

Guessing or reasoning?

A philosophical account of hypothesis

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1. Introduction

The rationality of hypotheses has been questioned throughout the whole history of logic. Twentieth-century philosophy held two standard views. On the one hand, hypothesis was simply something that transcended the limits of logic and was better left to “pre-theoretical intuitions”^[1, 2], a source shared by those actions in our daily life that do not follow the deductive pattern. On the other hand, historicism and hermeneutics defined hypotheses as a relationship with truth that belonged to tradition and to the history of effects of ideas^[3]. For the more radical views in that vein, that relationship is either so internal to a tradition as to be “incommensurable” with others^[4], or it is considered to be merely an “extra-methodical” event that happens to leave “dead traces” in our rationality^[5].

Both these views, by rejecting the inherent rationality of hypothesis, end up leaving scientific discoveries, trials based on circumstantial evidence, medicine diagnoses, or daily acts of trust, to the mere force of arbitrary will or to the force of social conventions and politics (the arbitrary will of those who hold power).

Is it possible to find a third definition, respectful of both logical method and happening events? C. S. Peirce (1839-1914) was a scientist and a logician who strove all his life to define the rationale of hypothesis. He called this kind of reasoning “abduction”. This is a subject-matter that has been frequently studied over the last forty years^[6, 7, 8, 7, 10], but those accounts have often blended abduction with induction, thereby missing the originality of the abductive pattern. I intend to present Peirce’s original insight and then to complete it with slight modifications and integrations that should make it fully operable – I will thus complete the sketch that Peirce was unable to finalize due to the precarious ending years of his life^[11].

Completing Peirce’s picture requires deepening his aesthetical and ethical views within a gnoseological (semiotic) pattern.

Finally I will try to give you some reason to share with Peirce and with me the conviction



that this rationale of hypothesis requires a metaphysical realism, even though we have to understand it in a very peculiar way.

2. The ratio of hypothesis

2.1 *An improving definition*

In my reconstruction, Peirce described hypothesis or abduction with three characteristics¹:

- 1) it is the passage from consequent to antecedent, or rather from consequence and consequent to antecedent, the most uncertain but the most fruitful type of human reasoning;
- 2) it arises when the researcher is facing a surprising phenomenon;
- 3) this phenomenon is unknown in the sense that we do not know exactly the genus that can comprehend both its occurrence and its explanation².

The problem is that according to deductive logic the affirmation of an antecedent amounts to an all-too-elementary kind of fallacy: the affirmation of the consequent. But Peirce was sure that abduction was a bona fide kind of reasoning, the only issue being that of formulating an exact definition. His first proposal (1878) took the following form (where the last line represents the type of proposition inferred from the first two) [Deduction, Induction and Hypothesis]: ^[12] (2, 623)

DEDUCTION	INDUCTION	HYPOTHESIS
Rule	Case	Result
Case	Result	Rule
Result	Rule	Case

Some years later, Peirce presented abduction in his 1898 Cambridge Conferences with few alterations. In the second lecture^[13] (123–142), he described it as a probable argumentation drawn from the second figure of syllogism. In its turn this latter is drawn from the first figure swapping minor premise and conclusion and changing both at the same time from affirmative

1 The role of abduction is one of the most interesting topic of Peirce's scholarship, and more in general of the philosophy of science. From Hintikka's claim that abduction is the crucial problem of logic in XXI century^[9] to the disclaim that hold abduction to be a simple reversed deduction^[4], it is impossible to avoid this topic in contemporary epistemology. The rationale of abduction as the passage from consequent to antecedent has been now accepted and well expressed by many authors^[15,16]. When this rationale springs, in what it consists and what is at stake in it, it is still controversial. For more a detailed discussion see *Semiotica* 153 1/4, completely dedicated to it.

2 It is worth noticing here the differences between my interpretation and Niño's. According to Niño the characteristics of abduction are: 1) the passage from consequence and consequent to antecedent; 2) conditions according to which we obtain the first premise (conditions we cannot quantify according to a calculus of probabilities as we do in induction); 3) maintenance of doubt: abduction will not lead to a belief. As I have said, I agree with the first one and I consider the second one as a part of the surprising phenomenon that Peirce stressed in his late writings. On the contrary, I do not agree with the third one. It is clear that the hypothesis, by definition, has always an interrogative characteristic, but Peirce was puzzled exactly by the fact that hypotheses suggest correct answers in a measure that exceed by far any statistical account. If it were not so, abduction will lose its main interest: from trials procedures to scientific inquiries, human research is based on this kind of reasoning. What we have with abduction is not certainty but a belief which is a plausible suggestion toward certainty. Peirce himself speaks of "uncontrollable inclination to believe" (2, 441^[17]). There are many passages in Niño's work in which he has to develop winding explanations to account for Peirce's statements that contradict his view (44, 53, 58, 74, 122, 172, 192, 205, 210, 270^[15]). The problem is that Niño accepts 1903 definition as the last word Peirce said on the topic, while – as we will see – Peirce will deepen the topic reaching a more completely picture that will involve aesthetic, ethics, and the "rational instinct" which presides over abductive reasoning.



to negative form or vice versa.

In the seventh Harvard Lecture held in 1903, titled *Pragmatism as Logic of Abduction*^[17] (2, 226-241), Peirce stated his new results on this topic. Here he defined abduction not as a modification of deduction but as an independent inferential process.

The surprising fact, C is observed;
But if A were true, C would be a matter of course.
Hence, there is reason to suspect that A is true.^[17] (2, 231).

Now the heart of abduction is not somehow related to deduction. In fact, it consists in the passage from a) the surprising fact is observed, to the conditional hypothesis b) if A were true, C would be a matter of course. Which changes did happen from the formulations seen earlier? The previous proof of the autonomy of abduction relied on the criticism of Kant's reduction of every argumentation to the syllogism in Barbara. However, Peirce could not feel comfortable with the possibility of considering abduction as merely a reversed deduction. He had to show — as with Bolser's intelligent comprehension^[18] (98–99) — that the process of consequence is more than the summing up of consequent and antecedent and that this process was the reality to which abduction referred.

In order to explain what we are trying to say, let us consider the famous example of the beans that Peirce used in his 1878 paper. Here the ratio of hypothesis is exemplified as follows:

All the beans from this bag are white;
These beans are white;
These beans are from this bag. ^[19] (3, 325)

The hypothesis obtained through abduction can be charged with being just a disguised deduction: I can reach the conclusion only because I already know that it is included in the first premise, as Petroni says^[14] (155–172). We can now understand why Peirce changed his formulation. In order to defend the autonomy of abduction, we have to establish that the link between the three passages must be somehow already present before abduction. Thus, it must be clear that it belongs to 'a flux of causality'^[20] (12) (the continuum of reality in which we are involved) for which we know that 'the beans come from some bag in this room'. We can see here a change of genus (from the genus that includes the particular case to the one that can include the rule, the case, and the result), which allows expressing a more general continuity that is the only chance to explain the case stated in the premise and the one in the conclusion. In this sense, the version of abduction that Peirce gave in 1903 is more faithful to the relevance of the process as regards the elements that compose the inference itself. It is worthwhile to notice that the acknowledgement of this flux of causality means that



every singular case already entered a 'general' description, setting aside for now whether this generality belongs to the realm of possibilities (where the principle of contradiction does not hold) or to the realm of necessity (where the principle of excluded third does not hold).

Whatever be the generality, it is formed by universal predicates through which it is possible to name and describe the singular phenomenon we want to know. Recalling the whole path of this hypothetical reasoning in its 1903 definition we can describe it through four passages taking from Peirce's account of Kepler's discovery a standard example:

- 0) hypothesis or abduction begins when a surprising or new phenomenon C is observed (meaning as "new" something that asks for an explanation different for genus, something we did not expect before and we cannot explain with previous experience – as "the observed longitudes of Mars which Kepler had long tried to get fitted with an orbit."^[12] (2, 96)
- 1) We formulate a rule A according to which "If A is true, C is understandable". Example: if Mars moved in an ellipse, the observed longitudes, latitudes and parallaxes would be understandable. "The facts were thus, in so far, a likeness of those of motion in an elliptic orbit. Kepler did not conclude from this that the orbit really was an ellipse; but it did incline him to that idea so much as to decide him to undertake to ascertain whether virtual predictions about the latitudes and parallaxes based on this hypothesis would be verified or not."^[12] (2.96)
- 2) We draw all possible deductive consequences. Example: If the orbits were elliptic, then the calculation of latitudes and longitudes would agree with observation.
- 3) We verify them inductively. "By trying triangulation at times when Mars was at the two extremes of his orbit, and when he was at intermediate places, Kepler could get a test of the severest character as to whether the elliptic theory really flattened the orbit by the right amount or not" ^[12] (2.97).

Let us focus for a few seconds on the first feature. "Surprising" means something belonging to a different explanation, to a genus we did not identify yet. Otherwise it would be just a kind of induction (crude or gradual)^[17] (2, 442). But "surprising" means also that it cannot be a priori provoked (here there is also the first big difference with Inference to the Best Explanation^[15] (375)³). Another mathematician of the same epoch, Vailati, who worked with Peano in writing the *Formulario*, thought that hypotheses coincide with our experiments and the deductive hypotheses which preside over them^[21] (23-42). But here Peirce was very strict in defining what "surprising" means: we will use abduction or hypothesis only when reality brings us something very different from what we were expecting. Not every datum is surprising, neither in theoretical research nor in daily affairs, and laboratory phenomena are surprising only as unexpected part of reality. In Peirce's reconstruction the laboratory

3 The second difference is that Inference to the Best Explanation is always a kind of reasoning from the antecedent to the consequent^[15] (374)



phenomena fall under a different kind or ratio of hypothesis called theorematism deductions, namely a deduction in which we add something already known (lemmas, in Peirce's application to geometry) in order to fit a problem we know. But it is a very different kind of reasoning: from known to known and not from known to unknown. Completing the picture, if the datum is not completely unexpected, it falls under the inductive pattern which is always at work when we are relying on previous experience⁴.

2.2 *The role of aesthetics and ethics in abduction*

But the difficult passage is the number 1). How can we find the rule A?

Here we have to recall that Peirce was also the founder of the scientific approach to signs. His well known basic structure of sign has three elements: 1) the object, divided into dynamic object – the one which changes all the time since nothing is exactly always the same as time goes by – and immediate object – the common representation of that object that we have in our mind and we share; 2) the representamen, term with which Peirce used to indicate the function of representing the object (he divided the various kinds of representamen according to their relationship with different aspects of objects and interpretants reaching a classification of 56049 kinds of signs); 3) the interpretants, signs formed as effect of the representamen: they can be mental perceptions (immediate interpretant), mental effects (dynamic interpretant), habits of action (final or logical interpretant).

As far as we are concerned in this paragraph, the most important aspect is the division of representamen. In this sense, the most important distinction is the one in which signs express the link to the dynamical object (the object that changes at that very moment of space and time). According to this classification signs can be "icons" – that represent objects by similarity, as the images we have in our minds; "indices" – that represent objects by rigid connection, as proper names or road signs; "symbols" – that represent objects by interpretation, namely creating another sign which stays to object in the same respect as the symbol stays: words are good examples of symbols. Formal logic uses symbols mostly, but our everyday common sense and our scientific methods also normally use lesser wrought signs as icons and indices. Now, my explanation of the passage from 0) to 1) is the following. Passing from 0) to 1) we are still inferring something. But it is a very subtle inference conducted on icons and indices. We play with them as we do with diagrams in mathematics. But this applies also to the game we have to play when we investigate a murder or when we try to understand whether we can trust the butcher. Only if we can say that abductive logic is a kind of logic different both from deductive and inductive pattern, and if we can say that there is a logic based on lower levels of signs coming before symbols (and from which symbols stem⁵), we can guarantee the logic of hypothesis. But, as we maintained, this holds not only for science.

4 The "surprising phenomenon" also makes the difference between abduction and qualitative induction as it is well shown in ^[22].

5 The intrinsic life of signs, their possibility to "grow" from icons to indices and symbols is a fascinating part of this study that could open a new perspective on linguistics and philosophy of literature, as suggested by authors as O. Barfield and J.R.R. Tolkien.



To give an example taken by Peirce himself from literature: we find a corpse, and we don't have any clue to solve the puzzle, as it happens with the strange murder in *The murderers of the Rue Morgue* by E.A. Poe. To be exact, we have a clue, but it is an odd one. The two ladies were killed with too much violence. What does the great detective do? He reads signs, clues, not in the usual way, trying to put the surprising phenomenon of that unusual violence within a continuum of causation which is not the usual one (in this case the usual one would have been: a person killed the murdered). In Poe's tale reading signs puts the great Dupin on the right path: the killer was an urang-utang.

As in daily problem of trusting people we meet for the first time, Dupin has to read signs under the symbols level, namely not with words. In semiotics those are indexical and iconic levels of signs. Indices, namely labels put on reality as road signs; and icons, namely representations of objects by similarity as geometrical diagrams or mental pictures. How can we infer something using those types of signs? Reading happens according to our familiarity with a more "general system of signs"^[17] (2, 494) to which we already participate. We could say, in a less technical way, we already participate to a kind of order that signs must respect to allow a plausible conclusion. So, we read signs as far as order – namely, gnoseological admirability – and plausibility of that order – namely, gnoseological goodness – are concerned. In this sense, there is an interpretation – as hermeneutics says – but it is objectively verifiable and acceptable. This is my way to read the impact of aesthetics and ethics on theoretical knowledge. Here we can observe the two definitions of those disciplines according to this new way of reading them:

Meantime, instead of a silly science of Esthetics, that tries to bring us enjoyment of sensuous Beauty, — by which I mean all beauty that appeals to our five senses, — that which ought to be fostered is meditation, ponderings, day-dreams (under due control), concerning ideals — oh no, no, no! 'ideals' is far a too cold a word! I mean rather passionate admiring aspirations after an inward state that anybody may hope to attain or approach, but of whatever more specific complexion may enchant the dreamer. Our contemporary religious doubt will prove a terrible calamity indeed, if the sort of meditations I mean are to be weakened, lying as they do at the very bottom, the very lowest hold of the ship that carries all the hopes of humanity. One should be careful not to repress day-dreaming too absolutely. Govern it, — à la bonne heure! — I mean, see that self government is exercised; but be careful not to do violence to any part of the anatomy of the soul.^[17] (2, 460)

There is certainly a particular pleasure and a particular esthetic quality in fruitful reasonings; and the mathematicians, who seem to me, as a class, still, to be the champion reasoners of today . . . have always attached great weight of importance to a certain esthetic quality of reasoning that they call 'elegance'; and in view of this fact I do not see how any student of reasoning at all worthy of this twentieth century can leave unstudied the question of the logical value of this esthetic quality of reasoning at least.^[20] (681, 8–9)

Ethics is the study of what ends of action we are deliberately prepared to adopt. That is right action which is in conformity to ends which we are prepared deliberately to adopt. That is all there can be in the notion of righteousness, as it seems to me.^[17] (2, 200)

Aesthetics and ethics do not enter hypothesis before or after it has been accomplished. They are the very core of it: the disciplines that infer moving from lower levels of signs. It is not just



a vague approval of beauty or a feeling of social values but a rational constraint ^[12] (1, 96). But here a deepest account of those disciplines in this Peircean perspective is due.

2.3 *The account of aesthetics and ethics in a gnoseological perspective*

Aesthetics and ethics are normative sciences and they precede logic in the Classification of Sciences written by Peirce as far as they give to logic its principles of judgments⁶. This is clear in the account of hypothesis we have just mentioned. But hypothesis is a central tool in logic since it affords also premises to deduction and a delimitation of the field of application to induction (only with a delimitation of the field induction does not fall under Popper's criticism).

Normative sciences examine mental operations that fall under our self-control. Peirce begins his account of aesthetics and ethics by considering logic, term with which he means the whole set of signs (including, besides symbols, icons and indices). "Inference essentially involves approval of it – a qualitative approval" ^[17] (2, 200), namely a voluntary act due to our self-control. "Now – Peirce concludes passing to Ethics – the approval of a voluntary act is a moral approval. Ethics is the study of what ends we are deliberately prepared to adopt" ^[17] (2, 200). In this sense, Peirce chooses a description of Ethics as a gnoseological science: badness or rightness do not refer to moral conduct but to the capacity of directing one's intellectual forces toward an ultimate end deliberately adopted. But how can we decide which ultimate aim is worth achieving? What would be our criterion in judging the ultimate aim? Peirce says that this is the task of aesthetics, that is the study of a state of things that "reasonably recommends itself in itself" as an admirable ideal. Therefore, according to the definition of their respective sciences the logical good appears as a particular species of the ethical good and the ethical good as a species of the aesthetical good. Now, what are the ethical and the esthetic good? Peirce tries to define them.

The ethical good has just one characteristic: it must be an ultimate aim. If it is not an ultimate goal, man cannot be blamed and his life is beyond any sort of control. We do not blame a hog for the way it behaves – Peirce says bitterly. Namely, if the aim is not "ultimate", there will be no freedom.

Here one can raise the question: "What about the partial aims?" Peirce seems to think that a partial aim cannot be admirable in itself because it requires a further aim to draw us forward. This is tantamount to saying that freedom requires a final satisfaction whatever this might be, although Peirce will indicate a special kind of quality as the only possible satisfaction. Here

⁶ The Classification of Sciences is the organization thought by Peirce after Comte's ideas of mapping importance and influences among sciences. According to Peirce, the sciences that come first lend to the following the principles on which those sciences can be funded and receive from them their contents. In the theoretical realm (sciences of discovery) Peirce thought that Mathematics comes first, followed by Philosophy and by Special sciences (divided into Physical and Psychical Sciences). Philosophy is divided into Phenomenology, Normative Sciences, and Metaphysics. Normative Sciences are divided into Aesthetics, Ethics, and Logic (Semiotic) ^[17] (2, 258-262).



we can see that in Peirce two different ideas of freedom are fighting: on the one hand freedom is just self-control or critical control as it is in the liberal tradition; on the other hand, freedom is the capacity of full satisfaction as it is in the scholastic definition.

We can see this double nature in Peirce's description of the characteristics that an aim must have to be "ultimate". "Ultimate" means that the aim must be valid in every circumstance and therefore: 1) it should be consistent with the "free development of the agent's own aesthetic quality"; 2) it cannot be damaged by any intervention of the outward world on which it is supposed to act. Peirce concludes: "It is plain that these two conditions can be fulfilled at once only if it happens that the aesthetic quality toward which the agent's free development tends and that of the ultimate action upon him are parts of one aesthetic total" ^[17] (2, 203).

Now, what is the aesthetical good that we need in order to understand the characteristics of ethical good (the concurrence with free development of the agent's own aesthetic quality and its total)? Peirce's description is the following:

[...] I should say that an object, to be esthetically good, must have a multitude of parts so related to one another as to impart a positive simple immediate quality to their totality; and whatever does this is, in so far, esthetically good, no matter what the particular quality of the total may be ^[17] (2, 201).

Are there "innumerable varieties of esthetic quality" ^[17] (2, 202) or the simplicity coincides with that "inward state that anybody may hope to attain or approach" ^[17] (2, 460) and that seems to indicate one ultimate quality?

Peirce's solution is that aesthetical goodness coincides with Reasonableness, namely the capacity of embodying general Reason or the comprehensibility of reality, when we have to rule or govern individual events ^[17] (2, 255). Reason as such cannot ever be completely embodied but our task, what is "up to us" ^[17] (2, 255), is to satisfy the deeper root of our being in making reasonableness grow. Therefore, what satisfies us is not what gives us the feeling of logicity – as Sigwart maintained – but what is true according to Reason. Peirce gives this solution, although he knew that this was the biggest problem of his reconstruction of the dynamic of knowledge (to which – by the way – he dedicated the best part of his later years), namely how to explain the singularity of events within the growth of an ever more absorbing generality.

Peirce's solution looks like a circle because what is true is good, what is good is beautiful and what is beautiful is true according to Reason. But the circle disappears if we understand the first and the second "true" in two different ways. The first means "logical", the second means "reasonable". Accordingly, what is logical is good, what is good is beautiful and what is beautiful is reasonable. Logic is part of reasonableness but does not exhaust it. In logic we have to draw our inferences from premises to conclusions, in reasonableness we have



to look for premises in the continuum world of experience. Continuity, that Peirce deeply investigated on a mathematical basis, becomes the pivotal point also from an epistemic and an ontological point of view. We will see later that it is this continuity – in its different levels – that corresponds to a precise concept of reality and of epistemological realism.

2.4 *Deductive consequences and inductive verification*

But before passing to this ontological task, we have to terminate the sketch of the hypothetical path. The aesthetic and ethic reading of signs is not of course the end of this process of hypothesis. We know that we are right because hypothesis works, as steps 3) and 4) of the summary of our passages can show in the way we described. As it happened to Kepler's measurement by triangulation, Dupin draws deductively the consequence that someone should have lost a big animal and test it inductively through an insertion in a newspaper. Accordingly, we know the person we met is really reliable because we draw the consequence that she/he will not kill me not even to show me I am wrong, and I test this conclusion very easily in the following minutes. And this working is what really convinces us as the pragmatic rule had always foreseen:

Consider what effects, that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object ^[23] (5, 402).

This is the part that has been well developed in the twentieth century Western philosophy of science as neo-positivism, Popper, and Khun have shown. In this sense, philosophy of science has taken a very pragmatist turn, focusing on effects and not on causes. But without the first part – the abductive one – we could not understand that the important thing is not that working alone, but the continuity between the surprising phenomenon intended as consequent, the new explanation in which it fits intended as antecedent, and possible and actual verifications intended as a new consequent^[6] (71). Loosing that continuity means to abandon new hypotheses and every creative gesture to irrationality, and not to explain why we prefer a certain hypothesis to others, testing it first.

3. **The epistemological continuity between belief and truth: the passage to Metaphysical Realism**

The path we pointed out stresses some consequences at a more general level, linking epistemology and metaphysics in a peculiar way. The subject matter of epistemology is “what and how we know?”, while ontology is an answer to the question “what is that?”

The abductive pattern has shown that we can make hypotheses by a reading of signs and by a profound continuity between our reasoning conducted on signs and “reality”. But two



questions arise: who is reading those signs?, and what is that reality that warrants our reasoning? As far as discoveries are concerned the problem is: are the laws that we discover through abduction necessary or are they fruit of our knowledge and free (and possibly arbitrary) will? Are they really there?

Trying to answer to these questions we can underline two main features.

3.1 *Who's reading signs?*

The path we signalled takes a diagonal and very interesting solution. Epistemologically speaking, reality is the final outcome of our reasoning. We know that something “is” because “it works”. Working is the necessary and sufficient condition for being; epistemology – knowledge is the way in which being lives and becomes self-aware. Abduction has its own logical pattern very different from both deductive and inductive patterns. The existence of this kind of reasoning is the link between logic and a more general way of comprehending reality which has to do with aesthetics and ethics. Signs are the keystone of this link because they are part of logic (even formal tools – and words more than anything else – are signs) and they derive from “a more general system” with which we are naturally acquainted.

The issue of this general acquaintance is: what is this crypto logic of those beauty and plausibleness that somehow we already know? In other words, we know we have to judge aesthetically and ethically (in a gnoseological sense) and we have the tools (signs), but which is the meter and who is judging?

Peirce passed his late years reflecting on this issue. He called “rational instinct” this criterion that we find in ourselves. He thought that it is so connected to nature that human beings often arrive to truth. And they get there in a few attempts compared to the standard number of attempts that a logic of probabilities should foresee. Peirce saw this as both the product of evolution and as indicating a religious faith that the real is rational: we are somehow attuned with Nature from the start. The biblical tradition called this faculty “heart” and the Christian medieval tradition *libertas major*. Giussani, a very deep Italian thinker, calls it “elementary experience”^[24] (8-11), made by our ultimate exigencies of truth, beauty and goodness. The crucial point is not the name we give to this capacity but understanding its main features: it is a judgment on our reading of signs, and therefore it is still an inference, but at the same time it is so fast that it can be mistaken as “intuition”. It is not an intuition, that can never be questioned, but at the same time its results are evidences, even though those evidences can be fallible.



3.2 *Belief and truth*

A question remains open: what is that continuity between Nature and “heart” (or “elementary experience” or “rational instinct”) that we were taking as the ultimate guarantee of our reasoning and what is the link between the belief we show in our reasoning in general – and hypothetical reasoning in particular – and truth or reality?⁷ Here we have to explain why in any event of discovery we have that peculiar feeling of happiness, like having reached something that is not “ours”. At the same time, we have to understand why we can appeal to that ‘flux of causality that we acknowledge aesthetically and ethically’. Continuity of reality exceeds our intellect even though intellect participates of that continuity itself. When we abduct something we are putting the surprising phenomenon into a higher order that fits our exigency of truth, goodness, and beauty. That is why we have those strong inclinations to believe our hypotheses and – more surprisingly – why they are so often true. In this way the relationship between belief and “true continuity” or “truth” or “reality” becomes an unavoidable matter of research: it means to understand that paradoxical unity between epistemology and metaphysics. Otherwise we have to reject this unity but – as we saw – in that way hypotheses become either ‘mystical intuitions’ or cultural pattern unable to reach any form of truth. Once again, we try to explain that relationship relying on our researches on Peirce’s manuscripts. He considered the topic of belief as a logical problem. In the series written for the “Popular Science Monthly” (1877-1878) he identified truth, belief (after inquiry) and reality. In this identification lies the core of the pragmatic rule. Truth is here an ideal-real term. Our path of inquiry will end with truth, even if this will happen in the long – and possibly infinite – run of our research. Namely, we all will acknowledge truth, which is independent from what any thinker thinks, even though such a process can take the whole time of history. On the other hand, truth coincides with the final opinion or belief reached by the community of inquirers. This is a deep teleological understanding of truth very much connected to the scholastic realism Peirce professed. Truth is the fated belief whose object is what we call reality.

The opinion which is fated to be ultimately agreed to by all who investigate, is what we mean by the truth, and the object represented in this opinion is the real. That is the way I would explain reality ^[23] (5, 407).

This first basic idea has to be linked to one of the main characteristics of Peirce’s pragmatism (and of every sort of pragmatism): fallibilism. We cannot be absolutely sure because we are not living at the end of inquiry. Being is in evolution and so is our understanding of it. Our beliefs will reach truth in the long run but cannot now claim infallibility. On the other hand, Peirce’s pragmatism is as far as possible from scepticism, even in the hypothetical form Descartes allowed. Research does not begin with doubt and does not finish with doubt. This sort of beginning from doubt is just a way to state a “paper doubt” through which you can only

⁷ The relationship between our beliefs, also scientific beliefs expressed in laws and truth has been discussed during the debate of the Conference “Discovery as an Event” by O. Gingerich and J. Polkinghorne. Gingerich underlines the asymmetry between the epistemic and the ontological levels calling our beliefs “plausible frameworks”, while Polkinghorne calls them “motivated beliefs”. Peirce’s view seems even stronger in considering the first level (the epistemic) as effective sign of the second (the ontological). In any case, it is worth noticing that neither of them consider the two levels as completely separated or disarticulated.



return exactly at the same starting point. The real and living doubt stems from a surprising phenomenon which strikes our previous certainty and puts us on the path of inquiry striving for a new certain belief and eventually leading us towards truth.

The final view Peirce proposes in his early articles is an evolutionary conscience of being or “reality” he never abandoned. In this view there is a growth of belief toward truth through enquiry, errors, and scientific method.

At the turn of the century his studies about “continuity” led Peirce to a new concept of “reality”. The independent discovery of Cantor’s theorem and paradox brought him to a profound view of a true continuity well beyond any possibility of being grasped by the set theory of his time. “True continuity” which coincides with reality is beyond the set of all sets, because the totality that sets can reach remains within the boundaries of the semiotic divisions from which every set, even a large one or the largest one, stems^[16] (137-192). Peirce thinks that “true continuity” is the development of reality from which we have to start thinking and not something that we have to reach. Every singularity is an interruption of this continuity as is the sign of chalk to the continuity of the blackboard. That is why our analytical reasoning cannot build or reach the totality that he identifies with “true continuity” or “reality” by composition and division as any analytic thought conceives them. Belief is not analytical in this sense and that is why its decisive importance as a sign of that continuous reality grows in those years.

In this period he did not question his previous ideas about beliefs but a new question grew through his papers. As we have seen, here Peirce starts putting a form of “rational instinct” as ultimate assurance for our scientific reasoning. Up to that time he had conceived instinct as a strong source of our beliefs but something irrational that should be excluded from any scientific point of view. Instinct was the source of our practical certainties, well detached from scientific beliefs. But in 1901 he realizes that instinct plays a role in the “economy” of our formulation of hypotheses. The view of continuity we mentioned pushes Peirce toward a perfect unity in the epistemological path so that he could not think anymore of a different rationale for practical belief and inferential reasoning. Setting aside the different steps of the growth of the importance of “rational instinct” in those years, it is relevant for our purpose to notice that “rational instinct” becomes more and more the topic of Peirce’s semiotic studies because it shows the problem of the origin of belief.

There is a third chapter in the history of Peirce’s research on belief, reality, and truth. In 1909 P. Carus asked Peirce to republish in “The Monist” the articles written in the ’70s. Peirce tried to write a new introduction that would have corrected his previous mistakes. Moreover, he wanted to have the chance to put the problem of belief and meaning within his new semiotic, epistemological, and metaphysical view.



Taking as given the unity among truth, reality and belief, let us see now what are the changes in Peirce's latest account.

Peirce maintains that the big mistake he made in his '70s papers was to consider truth as the sum of every possible effect of a concept which "will happen" in the long run of inquiry, not realizing that he had to correct the formula stressing the conditional future of the phrase. Rephrasing the famous motto: meaning consists in the effects that "would happen" in the long run of inquiry^[17] (2, 456).

The conditional truth described by modalities corresponds to a view of reality as "true or perfect (as Peirce started calling it) continuity". On this topic Peirce changed his mind once again around 1905 (and definitely in 1907). "Perfect continuity" is general not only in the sense of "necessity" (what is not subjected to excluded third) but also in the sense of pure "possibility" (what is not subjected to principle of contradiction) that "would become" a necessary habit. This change means that he was trying to think continuity as a model in which there would be room for any particular so that every single point would be more a realization than a rupture of continuity. This first change means the acknowledgment of modalities as the path through which reality itself evolves. Possibility, actuality and necessity are respectively the metaphysical realms to which our meanings refer. Without "transit" among these modalities there is no development of knowledge. There are beliefs in anyone of the three realms and all are part of the same path. This would explain the possible stage of our conjectures stemming from the first abductive part of our inquiry; the strong commitment to principle of excluded middle and principle of contradiction (the two features that according to Peirce determine the realm of existence) that characterize the deductive second part; and the epistemic necessity of the laws ascertained by our inductions.

Consequently, belief had to become something more than the outcome pursued earnestly through research. We must consider belief as an initial fulfilment of our possible understanding of our continuous reality. If reality is continuous, belief must reveal it at the outset and at the end of inquiry. In this new version belief is born as "rational instinct" or "elementary experience" and is the source of correct truth. When we start reasoning, we have to rely on that instinct or experience looking for that "plausibility"^[17] (2, 441) that an esthetical and ethical level of acquaintance with the totality of signs allows. Only through this epistemic view that unites the three normative sciences by the rising of rational instinct we can understand how reasoning can guess the truth. "Guessing" is a fast inference through the continuity of signs.



4. Conclusion

In this paper I tried to work out a different view of inquiry following C.S. Peirce indications which help avoiding the irrationalism stemming from both analytics and hermeneutics patterns well affirmed in the Twentieth century.

I argued that we have to defend discovery as a logical matter, and not as irrational poetic gift or a psychological mysterious and incomprehensible event. Discovery is a human event, that implies both human freedom and intelligence. Following Peirce we divided the logic of discovery in three logical steps: abduction, deduction and induction. The three steps have to work chronologically and in accordance with one another. The difficult first stage has been carefully examined, because it is the one which has not been accurately investigated in the past century. We can explain abduction as a reasoning from consequent to antecedent in which we operate on signs at a lower level in respect with the other inferences which work at symbolic level. In abduction we work on icons and indices, the very first representations we have of reality. This strong connection with reality expressed by signs explains why our beliefs are so many times leading us toward truth and to an adequate comprehension of reality, even though this understanding always remains fallible. As pragmatism taught us, truth is thus maintained by the working effects of our hypotheses. The necessity of being realists is the result of this working. We can be sure of reality because our ideas operate successfully in it. Are we saying that being and truth – that is knowledge about being – depend on our beliefs, namely on the actual state of our knowledge? No, we are just saying that working is a sign of truth that will be established in the long run. And metaphysical realism is the result we have to admit in order to guarantee this passage from beliefs or provisional truth into a shared truth in the community of inquirers, and even into a final truth at an ideal final point of history.

Realism emphasizes the continuity between reality and human minds more than the existence of objects “out there”. To maintain that an object can be “out there” while having no conceivable relationship to our knowledge is equivalent to saying that we could treat it anyway we wanted, not being constrained by it, simply because our rational faculties can afford to be the ultimate judges of that reality. The history of philosophy has labelled that attitude “nominalism”. Nominalism can believe in the ontological reality of objects without accepting that they govern either the method or the meaning of inquiry.

On a metaphysical level, defending hypotheses means that this reality to which we get to must comprehend not only hard facts (to which principles of contradiction and excluded third hold) but also possible ideas (possibility intended as the realm in which the principle of contradiction does not work) and necessities (the realm in which the principle of third excluded does not hold like verified hypotheses). Besides, the passage among those three



modalities must be continuous, the “true continuity” that Peirce and Cantor thought to be very different from the pseudo-continuity we can reach with the logic of sets.

In human hypotheses possibilities become necessities, as for Kepler’s laws. Were not they there before Kepler discovered them? Of course, they were not there as laws. Laws are part of human knowledge and they are a human product. But this product stems from reality through that depth of reason that we call “heart” or “rational instinct” and it works so that it becomes part of that reality, as far as it is tested. In this sense we are collaborators of the Creator, or as Tolkien used to say we are sub-creators: we cannot give existence, but we can create possibilities and understand the necessity of meaning.

Saying it with the Italian poet Clemente Rebora:

*Oh per l'umano divenir possente
Certezza ineluttabile del vero,
Ordisci, ordisci de' tuoi fili il panno
Che saldamente nel tessuto è storia
E nel disegno eternamente è Dio:
ma così, cieco e ignavo,
Tra morte e morte vil ritmo fuggente,
Anch'io ti avrò fatto; anch'io.*

[Oh, unbeatable certainty of the truth,
into the mighty becoming of humanity,
weave, weave your threads into the cloth,
because strongly in this cloth history lays,
and in the drawing God eternally stays;
but even in this way, blind and vile,
between death and death, poor fleeing
rhythm,
Me too, I have made you;
me too].

(C. Rebora, Frammento VI)

References

1. Popper, K.R. *Logik der Forschung*, Wien: Springer Verlag, (1934).
2. Reichenbach, H. *Experience and prediction; an analysis of the foundations and the structure of knowledge*. Chicago, Ill.: The University of Chicago Press, (1938).
3. Gadamer, H.G. *Wahrheit und Methode*, Tübingen: Mohr, (1960).
4. Kuhn, T.S. *The Structure of Scientific Revolutions*, Chicago: The University of Chicago Press, (1962).
5. Derrida, J. *L'écriture et la différence*, Paris: Editions du Seuil, (1967).
6. Hanson, N.R. *Patterns of Scientific Discovery*, Cambridge: Cambridge U. Press, (1958).
7. Harman, G. *The inference to the Best Explanation*, *The Philosophical Review* 74 (1): 88-95, (1965).
8. Thagard, P.R. *The Best Explanation: Criteria for Theory Choice*, *The Journal of Philosophy* 75(2): 76-92, (1978).
9. Hintikka, J. *What is abduction? The fundamental problem of contemporary epistemology*, *Transactions of the Charles S. Peirce Society*, XXIV (3): 505-533, (1998).
10. Paavola, S. *On the origin of ideas: an abductivist approach to discovery*, Helsinki-Vantaa: University of Helsinki (Philosophical Studies from the University of Helsinki, 15), (2006).



11. Brent, J. C.S. *Peirce. A Life*, Indianapolis and Bloomington: Indiana U. Press, (1993).
12. Peirce, C.S. *Collected Papers (CP)*, voll. I–VI, P. Weiss e C. Hartshorne (eds.), Cambridge (Mass.): Harvard University Press, (1931-1935).
13. Peirce, C.S. *Reasoning and the Logic of Things (RLT)*, K. Ketner and H. Putnam (eds.), Cambridge (Mass.): Harvard University Press, (1998b).
14. Petroni, A. M. *Alcune posizioni recenti relative alla logica della scoperta scientifica*, Quaderni di 'Innovazione Scuola' 18, 155-172 (1993).
15. Niño, D. *Abducting Abduction. Avatares sobre la comprensión de la Abducción de Charles S. Peirce*, Tesis Doctoral, Bogotá: Universidad Nacional de Colombia, (2007).
16. Maddalena, G. *Metafisica per assurdo*, Soveria Mannelli (CZ): Rubbettino, (2009).
17. Peirce, C.S. *The Essential Peirce*, vol. 2 (EP2), The Peirce Edition Project (ed.), Bloomington-Indianapolis: Indiana University Press, (1998).
18. Boler, J. E. *Charles Peirce and Scholastic Realism*, Seattle: U. of Washington Press, (1963).
19. Peirce, C.S. *Writings of Charles Sanders Peirce (W)*, voll. 1-6, The Peirce Edition Project (ed.), Bloomington-Indianapolis: Indiana University Press, (1981-2000).
20. Peirce, C.S. *The New Elements of Mathematics (NEM)*, C. Eisele (ed.), The Hague: Mouton, (1976).
21. Maddalena, G. *Giovanni Vailati e l'arte di ragionare* in G. Maddalena-G. Tuzet (eds.), I pragmatisti italiani. Tra alleati e nemici, Milano: Alboversorio, 23-42, (2007).
22. Tuzet, G. *Is Qualitative Induction a Kind of Induction?*, manuscript, (2007).
23. Peirce, C.S. *Collected Papers (CP)*, voll. VII–VIII, A.W. Burks (ed.), Cambridge(Mass.): Harvard University Press, (1958).
24. Giussani, L. *Il senso religioso*, Milano: Rizzoli, (1997).