

The Logical Goodness of Abduction in C. S. Peirce's Thought

Abstract

The term “abduction” has been used with different meanings since its introduction in C. S. Peirce’s writings. It has been used to refer to inference to the best explanation, hypothetical inference, inference to new explanations, and a guessing-instinct. These meanings converge to solve a central problem: how do new ideas emerge in inquiry? Different authors defend different meanings of “abduction” which, in their view, resolve this fundamental problem. This article seeks to displace the central question of abduction in order to account more coherently for its different meanings in Peirce’s thought. It is argued that abduction is not concerned with the emergence of new ideas in reasoning but instead with how ideas are made to fulfill their logical purpose. Since the logical goodness of abduction is most directly treated in Peirce’s 1903 Harvard Lectures on Pragmatism, this article first examines the link between abduction, pragmatism, and logical goodness in those lectures. This initial examination leads us to displace the central question of abduction, from “how do new ideas emerge?” to “how do ideas fulfill their logical purpose?”

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Introduction

“What is abduction?” asks Jaakko Hintikka in the title to his 1998 article on C. S. Peirce’s concept. The answer to Hintikka’s question is problematic on several counts. There is, to begin with, a difference between Peirce’s own views on abduction and later interpretations of abduction as “inference to the best explanation” (Minnameier 2004; Paavola 2006). There are, furthermore, tensions within Peirce’s own account of abduction, for instance, a tension between “inferential” and “instinctual” aspects of abduction (Fann 1970; Anderson 1986; Kapitan 1990; Paavola 2005; Paavola and Hakkarainen 2005). These tensions are exacerbated by two factors. First, there are several terminological variants of the word “abduction” in Peirce’s writings.¹ Second, there is a temporal development in Peirce’s reflection on abduction (Burks 1946, 301; Anderson 1986, 145; and Paavola 2011, 253). What is more, in the course of Peirce’s career he discusses abduction in relation to such disparate themes as inference, instinct, perceptual judgments (Nesher 2002), the “economy” of research (Minnameier 2004; McKaughan 2008), and the maxim of pragmatism (Pape 1997; Mullins 2002; Bertilsson 2004; Paavola 2005).

What exactly is abduction, then? As we have intimated, no strict definitions are admissible, especially not in relation to Peirce’s own conception. Hintikka seems to understand the issue and, accordingly, his answer to the question is slightly oblique. Abduction, as his article’s subtitle is quick to announce, is “the fundamental problem of contemporary epistemology.” The problem is not just what abduction *is* in Peirce’s view. It is, according to Hintikka, what the nature of ampliative reasoning (i.e., reasoning which derives exaggerated conclusions from limited premises) is (1998, 506). How are new ideas introduced in inquiry, scientific or otherwise? This is the question which, under some form or another, has driven

recent investigation into Peirce's notion of abduction. Several scholars, following in the footsteps of N. R. Hanson's interpretation of abduction as the "logic of discovery" (1958), define abduction as an initial "creative" stage in scientific inquiry, where new ideas are generated and new discoveries made (Anderson 1986; Roth 1987; Paavola 2004, 2005, 2006). With a similar interest in abduction as a creative starting point for inquiry, some scholars have inquired into the implications of abduction for formal logic (Shanahan 1986; Kapitan 1990; Burton 2000; Schurz 2008; Hoffman 2010), while others have inquired into its implications for learning, understood as an investigative process (Nesher 2001; Paavola and Hakkarainen, 2005).

Despite their contrasting foci, these scholars share an important common point: in their view, to understand how ampliative reasoning works, in science just as in everyday life, means to understand what abduction is. It appears, then, that we have come back to our point of departure. For if we need to define Peircean abduction in order to understand how new ideas emerge, we will inevitably collide against temporal, terminological and topical variations within Peirce's own account of abduction. Scholars interested in the problem of discovery have thus been brought either 1) to commit to one particular definition of Peircean abduction in accounting for discovery (e.g., abduction as instinct, or abduction as inference), 2) to propose a new or a reconfigured definition for the notion (e.g., Paavola's "strategic" view of abductive inference), or 3) to simply reject abduction as a valid answer to the problem (e.g., Frankfurt 1958; Kapitan 1990, 1992). Whatever option is chosen, we are left with a partial account of what abduction is in Peirce's view—and, by extension, an incomplete account of the ways in which ideas impact inquiry.

This article seeks to complete—and to challenge—these accounts by redefining the central problem of abduction. While in our view abduction does represent a fundamental

epistemological problem, we will argue that it is not the problem of ampliative reasoning, i.e., how “new” ideas emerge in inquiry. It is, rather, in contrast with recent Peirce scholarship, the problem of logical goodness, i.e., how ideas fulfill their logical purpose. This question of logical goodness is insistently present in Peirce’s 1903 Harvard Lectures on Pragmatism, where it traces a clear link between abduction and his maxim of pragmatism. Setting “logical goodness” as the central problem of abduction will therefore inevitably bring us to examine the scarcely explored link between pragmatism and abduction, and to reexamine previous interpretations of abduction in Peirce scholarship. Our argument will proceed in two main steps. First, we will examine the link between abduction, the maxim of pragmatism, and logical goodness in Peirce’s Lectures on Pragmatism. This examination should highlight the ways in which Peirce’s doctrine of pragmatism is entwined with his views on abduction, and in particular how the notion of logical goodness connects abduction to his pragmatism. Second, we will review previous interpretations of Peircean abduction to show, on one hand, how they have for the most part addressed a similar problem, but on the other, how our focus on logical goodness allows us to trace a more coherent and more accurate picture of abduction in Peirce’s thought.

Pragmatism and the Logic of Abduction

“If you carefully consider the question of pragmatism you will see that it is nothing else than the question of the logic of abduction.” (5.196, 1903)² Peirce cannot be clearer on the close connection he sees between abduction and his doctrine of pragmatism. Yet the connection remains enigmatic. The enigma is due, in part, to the literalness with which he compares two terms whose meanings seem distant from one another, especially considering that they have

evolved throughout his career. This difficulty can be overcome if we restrict ourselves to his 1903 Harvard Lectures on Pragmatism. The above quotation, which is taken from his seventh and concluding lecture, comes after six and half lectures in which he seeks to demonstrate the soundness of the maxim of pragmatism. As originally stated in 1878, the maxim is as follows: “Consider what effects, which 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.” (5.402, W 3:266)³

Peirce presents the maxim in his first lecture (5.14-18), and thereafter his entire exposition is devoted to laying out basic assumptions about logic, assumptions which, we can safely assume, are meant to provide necessary conditions for the maxim to be sound.⁴ These assumptions are distilled in three main propositions in his final lecture: (1) nothing is in cognition which has not been in perception; (2) perceptual judgments contain general elements; and (3) abductive inferences shade into perceptual judgments without clear demarcation (5.181). These tenets are not self-evident, of course, which is why Peirce tries to demonstrate their soundness in his six initial lectures. In his first three lectures, Peirce situates logic within his general classification of sciences. Logic, here, is embedded in two trichotomic schemes. First, it falls within what he calls “normative science,” which includes esthetics, ethics and logic itself. Second, it falls within philosophy, which includes phenomenology, normative science and metaphysics (5.36-40). The important point, as R. K. Atkins (2006) remarks, is that these trichotomic schemes are based on a systematic replication of three universal categories—Firstness, Secondness, and Thirdness—where Firstness (i.e., what just “is”), Secondness (i.e., what acts and reacts, what “struggles” in the world), and Thirdness (i.e., what is general, what has a “law-like” character) are successive and hierarchical stages (5.41-49, 66).⁵

After situating logic in his architectonic system, Peirce sets out to define its limits. In its simplest formulation, logic is defined as “the doctrine of what we ought to think” (5.35). It involves, according to Peirce, a controlled act of thought (5.108). Thus, we cannot criticize uncontrolled cognitions in logical terms, just as we cannot “pronounce the growth of [our] hair to be morally good or bad.” (5.109; see also 5.157) When we begin to control our thoughts, we begin to be logical beings, and only then can we define what is and is not logically sound, including the maxim of pragmatism. The question becomes, now, what is the threshold between control and non-control, between logic and pre-logic? According to Peirce, the threshold lies in perceptual judgment (5.115, 116, and 142; see Burton 2000, 150). A perceptual judgment is, in Peirce’s terms, “an act of formation of a mental proposition combined with an adoption of it or [an] act of assent to it.” (5.115) In this initial sense, perceptual judgments seem capable of possessing an inferential structure, which would make them logical operations. In practice, however, perceptual judgments are fundamentally uncontrollable, which makes them impervious to logical criticism. According to Peirce, this dual character makes perceptual judgment an irrevocable foundation for all knowledge about the world (5.116 and 142; see Nesher 2001 and 2002). In possessing a quasi-inferential structure, perceptual judgments are “convertible” into logical statements, while in being uncontrollable, they remain outside the purview of logical criticism.

To demonstrate how perceptual judgments act in quasi-inferential ways⁶ while simultaneously remaining , uncontrollable, Peirce uses two examples. First, he shows how it remains impossible to correct our perceptual judgment about a wall when, initially, we think that it is clean and, upon closer examination, we see that it is soiled (5.142). We can infer *a posteriori* that the wall has been soiled the entire time, yet we cannot correct our initial perceptual

judgment in the same way, i.e., we cannot say we had seen that the wall was soiled even as our only perceptual evidence for our first judgment indicates the contrary. Peirce makes a similar argument with visual illusions, where a percept (a line drawing) triggers an initial perceptual judgment (that we see a stone wall) but upon closer examination triggers a revised perceptual judgment (that we see a continuous line drawing), and that revision cannot cancel our initial perceptual judgment (5.183). These examples show how perceptual judgments are uncontrollable while remaining “convertible” into inferential thinking *if*, for any reason, we are brought to logically revise our uncontrollable judgments.

The “if” is crucial here, since, in both examples, perceptual judgments remain uncontrollable until the percept presents itself under a different light to human cognition. Peirce remains unclear, however, on the logical, i.e., cognitively controlled, conditions under which this change in perception occurs, and this probably means that the passage from perception to inference in perceptual judgment is itself uncontrollable, at least in its instigation. Thus, in the absence of logically controlled conditions under which one can trigger the passage from perception to inference, the proposition that perceptual judgments are simultaneously uncontrollable and quasi-inferential seems justified, in the last analysis, by the fact that perceptual judgments *do* oscillate, in uncontrollable fashion, from uncontrolled perception to controlled inference (5.186).⁷

According to Peirce, then, there is no sharp demarcation between perceptual judgment and abduction (5.181 and 184). In fact, both perceptual judgments and abduction oscillate between an inferential mode, where we inquire into our world in quasi-deductive steps, and an uncontrolled mode, where our minds become “naturally” or “instinctually” imbued with accurate perceptions/suggestions. The only distinction, in Peirce’s view, is that perceptual judgments are

fundamentally uncontrollable, while abduction remains a controlled logical operation and thus falls under the purview of logical criticism (5.186). In a weak sense, the link between perceptual judgments and abduction offers a possible connection between pragmatism and abduction. The maxim of pragmatism is premised upon the fact that all of our knowledge about the world is ultimately acquired through perception, and this explains, among other factors, why no cognitive conception is possible outside possible practical effects given in perception. As Peirce argues, however, there remains a gap between “uncontrolled” perception and “controlled” cognition, a gap which is bridged, primarily, by the lack of a stark distinction between perceptual judgments and abduction. This solution explicates one possible link between abduction and pragmatism: abduction is a necessary condition for the truth of pragmatism, because it is an intermediary stage between perception and cognition.

Nevertheless, it remains difficult to understand why the question of pragmatism would be, literally, the question of the logic of abduction (5.196). That these are the same question points towards another link. In his 1903 Lectures, Peirce insistently comes back to the idea of “logical goodness.” It is not “logical validity,” *per se*, because validity is an affair of (deductive) reasoning, as he indicates in his fifth lecture (5.146). The idea of logical goodness is difficult to define in straightforward manner, as Peirce himself remains cryptic on the matter. We can say, however, that goodness is attributed to ideas or statements *which fulfill their purpose in the world* (5.197). The question becomes, then, what purpose do ideas or statements have? To answer the question, we need to refer to the *situation* in which these ideas/statements are produced. The idea of global warming, for example, will have a very different purpose when it is invoked by a politician making a public statement than when it is invoked by a climatologist as an explanatory hypothesis. The goodness of the idea is different in each case. For the politician,

the idea of global warming is good when it fulfills its *political* purpose, e.g., to rally voters in an electoral campaign. For the climatologist, the idea of global warming is good when it fulfills its *logical* purpose, e.g., to provide an explanation for multiple observations about climate.

When Peirce talks about the *logical* goodness of abduction, then, he is attributing goodness to those ideas or statements which, having emerged in abductive reasoning, fulfill the *logical* purpose of abduction. According to Peirce, abduction generates explanatory hypotheses which aim, “through subjection to the test of experiment, to lead to the avoidance of all surprise and to the establishment of a habit of positive expectation that shall not be disappointed.” (5.197) In simpler terms, the purpose of abduction is to provide hypotheses which, when subjected to experimental verification, will provide true explanations. To be sure, this purpose is intimately linked with Peirce’s views on the scientific method, views which, as we will see later, set abduction as an initial stage in a scientific process whose concluding stage, viz., experimental verification, only leads to the establishment of truth “in the long run” of experience (5.199; see also 6.534, c.1901, and Mullins 2002, 203).

It suffices to remark, for now, that essentially, the logical goodness of abduction corresponds to the logical goodness of the maxim of pragmatism (5.196). Given what we indicated above, the maxim of pragmatism should have logical goodness if it produces ideas or statements which fulfill its logical purpose. In his Lectures on Pragmatism, Peirce defines two complementary purposes for his maxim: (1) to get rid of unclear ideas in logic, and (2) to lend support to ideas that are already clear (5.206). Thus, pragmatism is “good” when it produces *clear* ideas or statements, i.e., ideas or statements the possible practical effects of which constitute their entire meaning.⁸ We can see a parallel here between the maxim of pragmatism and abduction. While abduction seeks to provide “good” hypotheses which, through

experimentation, will lead to true explanations, pragmatism seeks to provide “good” ideas which, through ordinary experience, will lead to true representations. Both “true” representations and “true” explanations are to be understood, as Mullins perspicaciously remarks, as sustainable belief-habits, that is, as recurring settlements of belief about the world which rely on experientially or experimentally verifiable statements (2002, 203-204; see also Peirce’s “The Fixation of Belief,” 1877). When we argue, then, that the goodness of pragmatism is essentially identical to the goodness of abduction, we are referring precisely to their similar logical purpose, i.e., the establishment of sustainable belief-habits.

The question now becomes: what properties do “good” ideas or statements have? How do “good” ideas establish sustainable belief-habits? This is, we argue, the central problem of abduction. Peirce’s discussion of the subject merely hints towards a possible answer. These hints are contained, as Mullins signals (2002, 201), in the following passage:

What is good abduction? What should an explanatory hypothesis be to be worthy to rank as a hypothesis? Of course, it must explain the facts. But what other conditions ought it to fulfill to be good? The question of the goodness of anything is whether that thing fulfills its end. What, then, is the end of an explanatory hypothesis? Its end is, through subjection to the test of experiment, to lead to the avoidance of all surprise and to the establishment of a habit of positive expectation that shall not be disappointed. Any hypothesis, therefore, may be admissible, in the absence of any special reasons to the contrary, provided it be capable of experimental verification, and only insofar as it is capable of such verification. This is approximately the doctrine of pragmatism. (5.197)

We can gather, from this excerpt, that a good hypothesis, as obtained through abduction, has two main characters: first, it must *explain* given facts; second, it must be susceptible to future *experimental verification*. There remains, however, another implicit character to good hypotheses, a character which is not mentioned in the passage just quoted. In order to be logically good, a hypothesis needs to account for given facts in a *clear* manner, that is, it needs to provide explanations with distinguishable practical effects (Mullins 2002, 201). The main reason for this is simply that when a hypothesis is tested, one needs to confirm or disconfirm its true conceptual content: if the hypothesis is “unclear,” testing will only confirm or disconfirm some similar yet confused conception, with no hope of detecting that confusion except in another (abductive) search for clear explanations. This is perhaps another reason why the question of pragmatism would be, literally, the question of the logic of abduction (5.196). Just as pragmatism seeks to provide *clear* representations of the world, abduction seeks to provide *clear* hypotheses, except that—and herein lies abduction’s distinctive character—these hypotheses need to explain given facts with an eye on future experimental verification. To summarize, then, a “good” idea, as generated in abduction, would have three main properties if we follow Peirce’s reasoning: 1) it needs to be *clear*, i.e., it needs to have distinguishable practical effects; 2) it needs to *explain* available facts; and 3) it needs to be liable to *future experimental verification*.

Understanding Peircean Abduction: The Problem of Logical Goodness

We have indicated in our previous discussion what the logical goodness of abduction is concerned with and how it inherently relates to the logical goodness of the maxim of pragmatism. We have specified, furthermore, what properties logically “good” ideas in

abduction, i.e., “good” hypotheses, should possess according to Peirce’s view. It is now important to show how our views on abduction relate to, and, more importantly, how they are distinct from, prevailing views about abduction as a matter of ampliative reasoning. To engage in this demonstration, we will first present an overview of major interpretations of Peircean abduction in Peirce scholarship and show how these interpretations fit within the problem of ampliative reasoning. We will then explain how the problem of ampliative reasoning misplaces the central question of abduction, i.e., the question of its logical goodness. Finally, we will indicate how a focus on logical goodness allows us to understand Peircean abduction, under its different interpretations, in a more coherent way.

We need to insist, before we start, that there is a central temporal division within Peirce’s reflections on abduction. As Paavola succinctly puts it, we may distinguish between an *early* Peirce (1860s-1890s) who “emphasized abduction as an evidencing process with a syllogistic interpretation” and a *late* Peirce (1890s-1910s) who “emphasized a methodological process where abduction is especially related to the first stages of inquiry” (2011, 253). While Peirce himself did not perceive any radical discontinuity between his earlier and later views (2.102, 1902; 8.227, c.1910), his shift from formal syllogistics to a science-oriented view of logic is thought by some scholars to have impacted his views on abduction (Fann 1970; Thagard 1977; Minnameier 2004). From his earliest writings (e.g., his *Journal of Speculative Philosophy* series, 1868-1869), Peirce famously distinguishes between three types of inference—although, as we contend, his earlier division undergoes serious modifications in his later writings.

The early types of inference are (1) *deduction*, which is responsible solely for deriving necessary conclusions from given premises; (2) *induction*, an ampliative mode of reasoning uniting multiple observations under one general rule; and (3) *hypothesis*, or *hypothetical*

inference (2.706-707, W 4:419-420, 1883), which designates another ampliative mode of reasoning whereby multiple observations “called for by one occasion get united in a general idea which is called out by the same occasion” (6.146, W 8:152, 1892; see also 2.623-625, W 3:325, 1878; 5.145, 1903). The later logical types, as defined in Peirce’s 1903 Lectures on Pragmatism, are 1) *abduction*, which consists in “studying facts and devising a theory to explain them” (5.145)—it is, in other words, “the process of forming an explanatory hypothesis” (5.171); 2) *deduction*, which derives necessary consequences from adopted hypotheses in order to create testable statements (5.145 and 161-163); and 3) *induction*, which consists in the experimental testing of statements deduced from initial hypotheses (5.168-170).

Aside from terminological variations, the main difference between Peirce’s early and late divisions of logic lies in his shifting stance on logic itself. While his early writings confine logic to rigid syllogistic formulations, his later writings redefine logic in terms of scientific inquiry. According to K. T. Fann, Peirce came to consider science as a paramount logical method that goes beyond mere syllogistics (1970, 17-28). The crucial change in Peirce’s late division of logic is that abduction, deduction, and induction fulfill specific functions distributed on a temporal scale: not only does each stage develop “in time,” it also develops with an awareness of the entire temporal unfolding of scientific inquiry. Thus, the generation of possible explanations in abduction unfolds “in time,” while remaining responsive to the *in futuro* imperative of scientific experimentation, such that no hypothesis can be adopted *except if* it is liable to future testing and (re)confirmation (6.525-526, c.1901; 7.220, 1901).

This is not the case with hypothetical inference, whose sole import is to conjecture, in syllogistic manner, about supervening “cases” or events. The syllogistic nature of Peirce’s early logic is well illustrated in “Deduction, Induction and Hypothesis” (1878), where we are shown

how different types of inference would construe the origin of white beans on a counter (2.623, W 3:325-326):

DEDUCTION

Rule.—All the beans from this bag are white.

Case.—These beans are from this bag.

∴ *Result.*—These beans are white.

INDUCTION

Case.—These beans are from this bag.

Result.—These beans are white.

∴ *Rule.*—All the beans from this bag are white.

HYPOTHESIS

Rule.—All the beans from this bag are white.

Result.—These beans are white.

∴ *Case.*—These beans are from this bag.

This example shows how Peirce originally conceived of induction and hypothesis as weak inferential forms with a similar syllogistic structure as deduction, albeit without its truth-preserving property. In induction, we infer to a general rule from several cumulated results; in hypothesis, we infer to a local explanation based on a posited general rule and cumulated results (2.706-707, W 4:419-420, 1883; HP 2:878-879, 1900). As the later Peirce recognizes (2.102,

1902; 8.227, c.1910), his early notions of induction and hypothesis are easily confused with one another. Both logical operations are “unclear,” in pragmatist terms, since their practical effects are essentially similar: in induction, we infer to a general explanation from a series of results; in hypothesis, we infer to an explanation about a given case from available results and a conjectured general rule. The difference, here, is only one of degree: an induction is an inference to a rule; a hypothetical inference is an inference to a rule *about* an occurrence, or in Peirce’s own words, “an induction from qualities” (6.145, W 8:151, 1892). In his later writings, Peirce solves the problem by making induction a method of experimental verification leading to the establishment of truth in its long-term application (5.168-171, 1903; 7.110, 1903; see Burks 1946, 302; Anderson 1986, 150-151). Conversely, as Thagard remarks, Peirce’s solution involves a weakening of hypothetical inference into a semi-inferential/semi-instinctual faculty called “abduction” (1977, 121).

Peirce’s early writings on hypothetical inference implicitly raise a question which has become central in contemporary scholarship on Peircean abduction (Anderson 1986; Shanahan 1986; Roth 1987; Kapitan 1990, 1992; Hintikka 1998; Minnameier 2004; Paavola 2004, 2006). How do *new* ideas emerge in inquiry? In his 1903 Lectures on Pragmatism, Peirce insists that abduction, and *only* abduction, can generate new ideas, asserting that “[a]ll the ideas of science come to it by the way of Abduction” (5.145)⁹ and that abduction is “the only logical operation which introduces any new idea” (5.171). We may ask, therefore, how exactly does abduction generate new ideas? Peirce is evasive in his answers. In fact, his evasiveness has prompted two general interpretations of his intended answer. In the first interpretation, new ideas emerge from what we can call “abductive inference,” the most common form of which is stated in the following syllogism:

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. (5.189)

In a second interpretation, new ideas emerge from abductive instinct, an innate human faculty designed to guess explanations in more or less accurate ways (5.173; see also 1.81, c.1896).

In its inferential form, abduction looks like a “logic of discovery,” a logical way to generate new conjectures about given scientific objects (Burke 1946, 302; Hanson 1958; Paavola 2004, 2006). A surprising phenomenon is observed; there is a need to explain it; we conjecture an idea “A” to explain it; we conclude that “A” is a proper hypothesis because it explains given facts. As Frankfurt first remarked (1958, 596-597), the conclusion of an abductive inference is not necessarily a new idea in inquiry: rather, abductive inference provides a (weak) logical justification for the adoption of known propositions as hypotheses. Nevertheless, in “Abduction as a Logic and Methodology of Discovery” (2004), Paavola seeks to show how, even understood as an inference, abduction can still generate “new” ideas. He starts by identifying two lines of criticism against abductive inference: (1) that its conclusion cannot generate new ideas, since conjectures are always already contained in its premises; and (2) that it lends itself to wild conjectures, the character of which is foreign to logical inference (2004, 268-269). Taking inspiration from Hintikka (1998), Paavola answers these criticisms by shifting focus from deductive inference to “strategic” inference (2004, 270). It does not matter whether abductive inference can posit irrational conjectures, or whether its conclusions are wholly original ideas, since abduction’s main goal is to provide explanatory hypotheses for existing scientific puzzles.

Whatever explanation abduction might generate, then, the explanation needs to be “strategic,” insofar as it needs to fit new or available data with background information about a given problem. Innovation, here, lies not in conjecturing new ideas in general, but in recognizing that “the hypothesis really is a viable way of solving this particular problem and that the hypothesis works more generally” (Paavola 2004, 273). In line with Hanson (1958), then, Paavola sees abduction as a way to analyze conceptual issues in scientific discovery, as opposed to providing a mechanical (or syllogistic?) recipe to generate ideas (2004, 272).

There remains, however, one critical objection to the argument about “strategic” abduction, which relates to the logical *validity* of abduction as inferential reasoning.¹⁰ In his Harvard Lectures, Peirce viewed reasoning as being “logically valid” when it is *necessary*, i.e., when it leads to unequivocal conclusions from given premises regardless of “psychology” or of what anyone might think about it (5.146). To understand the validity of reasoning means, in this view, to understand in what way it is necessary. Peirce therefore insists that “while Abductive and Inductive reasoning are utterly irreducible, either to the other or to Deduction, or Deduction to either of them, ... the only *rationale* of these methods is essentially Deductive or Necessary.” (5.146) The problem here is that abductive reasoning is not necessary. Abduction, as hypothetical inference, is ampliative: even on the assumption that its premises are true, its conclusions are uncertain insofar as they suggest ideas whose contents are not entirely given in those premises (5.145 and 171). To argue that abduction is logically “valid” in Peirce’s sense would therefore be to maintain that ampliative reasoning is *literally* a form of necessary reasoning – unless abduction is not logically “valid,, or unless it is fusible with deduction or induction. Peirce is disinclined to admit either eventuality, which makes it difficult to understand in what way abductive inference is a “valid” form of reasoning.

In fact, and as Peirce himself recognizes, there is little to justify the validity of abduction. It needs no (deductive) reason, since it “merely offers suggestions.” (5.171) This “desperate” justification for abductive inference has pushed some commentators to stress abductive instinct, or “insight,”¹¹ as a more probable foundation for Peirce’s views on abduction (Shanahan 1986, 453; Kapitan 1992; Minnameier 2004). Since abduction *needs* to somehow generate conjectures about the world, these conjectures *have* to arise, somehow, from our guesses about the world (5.171). Peirce often insists that abduction, and, in particular, what he calls “retroduction,” is no more or less than guessing (6.531, c.1901; 7.219, 1901; R 692, 1901; R 293, c.1906; NEM 3:203-204, 1911;). However, he did not mean to equate abduction with mere intuition or “chance-guessing.” This instinct is to be understood, rather, as “a certain Insight, not strong enough to be oftener right than wrong, but strong enough not to be overwhelmingly more wrong than right, into the Thirdnesses ... of Nature.” (5.173) It is a natural disposition to correctly guess at general laws, that is to say, to attune our logical understanding of natural laws to their actual functioning (1.81). As several commentators have remarked, Peirce offers different evolutionary and metaphysical justifications for the existence of abductive instinct (Shanahan 1986; Roth 1987; Paavola 2005).¹² The key point is that abductive instinct does not randomly conjecture new ideas: it conjectures a link between Thirdness in nature and Thirdness in reasoning (which is, in Peirce’s architectonic system, logic itself). This “new” link impinges upon us like an “insistent Idea,” a “force majeure” (5.581, RLT 170): it falls outside logical control.

We can argue here, as Anderson contends, that abductive instinct provides a necessary, albeit insufficient, condition to make abductive inference work (1986, 158-162). In other words, if we are able to discern whether an idea is liable to explain a particular phenomenon, it is

because the phenomenon is inherently explainable, i.e., it possesses a certain generality, and, ultimately, our minds are attuned to this “explainableness,” i.e., our minds possess an “insight” into generality. Abductive instinct is not, in this view, a logical justification for abductive inference. As Peirce intimates in his Lectures on Pragmatism, it lies on the frontier between perceptual judgment and abduction (5.181-188), between uncontrolled perception and controlled inference. While abductive instinct offers a basis for abductive inference, then, it does not validate it; and it might not need to, since, as Peirce argues, abduction “merely offers suggestions” (5.171). What is more important about these suggestions is, perhaps, the degree to which they are “good,” clear, verifiable explanations for given facts, as opposed to being “new” and “valid” (i.e., necessary) consequences of observed premises.

We have seen how most interpretations of abduction in Peirce scholarship revolve around the question of how new ideas emerge in inquiry. If we understand abduction as “strategic” inference, then its conclusions are meant to provide “new” solutions to particular scientific problems; if we understand it as an instinctive faculty, then it is meant to generate “new” guesses about the world. Yet we can also see how Peircean abduction, under its different interpretations, means something more than generating or validating new ideas, for example, how abductive instinct is supposed to provide a foundation for abductive inference, and how “strategic” inference is supposed to solve specific problems before it creates new conjectures. How can we account for these different interpretations in a more coherent manner? We will argue, here, that the central question of abduction needs to be displaced, from “how do new ideas emerge in inquiry” to “how do ideas fulfill their logical purpose in inquiry.” But on what grounds are we entitled to displace the question? What is at stake? And how does our shift of focus relate to existing interpretations of Peircean abduction?

There are two main grounds on which we seek to displace the central problem of abduction. The first ground, as detailed in our first section, is the intimate link between abduction, pragmatism and the question of logical goodness in Peirce's Lectures on Pragmatism. This link, which has been given little attention in the literature (but see, for example, Mullins 2002 and Bertilsson 2004), is indicative of how abduction is not meant to be a process which generates new hypotheses but rather a process which generates good, clear, verifiable, explanatory hypotheses. The emphasis here should not be placed on how hypotheses are generated but on how they manage to fulfill their logical purpose, i.e., to lead to true explanations about our world. This brings us to our second reason to displace the question. If we interpret abduction as a problem of ampliative reasoning, what we seek, in abduction, are methods whereby new hypotheses are generated. We have, therefore, several competing mechanisms—abductive inference, strategic inference and insight into Thirdness—with correspondingly different understandings of what “newness” is. A “new” hypothesis generated in strategic inference, for example, is new in reference to a particular process of investigation; a “new” hypothesis with regard to abductive instinct, by contrast, is new relative to our previous insights into Thirdness. To be sure, these definitions are too different to ever provide a single explanation of how “new” ideas emerge in inquiry or why abduction remains, in Peirce's view, a single, autonomous, logical operation.

If we interpret abduction as a problem of logical goodness, however, we can stick to a coherent set of criteria, including clearness, explanatory power and experimental verifiability, with which to evaluate the extent to which any conjecture fulfills the purpose of abduction, viz., to provide a true explanation following experimental verification. The goal here is not to force Peirce's account of abduction to be coherent. It is to indicate how the problem of logical

goodness subsumes the problem of ampliative reasoning. Attending to the goodness of abduction involves, in practical terms, attending to the purpose of ideas and statements produced in abduction, *no matter how* these ideas and statements are produced. We are not looking, then, for general mechanisms to create new ideas in inquiry—and, frankly, this does not matter if we do not understand how abduction fulfills the logical purpose of providing hypotheses which, through experimental verification, will lead to true explanations. Only when we understand how abductive ideas fulfill their purpose in the world does their “newness” become relevant; only when abductive ideas are “good” does their “newness” matter.

We will meet, here, a serious objection to our argument, which is that there is no real difference between attending to “newness” and attending to “goodness” in abduction, since “good” hypotheses are only one possible species of “new” hypotheses. In this sense, our move away from the problem of ampliative reasoning would be fruitless, if not unnecessary. This objection relies on a further assumption, which is that there are multiple possible purposes for abduction. Qua abductive inference, for example, it could seek to explain a particular occurrence in everyday life; qua strategic inference, it could seek to solve a scientific problem. In each case, the purpose of abduction is different and, by extension, the idea of “goodness” it entails is different—which also amounts to saying, as we have seen above, that the idea of “newness” it entails is different. Since abduction could have multiple purposes, it could generate ideas which are “good” according to many different standards and, therefore, it does not matter whether we discuss “goodness” or “newness” anymore.

This idea could seem sensible, especially given what we have said about Peirce’s evolving reflection on abduction. Yet we should strongly refute it. While the meaning of

“abduction” does shift throughout Peirce’s career, abduction’s central purpose, viz., to provide ideas and statements which truly explain a particular phenomenon following inquiry, remains more or less the same. Thus, when we commit to discuss the logical goodness of abduction, we also commit to discuss its particular purpose, which has always animated Peirce’s investigation into abduction. Any discussion, therefore, which is geared towards the “newness” of abductive hypotheses should be, in our view, limited to this central purpose, or, in other words, should be limited to the logical goodness of abduction, with coherent criteria for discriminating between “good” and “bad” hypotheses.

What does it entail, then, to displace our focus from generating “new” hypotheses to finding “good” hypotheses? How should we interpret existing interpretations of Peircean abduction in this vein? It would seem, at first, that our views on good hypotheses favor what D. J. McKaughan calls a “justificatory” interpretation of abduction, where abduction does not generate new conjectures but instead evaluates available ones in order to warrant their adoption as research hypotheses (2008, 446-447).¹³ This interpretation, which has been emphasized in earlier works on Peircean abduction (Frankfurt 1958, 594; Shanahan 1986, 449; Paavola 2004), is certainly more similar to the concept of the evaluation of the goodness of a hypothesis defended here. Yet the selection criteria described in this interpretation are often either too simple or too unclear.¹⁴ Thus, our criteria defining “good” hypotheses, viz., clearness, explanatory power and verifiability, spell out, in much more precise terms, what the objectives of “justificatory” abduction are. Further investigation into the logical goodness of abduction should involve a search for additional, more specific, logical criteria whereby we could obtain some degree of assurance that a

given abductive idea will, after its subjection to the test of experiment, lead to true explanations.

Now, it is true that focusing on abduction as a problem of logical goodness naturally leads us to consider “justificatory” interpretations more favorably, since they are inclined to evaluate research hypotheses with an eye on their overall purpose, viz., to lead to true explanations after experimental verification. Yet our claim here is even stronger. We maintain that even “generative” interpretations of abduction, as McKaughan calls them (2008, 448-450), are subsumed within a consideration of its logical goodness. Thus, abduction’s core lies, in our view, in its capacity to admit “good” hypotheses in research with clear logical definitions. This does not mean that Peircean abduction is reducible to its logical, i.e., inferential, import.¹⁵ It means, simply, that logical goodness is the reason for “abduction,” under its diverse meanings. No matter *how* abduction *actually* generates “new” ideas—whether it is abductive inference, strategic inference, instinctive insight, etc.—its purpose is, ultimately, to provide true explanatory hypotheses for inquiry. And, in this regard, “new” hypotheses should always be evaluated in reference to their goodness.

Conclusion

This article makes two contributions to the study of abduction in C. S. Peirce’s thought. First, it elucidates how abduction shares a similar logical goodness (i.e., a similar logical purpose) with the maxim of pragmatism. While the maxim of pragmatism intends to offer true representations of the world, abduction seeks to offer true explanations of the world in generating good hypotheses for research. Good abduction should, therefore, produce hypotheses

which (1) are clear, (2) explain given facts, and (3) are subject to experimental verification. Second, the article demonstrates how logical goodness is in fact the central problem of Peircean abduction. The demonstration proceeds in two steps. It first reviews previous interpretations of abduction as a mechanism of ampliative reasoning, including abductive inference, strategic inference, and abductive instinct; second, it shows how these interpretations are in fact subsumed within the issue of the logical goodness of abductive hypotheses. Whether abduction is a good answer to the question of ampliative reasoning is, in this view, irrelevant, so long as we do not consider how it answers to its logical goodness. This is, in our opinion, Peirce's basic insight into what abduction is. Before asking where new ideas come from, we need to ask what new ideas are for, and knowing what they are for, we can attune their newness to their purpose. And their purpose is, in the case of abduction, to provide true explanations following experimental verification.

There remains, nonetheless, one lingering opposition to our central argument. Even if one concedes that logical goodness offers a more solid viewpoint on Peircean abduction, it can be claimed that, by trying to incorporate virtually all interpretations of abduction under a similar heading of "logical goodness," we eliminate or ignore any meaningful distinction among these interpretations. Far from offering a consistent outlook on abduction, then, our view would be an insipid, *post hoc*, homogenization of different strands in Peircean abduction. We can say, in our defense, that we do not seek to provide a hegemonic interpretation of abduction. On the contrary, we seek to show how different interpretations fit within a common logical problem. We will defend our stance, furthermore, in showing how the problem of logical goodness fits within Peirce's general architectonic system. The problem of "goodness," as Peirce indicates in his Lectures on Pragmatism, is originally a normative problem, and as such, it takes root in every

normative science (5.109). In other words, we can speak about esthetic “goodness” (i.e., whether something fulfills the purpose of esthetics or not; whether it looks beautiful); ethical “goodness” (i.e., whether something fulfills the purpose of ethics or not; whether it is moral); and logical “goodness” (i.e., whether something fulfills the purpose of logic or not; whether it leads to true representations). This trichotomic notion of “goodness” is replicated within the trichotomy of logic itself (i.e., abduction-deduction-induction), just as it is within the normative sciences. The coherence we detect in Peirce’s account of abduction is thus based, in part, on his metaphysical assumptions about Firstness, Secondness, and Thirdness, where “goodness” and “badness” are integral to these categories and in their replication in the normative sciences, especially in logic. This argument would require, perhaps, a fuller exposition, but its basic principles seem clear enough in Peirce’s Lectures on Pragmatism. Logical goodness seems to be, in any case, fundamental to an understanding of Peirce’s notion of abduction.

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¹ In his early writings, Peirce uses the terms “hypothesis” and “hypothetical inference” (2.623-625, W 3:325, 1878; 2.706-707, W 4:419-420, 1883; 6.144-146, W 8:151-152, 1892) or “reasoning à posteriori” (W 1:180, 1865; W 1:266-267, 1865) to designate an idea similar to “abduction.” Later on, he also talks about “retroduction” (1.68, c.1896; RLT 141, 1898; 8.385, 1913) and “presumption” (2.776-777, 1901; 2.791, 1901). Peirce traces his usage of the term “abduction” to Aristotle’s “apagoge,” a mode of inference discussed in the *Prior Analytics* (1.68, c.1896; 7.249-255, 1901; 5.144, 1903). Although he translates “apagoge” directly as “abduction,” the nature of “apagoge” is much closer to “hypothetical inference.”

² References in this decimal notation are to Peirce, *Collected Papers* (1931-1958), by volume and paragraph number. References to “W” are to Peirce, *Writings* (1983-), by volume and page number. References to “RLT” are to Peirce, *Reasoning and the Logic of Things* (1992). Reference to “HP” is to Peirce, *Historical Perspectives on Peirce’s Logic of Science* (1985), by volume and page number. Reference to “NEM” is to Peirce, *New Elements of Mathematics* (1976), by volume and page number. References to “R” are to Peirce’s unpublished manuscripts as cataloged in Robin 1967, by manuscript number.

³ The version of “How to Make Our Ideas Clear” that appears in the *Collected Papers* incorporates revisions that Peirce makes in 1893, and in that version the quoted passage begins: “Consider what effects, *that* might conceivably have practical bearings...” (emphasis added)

⁴ Indeed, in order to accept that a conception is nothing but the sum of its potential practical effects, one needs to assume, first, that no cognition is possible outside what we perceive. “What we perceive,” in this case, designates what is literally our only way to gain any cognitive access to the world, i.e., to gain any conception about the world. Second, one needs to assume that what we perceive necessarily contains, in itself, general elements. If we define “potential practical effects” as those manifestations, given in perception, which possess potential material consequences for human cognition, then it follows that, in order for these manifestations to be (re)cognized, these effects need to possess, inherently, a general character, i.e., a character which will allow human cognition to grasp their potential consequences without getting lost in the minute details of perception. Finally, in order to assume that any conception is a sum of potential practical effects, we need to assume that there are no clear demarcations between perception (where lie potential consequences) and cognition itself—a point which, if admitted, will subsume the two initial tenets.

⁵ Thus, when Peirce divides normative science into esthetics, ethics, and logic, it is implied that logic has a “Third” or “general” character with respect to normative science. Consequently, it lies in a higher hierarchical position, in the sense that it is founded upon “First” and “Second” categories—esthetics and ethics, in this case.

⁶ See Nesher 2002 for a full treatment of the matter.

⁷ Peirce’s stance here seems to fall in direct line with his metaphysical views on the Universal Categories. If we accept that there are such things as Firstness, Secondness, and Thirdness, and that these things structure our world, it seems reasonable to say, for instance, that general elements (i.e., Thirdness) are deducible from perceptual judgments (i.e., “Second” confrontations between percept and cognition); or that perceptual judgments are uncontrollable, since their Secondness makes it impossible to avoid collisions between perception and cognition; or that all knowledge (i.e., Normative Science, a “Second” Philosophy) rests on perception (i.e., Phenomenology, a “First” Philosophy).

⁸ Peirce distinguishes between different degrees of clarity in his writings on pragmatism (see “How to Make our Ideas Clear,” 1878). “Pragmatic” clarity, which is discussed in relation to abduction, is the most sophisticated degree of clarity. For a more complete discussion of clarity in Peirce’s thought, see Colapietro 2009.

⁹ Peirce intimates here, as he does in other writings, that scientific discovery cannot be subsumed under the ordinary progress of science, since deduction and induction (i.e., experimentation proper) only derive logical or experimental consequences from pre-given conjectures (2.776-777, 1901; 6.469-470, 1908; 8.227-231, c.1910).

¹⁰ Hintikka defends the validity of abductive inference on “strategic,” as opposed to “definitory” or deductive, grounds. While abductive inference cannot be “valid” in the sense of deriving necessary conclusions from true premises, it can be “valid” in the sense of offering strategic guesses, whose incorporation into the progress of inquiry leads, in the long run, towards experimental truth (Hintikka 1998, 513-515). But this defense conflates the question of logical validity with the question of the logical goodness of abduction, questions that are distinct in Peirce’s Lectures on Pragmatism. When Hintikka says that abduction is “strategically” valid, he means that it derives validity from fulfilling a particular purpose. This is, essentially, what Peirce understood as logical goodness, which is distinct from logical (i.e., deductive) validity (5.146 and 197).

¹¹ The term “insight” surfaces only, so far as we know, in Peirce’s Lectures on Pragmatism. It is meant to designate a phenomenon in the general class of Instinct, although its usage seems somewhat more general. While “instinct” designates a purposive disposition to interact with our immediate environment (7.381), “insight” seems to hint towards a mysterious ability to reach into Thirdness.

¹² As Shanahan (1986, 455-463) summarizes, Peirce provides three main justifications for the existence of abductive instinct: (1) it is adaptive, in the sense that it allows us to enhance our purposeful interaction with our environment on an evolutionary scale (6.417, 1878); (2) it provides a link between mind and nature, in the sense that it somehow absorbs general elements from nature into our own understandings; and (3) it has a divine origin, in the sense that it acts as a High Intellect guiding our action.

¹³ We should mention, in a similar vein, the interpretation of abduction as a mechanism to evaluate the “pursuitworthiness” of hypotheses, i.e., the degree to which material pressures in research drive scientists to choose “low-cost” hypotheses (McKaughan 2008, 457). In “On the Logic of Drawing History from Ancient Documents” (1901), Peirce discusses how abduction involves extra-logical or extra-scientific criteria for evaluating the “economy” of hypotheses. In brief, an “economical” hypothesis is an idea which requires low expenditure of time, money, thought, and resources during its anticipated experimental verification, while garnering high expected explanatory power (7.220; see also 2.776, 1901, and 5.600, 1903). Abduction involves, therefore, non-epistemic considerations designed to make “*practically grounded comparative recommendations about which available hypotheses are to be tested*” (McKaughan 2008, 452). This interpretation of abduction is often omitted from discussions on ampliative reasoning, yet it remains central to understanding how Peircean abduction works in reference to its logical purpose. Indeed, since equally good hypotheses can enter in competition during scientific inquiry, it seems evident, in Peirce’s view, that scientists will need to privilege “economical” hypotheses over others in order to avoid clogging scientific advancement (6.528, c.1901).

¹⁴ The interpretation of abduction as “strategic” inference illustrates this point. A “strategic” inference seeks to create a hypothesis which would fit into a particular process of research, with its particular objectives and its particular data collection and analysis mechanisms. As Paavola summarizes it, abduction becomes “a weak form of inference where clues and background information instigate and guide the search for new hypotheses and provide tentative constraints on the types of hypotheses searched for.” (Paavola 2006, 97). It is in this restricted sense a “justificatory” viewpoint on abduction, since it evaluates, given available or newly collected data, which piece of information fits, or will fit, better with the background data. This description shows, on one hand, how “strategic” inference can yield “good” hypotheses, and yet, on the other, just how imprecise its “strategic” criteria for selecting hypotheses are. This is due, in part, to a focus on how “new” ideas arise in the context of particular scientific projects, without paying attention to the fact that, as we have seen, what matters most for the emergence of “new” ideas is just how “good” they are, i.e., how much they fulfill their purpose in inquiry.

¹⁵ There is an obvious objection to highlighting logical over non-logical facets of abduction, which is the central import of abductive instinct in Peirce’s writings, especially in his Lectures on Pragmatism. Since abductive instinct lies outside conscious control, it cannot be subjected to logical criticism, including criticism about its goodness. Thus, unlike abductive inference, abductive instinct cannot provide “good” hypotheses for inquiry. An instinctive idea is not necessarily “clear,” nor does it fulfill a particular purpose. It just occurs, much like perception. Peirce does, in fact, assimilate abductive “insight” to perceptual judgment in his Lectures on Pragmatism (5.173; see Mullins 2002, 201-202). The link is never fully fleshed out, but we can discern two main similarities: (1) “insight” falls outside logical control, just like perception; and (2) abductive “insight” provides a foundation for our knowledge about Thirdness in nature, just as perceptual judgment provides a foundation for our knowledge about the world. Abductive instinct is, in this sense, a necessary foundation for abductive inference and its variants. In fact, as Shanahan (1986) points out, it is Peirce’s closest answer to the question of ampliative reasoning—an answer which stresses the evolutionary and biological determinants of hypothesis-generation.