In Pursuit of Objectivity

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"There is a form of objectivity that spurns all images, whether they are perceived by the eye of the body or that of the mind, as irretrievably subjective". It is in these terms that Lorraine Daston and Peter Galison (2007: 254) define "structural objectivity", the epistemic attitude that characterised late 19th and early 20th century attitudes toward scientific inquiry and its objects. "Objectivity without images" (ibid.) is the ideal pursued, in a number of variations and shades, by logicians, mathematicians and physicists alike. It permeates the Fregean rejection of mental pictures and intuitions from the (strictly formal) logic of proof in the *Begriffsschrift*, and fuels the aspirations to unity that animated the logical positivists' quest for a neutral language. It lurks in the background of Henri Poincaré's conventionalism, and animates Hermann Weyl's interpretation of Einstein's special theory of relativity as the promise of a new scientific philosophy rooted in invariants under transformation (ibid.:253-307).

While the quest for invariant structures, often pursued through the means of symbolic formalism, offers a reasonable ground to understand and problematize the very notion of objectivity (indeed, residues of this attitude still pervade a rather large portion of analytical philosophy), one detail of Daston and Galison's account stands out as rather puzzling: the inclusion of Charles S. Peirce in their discussion of structural objectivity. In this paper, I want to dissect their reading of Peirce, and spell out the commonalities and differences between their account of structural objectivity and the one that emerges from Peirce's own writings on this issue.

The most glaring contrast between Peirce and the main advocates of objectivity as structural invariance has to do with the nature of the logical systems that they respectively proposed and pursued. While structural objectivity well captures the symbolic formalisms advanced by Bertrand Russell and Alfred North Whitehead's *Principia Mathematica* or Gottlob Frege's *Begriffsschrift*, Peirce's take on logic seems to elude the very characterization of "objectivity without images". His diagrammatic system of Existential Graphs stands out as an extraordinary exception to the dominant trend in logic at the turn of the 20th Century, in that it aimed at being as iconic as possible. Peirce's ambitious goal was indeed to pursue objectivity as universal communicability (as Daston and Galison correctly point out), but he accomplished it by constructing a logical system of visual – or at least heterogeneous – representations that would function as "moving pictures of thought" (CP 4.8, c1905; Pietarinen 2006).

This does not completely invalidate, of course, Daston and Galison's thesis regarding structural objectivity. But it does open some questions on how the practice of self-restraint that motivates, in their account, the exclusion of images from logical and mathematical notation as variable and

subjective, applies to the case of Peirce. The emphasis on self-restraint is directly related to Daston and Galison's claim that objectivity in its many (historically contingent) guises, is first and foremost an epistemic virtue among many. Indeed, in their account objectivity is one of the norms that are enforced, shared, and internalized by scientific practitioners for the purpose of securing knowledge (Daston and Galison, 2007: 40). Once again, while the moral connotations of this characterization seem broadly in line with the concerns that animated Peirce's philosophy, I am not entirely convinced that the specific focus on *restraint* as a requirement for the pursuit of objectivity fully captures the spirit of Peirce's account. In particular, there is an element of *dynamic responsibility* in Peirce's account of objectivity that seems to find no counterpart in Daston and Galison's characterization. It is to this particular aspect of Peirce's account that I want to turn my attention.

This paper will develop in two main parts. In the first section, I will explore Peirce's take on diagrams and relate it to his account of iconicity. My aim is to show that the very formulation of iconicity and its key role in Peirce's philosophy is at the core of his explicit rejection of the ideal of "objectivity without images" that Daston and Galison place at the centre of their account of structural objectivity. In the second part of the paper, I will relate this aspect of Peirce's account of iconicity to his broader ideas about objectivity as universal communicability across a community of inquirers. In particular, I argue that Peirce placed *perspicuity* at the heart of universal communicability. This still qualifies as "structural objectivity", but in a sense that is rather different from Daston and Galison's emphasis on symbolic formalism as the key to the quest for invariance that characterised 20th century logic. I will conclude with some brief general remarks on what we can learn from Peirce's account of objectivity in terms of epistemic virtues: rather than discipline as *restraint*, Peirce's views entail a sense of *dynamic responsibility* towards the objects of logical and scientific inquiry.

Perspicuity as universal communicability

> "This is not the place to speak of Mr. Russell's book, which can hardly be called literature. That he should continue these most severe and scholastic labors for so long, bespeaks a grit and industry, as well as a high intelligence, for which more than one of his ancestors have been famed. Whoever wishes a convenient introduction to the remarkable researches into the logic of mathematics that have been made during the last sixty years, and that have thrown a new light both upon mathematics and upon logic, will do well to take up this book. But he will not find it easy reading. Indeed, the matter of the second volume will probably consist, at least nine-tenths of it, of rows of symbols". (Peirce, 1903:309)

To the Peirce scholar, this unenthusiastic response to Russell's (1903) *Principles of Mathematics,* presented by Peirce in a review for *The Nation,* is rather unsurprising. Aside from the issue of the originality of Russell's approach, which has been extensively discussed by historians of logic,[1] the ground for contention here is what a logical system is supposed to achieve in the first place. What is

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[1] Peirce's review of Russell is usually interpreted as a controversy over credit (and plagiarism on Russell's part!) for the development of the logic of relations. See especially Anellis (1995), Anellis (2004-5), and the excellent commentary to Peirce's MS 514 by John Sowa (2001), available online at http://www.jfsowa.com/peirce/ms514.htm (last visited 15/05/2013).

truly at stake, for Peirce, is the epistemic desirability of Russell's "rows of symbols" for the purpose of capturing the very process of reasoning. The tone of slight disapproval that emerges from this review suggests that Peirce had an entirely divergent view on that issue. In a later manuscript (MS 514) dated 1909, Peirce is even more explicit about the requirements of a good system of logic, and more generally about the current state of logic:

> "So I will break off that and just give an illustration or two of how this Syntax of Existential Graphs works. But before doing that I wish to draw your attention, in the most emphatic way possible, to the purpose this Syntax is intended to subserve: since anybody who did not pay attention to that statement would be all but sure, not merely to mistake the intention of this syntax, but to think that intention as contrary to what is as well he could. *Namely he would suppose the object was to reach the conclusion from given premises with the utmost facility and speed, while the real purpose is to dissect the reasoning into the greatest possible number of distinct steps and so to force attention to every requisite of the reasoning.* The *supposed* purpose would be of little consequence, and it is the fussiness of the mathematicians to furnish inventions to attain it; but the *real purpose is to supply a real and crying need, although logicians are so stupid as not to recognize it and to put obstacles in the way of meeting it*" (pp. 20-21, emphasis mine).

The primary requirement of a good system of logic is to supply *a real and crying need to force attention to every requisite of reasoning*. But Peirce complains that logicians (and here there might be another hidden reference to Russell) are placing obstacles to the development of a transparent inquiry into the process of reasoning, by privileging facility and speed over perspicuity and clarity. On the contrary, logic should provide the clearest and most perspicuous way of dissecting reasoning in each of its steps. It is this requirement that Peirce's *chef d'oeuvre*, the Existential Graphs, were supposed to fulfil.

In 1896, Peirce had put forward his alternative system of diagrammatic logic. As Pietarinen (2006: 109ff) notes, the system was rooted in Peirce's previous investigations in logical algebra. More importantly, it is possible that the original motivation for the Existential Graphs dated as far back as 1882, and it was a clear effort on Peirce's part to improve on the perspicuity and readability of his logic of relatives. Indeed, in a letter to his student and then colleague at Johns Hopkins Oscar Mitchell, Peirce noted that his "notation of the logic of relatives can be somewhat simplified by spreading the formulae in two dimensions" (MS L 294, 1882, cited in Pietarinen, 2006: 109).

The development of the Existential Graphs shows that Peirce fought his battle over "structural objectivity" through pictures. He often complained about his own personal struggle to cope with the limitations of language: "I do not think I ever *reflect* in words: I employ visual diagrams firstly because this way of thinking is my natural language of self-communion, and secondly because I am convinced that it is the best system for the purpose" (MS 619: 8, 1909). But for Peirce the value of diagrammatic logic went beyond a mere psychological effect. The value of diagrams lies in their iconic nature, which ultimately is what distinguishes them from other systems and defines their fruitfulness:

> "I invented several different systems of signs to deal with relations. One of them is called the general algebra of relations, and another the algebra of dyadic relations. *I was finally led to prefer what I call a diagrammatic syntax*. It is a way of setting down on paper any assertion, however intricate, and if one

so sets down any premises, and then (guided by 3 simple rules) makes erasures and insertions, he will read before his eyes a necessary conclusion from premises" (MS 514, 1909, p.11).

Diagrams make relations visible, and their iconic nature is crucial to achieve this aim. Logic should not consist in devising "rows of symbols" that accelerate reasoning with the risk of missing steps or obfuscating the very action of thought. On the contrary, it should provide ways of forcing attention, observationally, on the necessary relations between premises and conclusions. It is for this reason that diagrams should be as iconic as possible. Iconicity is what grants the perspicuity of diagrams, and makes reasoning fruitful and fertile.[2] In the years leading up to the development of the Existential Graphs, and probably with his system of diagrams in mind, Peirce placed the very concept of observability at the very centre of his idea of iconicity:

> "A great distinguishing property of the Icon is that by the direct observation of it other truths concerning its object can be discovered than those which suffice to determine its construction" (CP 2.279, c1895)

Clearly here Peirce is not advocating a crude form of empiricism, nor should he be seen as a precursor of the concept of observability that the Logical Positivists would associate with the meaning of "observation statements". Instead, observation is the first step, for Peirce, toward the discovery of "new truths" that go beyond what is placed before an observer's eyes. In this sense, perspicuity is an *achievement* of logic, rather than being an implicit attribute of formal systems. As for all iconic representations, it is the construction and interpretation of diagrams that determines their perspicuity, and it is their perspicuity that points toward their universal communicability. Universal communicability, in turn, is an achievement in itself. It is the result of a series of stipulations between observers around what is observed, which leads to the communal discovery of new, unobserved relations.

Objectivity as a "Code of Conduct"

Peirce's defence of the perspicuity of diagrammatic reasoning blends very well with the account of "objective inquiry" proposed by Joseph Ransdell in a 1979 paper that is particularly relevant to contemporary debates around objectivity. According to Ransdell, Peirce construed scientific objectivity as a "code of conduct – more like a code of honour than a linguistic code" (Ransdell, 1979: 266-7). Objectivity, in Ransdell's terms, is not an implicit feature of science, nor is it a prerequisite for inquiry to qualify as "scientific". It is, instead, the result of the communal hunt for responsible truth-claims in a scientific context (ibid.: 264). Inquiry qualifies as "objective", Ransdell points out, provided that we agree where to start from and what is the most suitable method to reach satisfactory conclusions:

> "Objectivity is not a matter of results or even of types of inferential procedures, but rather a matter of the recognition *in* one's communication with other inquirers that where one started from, and how one got to the conclusion (or how one thinks one can get to the conclusion), may be capable of being

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[2] For a full discussion of iconicity see Ambrosio (2009) and Ambrosio (forthcoming).

corrected by them, and hence to be shared so that they can be subjected to the real possibility of such correction". (ibid.)

This aspect of *dynamic responsibility* is what differentiates Peirce's ethos from the practice of restraint that Daston and Galison place at the foundations of their account of objectivity. Inquirers responsibly and actively participate in the construction of the code of conduct that informs and animates science. Rather than a suppression of the scientific self, Peirce's philosophy is an open call to take active responsibility in the construction of the ethos of scientific inquiry.

It is with this definition of objectivity in mind that we can return to the role of logic in the broader framework of Peirce's account. What Peirce has in common with the picture of structural objectivity proposed by Daston and Galison is indeed a view of logic as a way of guaranteeing the framing of inquiry in a common and universally communicable language. But symbols and formalisms alone will not lead to the accomplishment of universal communicability. It is perspicuity, along with the recognition of the fallible nature of our inferential processes, that paves the way to what counts as objective in science. This is evident in Peirce's mature definition of logic, which unsurprisingly he identified with "semiotics":

> "…The quasi-necessary, or formal, doctrine of signs. By describing the doctrine as "quasi-necessary" or formal, I mean that we observe characters of such signs as we know, and from such an observation, by a process which I will not object to naming Abstraction, we are led to statements, eminently fallible, and therefore by no means necessary, as to what must be the characters of all signs used by a "scientific" intelligence, that is to say, by an intelligence capable of learning by experience". (CP 2.227, c 1897)

Peirce's definition condenses all the key features that eventually converged in his *chef d'oeuvre*: perspicuity, iconicity, observation as prompting inquiry, the presence of a "scientific intelligence" in the form of a community of inquirers, and the recognition of the fallible nature of our inferential practices.

Conclusions: Logical Sentiments and Epistemic Virtues

In their account of structural objectivity, Daston and Galison cite passages from Peirce's 1878 paper on "The Doctrine of Chances". What they extrapolate is Peirce's appeal to a "cosmic community" as the guarantee of the validity of logical inferences (Daston and Galison, 2007: 257): "logicality inexorably requires that our interests do not stop at our fate but must embrace the whole community" (ibid.; EP1:). But Peirce's claim here is slightly more subtle, and it is framed in terms of "logical sentiments". We would probably identify nowadays such sentiments with epistemic virtues, but their connotations are slightly different from the drive toward formalism that Daston and Galison place at the core of their account of universal communicability. The first requirement for logicality, Peirce claims, is selflessness:

> "To be logical men should not be selfish…the wilful prosecution of one's desires is a different thing from selfishness. […] it is not necessary for logicality that a man should himself be capable of the heroism of self-sacrifice. It is sufficient that he should recognise the possibility of it, should perceive

that only that man's inferences who has it are really logical, and should consequently regard his own as being only so far valid as they would be accepted by the hero. So far as he thus refers his inferences to that standard, he becomes identified with such a mind" (EP1: 149-150)

To be logical presupposes that men must not be selfish, as logic requires the identification of one's interests with the interests of an unlimited community of inquirers. Selflessness is what motivates the quest for a common language, which is in turn built upon "Three Logical Sentiments", which Peirce Identifies as follows:

"It may seem strange that I should put forward three sentiments, namely, interest in an indefinite community, recognition of the possibility of this interest being supreme, and hope in the unlimited continuance of intellectual activity, as indispensable requirements of logic. Yet, when we consider that logic depends on a mere struggle to escape doubt, which, as it terminates in action, must begin in emotion, and that, furthermore, the only cause of our planting ourselves on reason is that other methods of escaping doubt fail on account of the social impulse, why should we wonder to find social sentiment presupposed in reasoning? As for the other two sentiments which I find necessary, they are so only as supports and accessories of that" (EP1:150)

In 1878, the time in which the "Doctrine of Chances" was completed, Peirce's work in logic had not yet extended to his system of diagrams. Yet an echo of his pragmatism, which appeared in the same *Illustrations of the Logic of Science* as the "Doctrine of Chances", is clearly visible in his assertion that "logic depends on a struggle to escape doubt". In the following years, and probably in light of his critical revision of the shortcomings of his own logic of relations, Peirce developed a diagrammatic system of logic that would fulfil both the requirements of his pragmatism – primarily not to block the way of inquiry – and the pressing need for universal communicability. It is in this context that Peirce's critique of Russell needs to be re-read and re-contextualised. By privileging formalism over iconicity, logicians are being "selfish". True, formalism might be a device that minimizes the number of steps between the premises and the conclusions of our inferences, but this comes at the price of obfuscating the very process of thought in action, and depriving it of the necessary clarity that opens its analysis and use to a community of inquirers. Adopting perspicuity as a criterion for universal communicability, on the other hand, maximises the chances of making reasoning visible and intersubjectively communicable. Perspicuity as universal communicability entails responsible negotiations and stipulations around the objects of scientific and logical inquiry. It is in this sense that Peirce's logic stands out as a response, and a perspicuous one, to structural objectivity.

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