Chapter 11
The Dilemma of Defining Abduction

ABSTRACT

Although Peirce states that abduction is the “only logical operation which introduces any new idea,” many, if not most, explanatory hypotheses offer nothing new at all. They do not seem to be, in the sense Peirce means, abductively derived. In various writings, Peirce provides at least four different descriptions of abduction. Italian computational philosopher Lorenzo Magnani proposes three types of abduction: theoretical, model-based, and creative (the final chapter of this book discusses the third type). In her 2005 paper for Semiotica (“Abduction as an Aspect of Retroduction”), Chiasson points out that Peirce uses two distinct and contradictory terms to signify these processes. The purpose of this chapter is to clarify the various ways abduction has been defined. In addition to defining abduction as an aspect of retroduction, the authors discuss induction, with which abduction is often confounded. This discussion of induction includes the concepts diagnosis and inference to the best explanation, both of which can be achieved inductively (and deductively as well, though deduction will not be addressed here), as well as abductively.

INTRODUCTION

In earlier chapters, we compared the methodological aspects of discovery, for instance, the discovery of Relational Thinking Styles to discoveries in ecological sciences. The character of ecological sciences includes aspects of field geology in which hypothesis such as plate tectonics were adduced from observing patterns. Darwin adduced the hypothesis of natural selection, and Mandelbrot seems to have initially adduced the Mandelbrot set. These discoveries found order in the data and emphasize the importance of comparative reasoning, asking better questions, and attention to detail. Each begins with adduced mapping and finding pattern, which are later conceptualized. Scientific
progress is characterized by better explanations. Apocryphal stories describe individuals suddenly having eureka moments when working alone or with a team. The anomaly—the observations that could not be explained by current hypotheses—suddenly became clear. The puzzle, paradox, or confusing assemblages acquire a new and pregnant order. While the pattern may appear early on, the inference or insight often comes in a flash.

Where does such an insightful inference come from? Karl Popper, in his *Logic of Scientific Discovery* (Popper, 1968), while remarking in his preface that the central question in philosophy of science should explain the growth of science, nevertheless dismissed the question of a science of abduction. The fact is, Popper asserted, ideas occur to us, while drinking coffee, driving to work, or walking the dog. Popper argued that we make new ideas scientific by testing (Popper, 1968, p.32). The explanations science ends up with are not verifiable in any conclusive logical sense, so Popper’s insight is that testing conjectures and attempting to falsify them is the best we can do (Popper, 1968, p. 40). In Popper’s view, science does not necessarily have the best explanations—we have no way to demonstrate that it does—instead, what scientific explanations consist in are conjectures that have not been falsified—yet. Thus, all we are left with are explanations that tests do not falsify, not necessarily with the best explanations. While initially appealing, Popper’s dismissal of this question of insights and discovery as part of scientific method was, as may become clear, premature.

Peirce, who had worked in a laboratory, and in the field, treated the subject of discovery and invention, as a problem requiring more attention. Although some argue that abduction to the best explanation is rare, such inferences (rightly understood) are commonplace. What exactly is the nature of the insightful inference? Such inference differs from both deductive inferences, which discover what follows from a given and from inductive inferences that place observations into categories, types, and kinds.

Peirce’s formulation of the problem: *How is a leap to the best hypothesis achieved?* led to a more preliminary question: *What is the nature of abductive inference?*

Abduction is “the art and the science of discovery and invention” (Peirce, 1998a). For Peirce, the nature of abduction is an important question. Philosopher Jaakko Hintikka counts Peirce as a “major star on the firmament of philosophy” because he brought the concept of abduction to the “forefront of philosophers’ consciousness [thus creating] a problem which,” Hintikka argues, “is the central one in contemporary philosophy” (Hintikka, 1999, p. 91).

In various writings, Peirce provides at least four different descriptions of abduction, which philosopher Thomas Kapitan (1997) sums up as follows:


2. **Thesis of Purpose.** The purpose of “scientific abduction is both to (1) generate new hypotheses and (2) to select hypotheses for further examination (Peirce, 1935, Vol. 6, para. 25); hence, a central aim of scientific abduction is to “recommend a course of action” (Peirce, 1935, Vol. 6, para. 375).

3. **Comprehension thesis.** Scientific abduction includes all the operations whereby theories are engendered (Peirce, 1935, Vol. 5, para. 590).

4. **Autonomy Thesis.** Abduction is, or embodies, reasoning that is distinct from, and irreducible to, either deduction or induction (Peirce, 1935, Vol. 5, para. 146).

Italian computational philosopher Lorenzo Magnani (2001) proposes three types of abduction: theoretical, model-based, and creative. This