvard problematic. Instead Peirce was drafted into the Coastal Survey, a connection he would maintain for thirty years[6] . Clearly his father, who in addition to his academic position at Harvard also was head of the Governmental agency, did play a crucial role in the appointment as well as in the rapid promotion of his son which smacks of nepotism. The appointment to the Coastal Survey was clearly meant to be a sinecure, supplying Peirce with a steady income setting him free to pursue his real philosophical ambitions, but there were duties involved, which Peirce took seriously if not always consistently so. Anyway his association with the Coastal Survey exposed him to a wide variety of practical and experimental sciences, inciting his curiosity as well as

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in general and the sentiments of his wife in particular, but no real paradox will be present in assuming that some of that piety was genuine if unreflected on.

[5] Although the enmity towards Hegel was never as strongly expressed by Peirce as it was by James.

[6] Peirce, whose family members, especially his father, were by todays standards virulently racist, considering the Blacks along with the Irish, congenitally mentally defective; predictably did not espouse the abolitionist cause, and was able by pulling influential strings, evade being drafted into the Civil War.

honing his skills, and also, one tends to suspect, influenced his pragmatic approach to the problems of philosophy. The main preoccupation was with the gravimeter the purpose of which was to as accurately as possible to measure the variance of the gravitational field with the aim of estimating the precise shape of the Earth - the science of geodesy. This involved a lot of drudgery, both as to the regular observation of the instrument as well as the necessary computations; but in the beginning of his career he had assistants to do this job[7]. But it also invited theoretical investigations into sources of error, the backbone of every experimental science, and Peirce were able to make internationally acclaimed contributions to this field. Contributions which, in addition to the lobbying of his father, must have ensured him membership in the august National Academy of Science. In addition to his work on gravimetry Peirce acquired expertise in a wide range of scientific subjects, such as the applications of chemistry and physics to geology, meteorology, and anything practical involving non-trivial computations and mathematical skills. An expertise which would be quite useful in his later career as a professional reviewer[8]. Peirce designed new map-projections and also was the first to suggest how one could define the unit of length through spectroscopy in the sense of the accurate measure of wave-lengths of light.

Personally the life of Peirce was stabilized by his early marriage to Melusina Fay (known affectionately as 'Zina') in 1863. She was a slightly older woman, pursuing her own career as a suffragette, and who could well appreciate his intellectual gifts and who provided an emotional anchorage, for which he had a great need. Peirce was indeed unstable. His health was precarious, but as with many people of apparent fragility basically robust as his survival into mature old age would prove, his sufferings being more in the nature of psychosomatic afflictions than real physiological defects, although the former can be debilitating enough. Painful neuralgia was his curse, an irritation of cranial nerves that incapacitated him for days on end and probably led to drug dependency. In addition to his naturally arrogant demeanour, encouraged by his father and his appreciation of his own genius, he was further prone to uncontrollable rages, and it is quite likely that he abused his wife not only verbally. Such temperament is not incompatible with great personal charm, and it is quite likely that his wives suspicions of intermittent infidelity were not entirely unfounded. Add to this a certain extravagance in lifestyle, dressing well[9] and living above the means provided by the rather modest remuneration of the Survey. And finally if this would not be enough, Peirce has also been suspected of having suffered from a polar disorder, i.e. what formerly was referred to as a Manic-Depressive psychosis. True the life of Peirce was marred by bouts of depression, but considering the circumstances it is not so much the depression that is remarkable, as his ability to work through them. As to manic episodes one could refer to his inability to properly manage his affairs.

The first tentative declines in the fortunes of Peirce were detectable by 1874 when his

[7] Appropriately the latter were referred to as 'computers'.

[8] One should be careful to assume that Peirce did possess the full expertise in all of those fields which he may have claimed. A true polyglot does not exist in science, although the fragmentization that characterizes modern scientists was not inevitable at his time. It is tempting to speculate that Peirce made up for his deficiencies by his arrogance and a general conceptual and philosophical approach.

[9] Brent choses to characterize him as a Dandy, a certain type of the mid 19th century, exemplified by Baudelaire.

father resigned from the presidency of the Survey and was replaced by Patterson. This did not immediately involve any loss of loyal support, rather on the contrary as Patterson was a loyal associate of the elder Peirce, and the younger Peirce may have been tempted to exploit the indulgence of the new president excessively. In the following years Peirce travelled extensively in Europe financed by the Survey, not always being contact-able and incurring serious expenditures. His wife did accompany him, and he received scientific recognition where it counted, but upon their return she separated from him permanently, finding that she could no longer stand the spectacle of a man so intent upon his own destruction. Her leaving him was a big blow to him, and he begged for a reconciliation, but he soon found consolation elsewhere, which would turn out to have unintended consequences.

His association with the Survey was of course only in the nature of a proviso, what he really desired was a regular academic appointment, allowing him to pursue his studies and investigations in peace, as well as providing the steady stimulation of colleagues and students. An opportunity arose at the newly instigated Johns Hopkins in Baltimore, headed by a certain Gilman, and to which the famed British mathematician Sylvester was associated. Much to his initial disappointment he was offered a lectureship instead of a regular professorship in 1879, but with the promise of a permanent position. Nevertheless he maintained his association with the Survey, whose duties he apparently thought he could do on the side. However, he might have underestimated his duties or overestimated his own strength, the following spring he suffered a mental breakdown manifesting itself in paralysis[10]. His association with Johns Hopkins lasted only for four years. Although he patched up relations with Sylvester, who had originally slighted his accomplishments[11], and he did lecture successfully and influencing people such as John Dewey who would in his turn become quite influential philosophically and educationally in the 20th century, the seeds for his destruction were being sown. His father died in 1880, which was a terribly blow to him, dependent as he had always been on his support. This blow was further aggravated by the death of Patterson the following year, thus completely removing his last professional safety net. In the interim he took up with a young lady of obscure provenance, a certain Juliette, whom he would marry two days after the formal divorce from his first wife went through in April 1883. His relations with this new woman had scandalized his social circle, and the disapproval may only have been exacerbated by the subsequent legalization rather then being mollified by it, and it is quite possible that those underlie the charge of immorality which would result in his dismissal from Johns Hopkins in January 1884[12]. The one responsible for this rumour coming to the attention of the President was Simon Newcomb, the astronomer, who would turn out to be the nemesis of Peirce

[10] The late 19th century saw a plethora of mysterious diseases of a hysteric nature such as the common habit of women to swoon when upset. Diseases that are never seen in our age, leading some people to speculate as to the social construction of disease itself, others to explain them by the particular repression prevalent during the Victorian Age.

[11] As to Peirce's philosophical writings, Sylvester thought little, claiming that they were vague and that anybody could have written them.

[12] The dismissal was to some extent concealed by the procedure of terminating all the lecture positions at the university, but rehiring everybody, with the exception of Peirce. But of course the stigma attached was not removed by this transparent ruse.

in the years to come. Newcomb ironically had been one of the favourite students of the elder Peirce and also a welcome guest in the family household. One may at this stage only speculate as to the motives of Newcomb, but it might be as simple as just simple outrage as a reaction to perceived outrageous behaviour. Peirce was a difficult man and his ability to antagonize people must have been even sharpened by his acknowledged brilliance making people feel inferior. Had he kept a lower profile by being more mediocre, it is not unlikely that he would have been spared some of the setbacks. In Gilman those rumours found a perceptive mind, in fact Gilman would consider him an immoral man for the rest of his life and studiously avoid having anything to do with him[13]. Newcomb was less forthcoming, in spite of Peirce's mania for feeling persecuted, which in fact was not entirely unfounded, he never seems to have suspected Newcomb, but would until the rest of Newcombs life appeal to him for support.

Now the traditional method of biography consists in constructing a life from the documents left behind, which means letters and diary notes. This is not an altogether satisfactory source out of which to piece together the elements of a persons character, but of course with somebody like Peirce having been dead for eighty years at the time of writing, this is the only available source. Letters and notes do but reveal a part of a person, and in none of the letters displayed is it possible to detect any untoward behaviour, there are some strong statements of course, but who has not let such slip in correspondence? Obviously there must be more than meets the eye, and many seemingly innocuous letters would have to be read in view of a context no longer available to us. The good behaviour of academics has always been an implicit factor in all kinds of university appointments as well as its absence in the relatively rare cases of expulsion. There has been and still is the notion of tenure intended to protect academics from the vagaries of personal opinion, but such traditions can always be circumvented would there be sufficiently strong incentives. And of course the notion of academic freedom may not have been as developed in provincial America at the time, where the desire to have harmonious personal relations and to have the faculty being exemplary would have carried more weight than mere academic excellence[14]. And also being a lecturer instead of a professor, his legal position must have been considerably weaker, as illustrated by the procedure of terminating all lectureships.

Peirce was shocked at what he thought was totally unwarranted and referred to breaches of promises and insisted on staying on an extra year to conduct more lectures and advise students. There was some admission of bad conscience on the side of the University administration whose officers agreed to cover costs that Peirce has unwittingly incurred moving to Baltimore under the false impression of permanent employment. From now on he was dependent entirely upon his salary from the Survey, but his remaining years at that governmental agency would be more or more painful, and he would of course had quit at the first available option, had any such materialized. First the successor Hilgard of Patterson was dismissed due to incompetence (in fact he was an alcoholic) and the whole

[13] One should also keep in mind that early on at his association at Johns Hopkins, Peirce had confided in Gilman that he sometimes feared for his sanity. An admission it surely was madness to make except to a very close friend.

[14] Such tacit understandings invariably invite hypocrisy, one of Peirce students at John Hopkins, the economist Veblen of 'conspicuous consumption' fame led a life of sexual excess, but which was tolerated.

operation came under Congressional surveillance and charges of profligacy were brought against some of the main people, and Peirce was especially singled out. It did not lead to his forced resignation, but he was put under pressure to deliver long over-due reports from his gravimetric investigations, while at the same time for financial reasons being denied the assistance that was necessary for him to proceed with the reports. The result was procrastination further aggravated by the constant ill-health of his wife, as well as bouts of depression and ill-health of his own. The mental collapses he had already suffered during his initial days at Johns Hopkins now became a regular occurrence. Nevertheless he did in the end manage to present at least a preliminary report, in which he presented his findings in a new and original way. Newcomb was asked to report on it, and maybe more out of ignorance and stupidity than actual malice, did he condemn it as unworthy of publication. The dilemma that faced Newcomb is not an unusual one. Newcomb enjoyed a high degree of prestige and was often asked to give his scientific opinion of a wide variety of subjects of which he mostly had no expertise. Not that he was a simpleton, he was a renowned astronomer, but as many scientific men his competence was but narrowly defined. Narrower than he would in fact be prepared to jeopardize his standing by admitting. He then had no alternative than to give his personal opinion without indicating that it was nothing more than that. He was a practical man and he lacked any genuine appreciation for the kind of theoretical mind that was Peirce, with predictable results.

The termination of the contract with the Survey was only a matter of time and further procrastinations did not help matters, and in 1891 he was without employment and a steady income. He was over fifty, a time in life when the prospects of a new career are slim, but also at a time of history when there were no social security nets. Life in the States at the 19th century was harsh, every man for himself and the Devil take the hindmost as Peirce used to reinterpret Darwin's motto of the survival of the fittest. A few years before, taking advantage of an inheritance from his mother, he had together with his ever ailing wife bought property at Milford, close to the triple New York-New Jersey-Pennsylvanian border along the Delaware river, obviously overextending his financial resources in an effort to keep up appearances. Extensions to the house, keeping servants and socializing with the local gentry made him to run up bills which would eventually give the banks the authority of foreclosure on his property, and only its unattractiveness prevented it from being sold. He now eked out a precarious living by writing extensively for the Nation and obtaining advances. As he still maintained a life style to which he had become habituated, those advances had to be supplemented by hand-outs and loans from relatives and friends, which he never repaid. He engaged in some schemes to acquire quick wealth, which all foundered miserably[15], as well as acquiring wealthy patrons (he viewed the life of Aristotle with envy, as the ancient Greek had benefited from the patronage of Alexander the Great).

In the beginning of the 20th century there was the possibility of a breakthrough when he had managed to drum up considerable support for receiving a Carnegie grant to conclude his life work, the writing up of his logic. Even President Roosevelt was on his side, but the whole thing fell through, in spite of promising hints, due to once again the opinions

[15] But at least one of them (involving an alternative to Edisons light-bulbs and a hydroelectric plant) was sound enough to have been successful had he had the benefit of proportional and sustainable resources. It is never hard to become rich, if you are rich to start out with.

of Newcomb who were given undue weight. The track record of Peirce was simply too discouraging, especially his performance at the Survey. What guarantees would there be that he would finish his task, old and sick as he was, and with a history of a succession of uncompleted ventures?

William James, his old loyal friend did what he could, and was able to get him to lecture in the Harvard vicinity, if not at Harvard itself. The lectures turned out to be incomprehensible, especially to James, whose patience for mathematical logic was very low, and who strongly discouraged publication afterwards. Eventually the only resort available was a private subscription, i.e. a regular charity, to stave off his starving to death. In view of his extravagance the money was given in small installments and meant to be handled by his wife. He worked to the end and died in April 1914 in his 76th year having suffered from abdominal cancer diagnosed five years earlier.

So in the end most of what he ended up writing was unpublished and the Nachlass was only rescued through the initiatives of the philosopher Joshua Royce, a common friend of James and Peirce, and deposited at Harvard for future preservation[16].

So what is it all about? Was Peirce a genius, whose life was gone to waste due to the uncomprehending stupidity of his peers, and who would have had a much larger impact on 20th century thought had he been allowed to work and publish rather than starve and perish? Or was he simply a crank, whose scribblings have been greatly overestimated. A crank, no doubt brilliant, but brilliancy is not all in life. To every path-breaking genius there are ten also runs, but whose contributions will all ultimately turn out irrelevant. The verdict seems far closer to the first assessment than the second.

Peirce is above all associated with pragmatism, or as he preferred to call it 'pragmaticism' to distinguish it from the variety peddled by William James. To his friend James he must have had an ambivalent relationship. On one hand he must have been aware of his own philosophical superiority, on the other hand he must have been somewhat resentful with the worldly success of his friend. Friendships are hard to maintain over a social cleft, but Peirce had little incentive to antagonize an influential friend no matter how much he might have despised him intellectually. The latter is of course speculation, and Peirce might very well have been blind to the shortcomings of his friend. A blindness conspired to by dependency and good-will. It was James who after all championed him, and attributed the pragmatic approach to philosophy to some of Peirce popular articles.The somewhat embarrassing thing being of course that the term pragmatism was never explicitly used in any of those articles. The essence of pragmatism is that truth should only be contingent upon practical consequences, an attitude no doubt presenting itself naturally to someone involved in the kind of practical problems Peirce confronted in his Survey work. It was also an attitude that was very congenial to James as a reaction against metaphysical spec-

[16] Royce was a above all a very close friend of James. In November 1891 Royce publicly attacked another common colleague and philospher - Francis Ellingwood Abbot, as being incompetent and immoral. Peirce saw Abbot as a fellow outcast and came to his spirited defense. James was puzzled by the engagement of Peirce, no doubt very loyal to Royce. Abbot ended up committing suicide, something Peirce in later life would often threat to do. Yet relations between Royce and Peirce were later patched up, as Royce seems to have been one of the few estabished philosophers who took a sympathetic interest in what Peirce was trying to do.

ulation. The problem is that it is too nominalistic for Peirce who was a realist at heart, thereby in his philosophy transcending his instincts of a practical scientist. If the pragmatic view is taken consistently it means that the past injects into the future, as otherwise events which leave no traces, have for all practical purposes never existed, which might be fine with the qualification of practical, but deeply unsatisfying without. As a consequence the past should be in principle reconstructible, thus we have a determinism going backwards but not necessarily forwards.

Pierce rightly observed that mathematical logic is a branch of mathematics, while logic itself has an ethical dimension lacking in the technicality of the former. In fact Pierce went as far as to put the conventional hierarchy on its head. Ordinarily we consider the True the most basic, in particular independent of man itself, while the Right does not make sense without humanity. This does not mean that the Right is not objective, it is objective as far as the individual is concerned. Beauty on the other hand is clearly residing in the eye of the beholder. But Peirce not only claimed that Logic, the search for immutable truth, is based on ethics (in the sense that the search for truth by man is an ethical imperative?), but that ethics itself is based on aesthetics. Does it make sense? Ockham razor, the scholastic principle of thought *par excellence* could be an illustration that some principles of thought are based on aesthetically pleasing principles. But if you really scrutinize what Pierce might have meant, would it not crumble? The problem with philosophical thought on the most basic level is the infinite regress brought about by circularity.

Peirce has been hailed as a forerunner of Popper and his falsifiability criteria. As far as I know Peirce does not ever state this principle with the same clarity and simplicity as does Popper, but surely out of the mess of Peirce's various outpourings it should not be difficult to find it repeatedly in implicit and tentative form. In fact the Popperian program is most clearly foreshadowed in Peirce's theory of three forms of logical reasoning, namely abduction, deduction and induction. Of the three the last two provide little confusion, after all those are well established terms. To Peirce deduction does not provide new knowledge, it just works out the necessary implications of assumed premises. Traditionally mathematics is considered a purely deductive science, the science of necessary conclusions as Peirce calls it. Most mathematicians would, or rather should take umbrage to such a dismissal, but for the present discussion this could most profitably be ignored for the time being. Induction is a means of empirical verification from a large number of isolated observations, but of course Peirce is more specific, including considerations of probability and what we can actually conclude from a finite number of observations. Popper is of course more adament, induction can never prove anything, a finite number of observations cannot tell you anything about an infinite number of cases. Induction can only contradict never prove[17] Such misgivings must of course be found as well on Peirce, but does he ever state it so categorically? Finally abduction to Pierce is the truly creative element in logical reasoning, given what is, a hypothesis is formed compatible with the case. What

[17] From a purely formal point of view there is no difference between a verification and a falsification. A falsification of a statement is simply the verification of its negation. However, in practice, this is based on some implicit general principles. If a tacit general principle is assumed that wrong theorems cannoy be proved, a single counterexample verifies that out of an infinite number of potential proofs of the theorem contradicted by a single instance, none can be correct, without ever having to inspect a single one of them.

does that mean? A hypothesis is formed, and then a lot of necessary consequences of it are deduced, each of which can be subjected to an inductive test. This is essentially how science works according to Popper. Scientific theories can never be verified beyond doubt, they can only be proved wrong. This means that we can never attain absolute truth, but it does not imply that such an exalted thing cannot exist, only that we can only hope to approach it asymptotically. A world view I suspect would have been very congenial to Peirce, who believed in the successive approximation to truth, because of the natural continuity between Mind and Nature, that Mind naturally proposes hypothesis congenial to the way the world is[18]. Finally also in mathematics everything is not deduction, but abduction plays as creative a role as it does in science proper, only that one may in principle do away with the tentativity of induction, replacing verification by deduction.

Finally the most fundamental contribution to thought made by Peirce is probably his involved theories of seimiotics. They constitute a thicket into which only the most daring may want to penetrate. The reason for their 'thickness' is the idiosyncratic use of Peirce of triads. Metaphysically he speaks of the First (the immediate), the Second (the first coming into brutal conflict with others) and the Third (the reflection on the First and the Second bringing them into relation to themselves, and which is the basis of perception). This notion superficially reminiscent of Hegels, thesis, anti-thesis and synthesis constitute the incipiency of his semiotics, which start out with 'icon', 'sign' and 'symbol'. Now, the plot thickens by inductive use of triads, each element in a triad can be subjected to a triadization itself. In this way finer and finer shades of classification proliferate exponentially, making for dense thickets. Could it be that it is this principle which constitute the simple method of reasoning he is repeatedly referring to, and which allowed him to transcend his supposedly imaginative defects?

But his philosophical essays contain much more. He takes evolution beyond the biological realm and speculates whether physical laws themselves could have been evolved[19]. As to evolution he observes that it has two apsects, the vital one being the realization of the dormant idea, the indifferent one the creatiob of mere variation. In modern cosmology one uncannily finds many echoes of Peirce's speculations, although one should be wary of taking it too literally. As to religion he not only did not rule it out but professed to mystical experiences and among his writings one can also find ingenious arguments in favor of some God, still he remains a skeptical mind and is far less gullible than James when it comes to the supernatural. Finally he maintained that Evil was necessary, without it Love would have nothing to do[20].

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[18] Peirce believed that the ultimate arbritarer of truth is the community, but an unbounded community not tie to a particular place or time, but involving all the searching people of the future.

[19] Peirce claimed that the integers are more basic than logic, something which is congenial to a mathematician. But that logic more vital than habits, habits more vital than physical laws (which also William James speculated were primitive instances of habit) and that finally physical laws were more vital than mere matter.

[20] A drawing is made manifest by the contrast between Black and White, a drawing that contains only white or black is obviously no drawing at all. Similarly a world exclusively ruled by Evil or the Good, would have no aesthetic qualities. The simile is not Peirce, as far as I know, but as he wrote so much, maybe it is hidden somewhere among his papers.

Peirce did not write very well. The reason for this might have less to do with the neurological architecture of his brain than the immensity of the task he envisioned for himself. Reading his essays you encounter a man wanting to say so much in a limited space, that each paragraph could easily be expanded into an essay by itself. Grace of style is something only the unhurried can allow himself.

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