Peirce and the Continuum of Means and Ends

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Abstract:

It may seem obvious that, before we can begin to verify a hypothesis, we must somehow “acquire” one. Yet, until Peirce began working on his theory of abduction, little thought had been given to the issue of hypothesis acquisition and its everyday equivalent goal acquisition. Even today, most people seem satisfied with the idea that goals and hypotheses arise “somehow,” and that the primary purpose of scientific inquiry is to verify a hypothesis; and, of ordinary life, to achieve goals. The idea of a normative method by which hypotheses should be formed (abduction) belongs to Peirce. Here we will be loosely applying the mental construct of John Dewey’s “means-end continuum” as a heuristic device for explaining the differing ways in which hypotheses (as well as goals and purposes) can be constructed‹and the way in which, according to Peirce, they “should be” constructed. Dewey’s means-end continuum enables demonstration of the differences between goal-directed and means-directed hypothesis construction. The following discussion will be addressing the aspect of goal-acquisition habits in everyday life (an aspect of logica utens), and of hypothesis construction in formal logic (abduction in logica docens) in terms of the ways in which these relate to means-directed and goal-directed processes.

Keywords: Continuity, Goals, Logica Utens, Fallibilism, Retroduction, Abduction

Reasoning

The philosopher, Jaakko Hintikka (1998: 503) wrote:

> It is sometimes said that the highest philosophical gift is to invent important new philosophical problems. If so, Peirce is a major star in the firmament of philosophy. By thrusting the notion of abduction to the forefront of philosophers’ consciousness he created a problem which, I will argue, is the central one in contemporary epistemology.

Nearly a century now since Peirce’s death, philosophers still argue the form and meaning of Peirce’s theory of abduction. They will argue that Peirce, himself, made contradictory statements about the nature of abduction (see Chiasson, 2000).

Perhaps one factor contributing to the ongoing confusion about Peirce’s theory of abduction is the fact that “reasoning” is usually thought of as operating in two ways:

- deductively–from an end-in-view which directs the selection of means (or options) for affirming or denying that end, and
- inductively–for which a conclusion, generalization, or end-in-view is “contingent, probable,

or wrong.” (Greenwood, 1983, pp. 280-281)

But abduction is very different from either deduction or induction. Unlike deduction, abduction is a *means-directed* inference-making process–which is to say that in abductive reasoning, the *means* (surprising facts, anomalies, materials, problems, unanswered questions, mistakes, etc.) guide the formation of purpose, rather than a purpose guiding the selection of means for its achievement. Unlike induction (which also begins with an encounter with means–or examples), abduction results in a hypothesis (or guess) and not in a conclusion, probability, or generalization as induction does.

Since working out how to “adapt” means to ends (deduction) and compiling examples which eventually lead to a generalization (induction) are generally accepted as basic functions of reasoning, some may feel that even bothering to discuss the concept of “means-directed ends” is unnecessary. However, since Peirce insisted upon the primacy of abduction in directing all reasoning (Fann, 1970), understanding his intent for the meaning of abductive inference is vital for understanding his pragmatism. For this reason, we will “borrow” the concept of a means-end continuum from John Dewey and use it as a heuristic tool for explaining abduction, deduction, and induction as each relates to the formation of goals and purposes.

Types of Inference Forms

In his 1908 essay, “A Neglected Argument for the Reality of God,” Peirce carefully delineated the tasks of each of three forms of logical inference: abduction, deduction, and induction.

In logic, Peirce tells us, abduction proceeds from a “surprising,” or anomalous fact (a consequent) to a guess (or hypothesis) about what might have caused that fact to occur (an antecedent). Thus, abduction is “means-driven” in the sense that the *consequent* (anomaly) drives the formation of a possible reason (antecedent) for that consequent to have occurred. Peirce warns that, in science and logic, abductive inferences cannot stand alone. He tells us that abduction “does not afford security. The hypothesis must be tested.” (Peirce, 1892/1958, p. 368) However, abductive reasoning can be applied to other activities besides hypothesis development. (Chiasson, 2001) For example, an artist can develop original work by encountering an interesting piece of material (a consequent) and placing it into juxtaposition with other materials to develop hypothetical or tentative relationships among them. (The *antecedent* aspect of the artist’s process resides somewhere in the continuum of existent possibilities that have not yet been unfolded). However, at the end of a means-directed process (after making a

web-like series of interrelationships), the artist may have a finished original work of art, while the scientist will only have a hypothesis in need of explication and testing.

Deduction, according to Peirce, has two parts: explication and demonstration (Peirce, 1892/1914, p. 370-371). The purpose of explication is to define the hypothesis in all its categories and elements–to “render it as distinct as possible.” Demonstration “invariably requires something in the nature of a diagram” (Peirce, 1892/1914, pp. 368-369). Diagrams make use of signs and can include *icons* (representation by resemblance); *indices* (signs that indicate, or are actually connected to, something); and *symbols* (signs that represent objects “because they will be so interpreted”).(Peirce, 1892/1914, p. 368). Deduction is the inference form for which a conclusion *necessarily* follows from a premise (or set of premises)–proceeding from *antecedent* (that which comes before) to consequent (or result). In scientific reasoning, deduction is performed as “analysis,” for which reasoning moves from the general (as a principle or hypothesis)–to the less general (as categories such as “genus,” part-whole relationships, and operational predictions–to the specific (as examples, or “specimens”).

Propositions of any kind are explications in the form of proposals for demonstrating something that is to occur in the future. As such, propositions are types of goals–or proposed ends (outcomes). For example, a recipe is a kind of proposition, which when followed correctly, should produce a certain outcome. Building plans (whether of an original design or reflecting homes that have already been mass-produced) are also propositions of this same sort. One purpose of deductive reasoning as analysis is to pre-plan the methods and prepare the materials required for reaching (or verifying) the conclusion which the proposition predicts.

Induction, on the other hand, proceeds from example (consequent) to a conclusion (or generalization) based upon enumeration or evaluation. *Crude induction* (simple enumeration) is, according to Peirce, the weakest form of argument.(Peirce, 1892/1914, p. 369). *Gradual induction* “which makes a new estimate of the proportion of truth in the hypothesis in every instance”(Peirce, 1892/1914, p. 369), can be either “qualitative” or quantitative.” This latter sort of induction, says Peirce, can lead to the elimination of falsity–in other words, “truth.” Since inductive reasoning is evaluative (rather than generative, as is abduction) it relies upon a direct relationship between a *consequent* and its degree of matching to other consequents of the same sort. This “matching” aspect of induction implies a pre-existing set of categories based upon qualities (or standards) to which a consequent is “matched.” These existent categories function for induction in much the same way that premises function for deduction, though in a linear

fashion. Thus, the "purpose" of induction (which is to verify and evaluate according to existent standards) tells us that induction is *not* means-directed (even though induction begins with a consequent), but rather induction is a *means-initiated* inference method used for sorting objects of experience into pre-determined categories (or conclusions). The entire abductive process, on the other hand, is means-directed, since it both begins with a consequent and leads away from fixed categories toward the formulation of the qualities of new ones.

Thus, for our purposes here, we are going to define deductive and inductive reasoning as purpose or goal-directed, and abductive reasoning as means-directed.

- Deductive reasoning is a process that results in a conclusion drawn from a set of premises. Those premises function in the same way as any purpose or goal–that is, they define the parameters within which options are selected and rejected in the course of reaching a conclusion (or outcome).
- Inductive reasoning is a sorting process ending in generalization. It is a process of selecting and rejecting among options based upon similarities to the qualities of familiar, or pre-existing, classes and categories. These pre-existing categories serve the same function as a goal, since they define what should and should not be selected for membership in a particular class.
- Abductive reasoning, on the other hand, is a "means-directed" process. For abductive reasoning to occur, the means (fact, anomaly, knowledge, quality, material, prior goals) must direct inquiry and the eventual formation of a goal–or, as Peirce said, the construction of a "conditional purpose."

Elsewhere the term "*retroductive* reasoning" has been specifically defined as the overarching method of deliberate recursive reasoning of Peirce's methodeutic. (Chiasson, 2001b)

- Retroductive reasoning is a deliberate and "reciprocal" process for which means initially direct goal formation, followed by the goal directing selection of means for a while, then returning to a means-directed activity and then back again to a goal directed one.

Although reciprocity between means and goals can occur within any process, retroduction (the overarching method by which new theories are engendered) involves the deliberate employment of a particular pattern of actions for the needs of a particular stage of an inquiry. This deliberate reciprocity occurs while the retroductive reasoner remains sensitive to the needs of the context and deliberately recognizes (and adjusts to) system-wide implications during a particular course of action. (Chiasson &

Davis, 1980)

“Constructing” versus “Having” a Goal

Before we begin this discussion of Peirce’s theory of pragmatism and the means-end continuum, it is very important to emphasize that abductive reasoning has mainly to do with “constructing” (or formulating) a goal or hypothesis, not with “having” one. Recognizing the distinction between “having” and “constructing” a goal (or hypothesis) is essential to understanding Peirce’s concept of abductive reasoning and the relation of abduction and the other sorts of inferencing methods to goal formation along a means-end continuum.

Most of us do not “formulate” new ideas (or goals) so much as we replicate existing things and concepts. Replication is of two sorts: simple and complex. Simple replication corresponds to simple induction, as it is a form of direct replication by directly matching similarities–thus producing copies (or more instances) of something. Complex replication, on the other hand, corresponds to deductive reasoning, since it uses an indirect form of replication–copying a general idea (or concept), then describing (explicating) that concept and developing the framework and plans for achieving (demonstrating) the projected outcome.

Only abductive reasoning can result in truly original outcomes. Abduction neither begins, operates, nor ends by using familiar categories as a guide–but rather addresses familiar goals and options as equal to any other raw material, considering these as available for adjustment, evolution, transformation, or abandonment as new options and new information arise. (Chiasson & Davis, 1980)

It is also essential to realize that purposes can be acquired in other ways besides by means of abductive reasoning. Abduction is the method by which “new” discoveries are made and formulated into hypotheses worthy of testing and evaluation. Abduction is also the method by which truly “original” insights, methods, and outcomes are engendered in such fields as art, music, poetry, and dance (Chiasson, 2001, pp. 159 - 160). These are fields for which abduction alone can be used to produce original outcomes, rather than hypotheses in need of explication and testing. However, countless other sorts of goals are acquired by means of replication, and some goals are taken on capriciously with no forethought at all. Though they may be highly complex, replicated goals can never direct the production of original outcomes. Capriciously acquired goals, on the other had, can result in original outcomes if they are further explored by means of abductive reasoning.

For our purpose here of examining Peirce's concept of inferences within the means-end continuum, we will be examining the ways by which differing individuals *habitually* acquire goals. These *non*-deliberate goal acquisition habits parallel the deliberate inferencing methods of Peirce's *logica docens*. We are addressing these methods as used in habitual modes of reasoning because this perspective is more useful for clearly delineating the advantages and pitfalls of each sort of inferencing method in various goal acquisition contexts.

Goal acquisition begins in one of two general ways:

- Either a person begins with a goal in mind (actual or conditional) which directs what is selected and rejected from among the resources available, as well as potential resources.
- Or else, the person begins by interacting with the means (materials, tools, ideas, and other such resources)–permitting available means to direct the eventual formation of a goal.

Everyone of us habitually begins any purposeful activity in one of these two ways. Some of us nearly always begin with a goal in mind, and others of us nearly always allow the means to direct the development of a goal. Neither of these general ways of acquiring goals is good or bad–just appropriate or not for a given context. For example, some sorts of activities (like creating hypotheses and developing unique and original ideas) are best begun by letting the means direct the formation of goals. Other activities (such as testing hypotheses and producing outcomes) are best begun with well-defined goals that can be predictably performed and replicated.

Those who attempt to develop unique and original ideas by using a replicated goal (whether simple or complex) to direct the selection of means will find that they cannot do so. Those who attempt to meet actual goals by applying the *means-directs goal* method will be very frustrated as well. Originality and new discoveries (but not predictable outcomes) result from means-directed goals. Analysis, testing, and production always proceed most predictably when a goal directs the means selected.

Peirce sets out the protocol for formally applying means-directed and goal (or hypothesis)-directed inquiry in his *logica docens*. He defined instinctive (untrained) reasoning habits as belonging to *logica utens* –the "acritical and implicit logic of the common man." (Fann, 1970) Although Peirce did not believe a theory of *logica utens* to be necessary (Peirce, 1898/1992, p. 109). Dorothy Davis, who designed the Relational Thinking Styles model of non-verbal reasoning habits, provided a model and non-verbal assessment tool for identifying the logica docens of differing individuals. Her model and assessment tool has allowed us to correctly identify innate reasoning habits which

parallel each of Peirce's normative methods (Chiasson & Davis, 1980). Davis applied Peirce's unique concept of *logica docens* as she developed her parallel model of *logica utens*. Her model delineates the "reasoning instinct or habits of reasoning" that differing individuals use for daily decision-making (Chiasson, 2001). This model has proven valuable for examining and clarifying aspects of Peirce's pragmatism in dispute since his death.

Davis's model of *logica utens* makes it possible to identify which of the types of reasoning (abductive, deductive, or inductive) a particular individual habitually applies when making decisions of quality, of purpose, and of method. As far as Davis's model and Peirce's pragmatism are concerned, however, we will be limiting our discussion here to methods having to do with the acquisition of purpose (or goals). Since Davis's reasoning habits are the instinctive and non-verbal expressions of the same reasoning methods that Peirce proposed in a formal sense, they will be treated as belonging within the same system as the formal one.

Now let us begin to examine the relationship of differing goal acquisition habits to the concept that John Dewey described as the "means-end continuum. In his 1939 book, *Theory of Valuation*, John Dewey (1939) wrote:

> …[O]nly the conception that certain things are ends-in-themselves can warrant the belief that the relation of ends-means is unilateral, proceeding exclusively from ends to means… [The] arbitrary selection of some one part of the attained consequences as *the* end…is the fruit of holding that *it*, as the end, is an end-in-itself, and hence possessed of "value" irrespective of all of its existential relations.

By this, John Dewey is saying that it is mistaken for us to assume that ends-in-themselves have value regardless of the relation of that end (or goal) to other factors, and to the means used to achieve it. Dewey's definition of value is critical to understanding his view. We only *think* we have "achieved" an end because we have arbitrarily selected one part of a consequent as our "end,' thus placing value upon it to the exclusion of whatever else our achievement has affected. For example, reaching the valued "end" of purchasing a new gas-guzzling vehicle, may mean disregarding the consequences of the relationships of that purchase to environmental pollution, traffic congestion, or perhaps the purchaser's financial responsibilities (such as saving for a child's education). Dewey's concept of the relations between means and ends describes the value-driven interaction between options and ends (or goals). Dewey is careful to define value to exclude the mistaken notion that valuing is purely subjective or emotive.

Dewey's use of the term "means" refers to resources–that is: materials, tools, ideas, facts, anomalies, prior ends or consequences, and new discoveries–whatever is available. The term "ends" refers to projected outcomes–whether *conditional* outcomes (as are hypotheses and general goals) or *actual* outcomes (as are the proposed replication of previous results and consequences). Dewey contends that the perception and selection of means and goals are value-driven because, whenever we make purposeful choices, value directs the selection of means and options leading to formation of purpose. Then purpose, in turn, directs our selection of further means and options for attaining the purpose.[1]

Dorothy Davis (1972) in first describing her model of *logica utens* tells us that "a goal is a value in action," and underscores a fundamental principle of all reasoning: *no purposeful action can be taken without a goal of some sort*. She thus places goal-acquisition and their means of accomplishment squarely into the realm of value-driven activities. Davis contends that individuals habitually acquire goals in one of four ways:

1. *spontaneously*–by immediate, capricious, and *shallow* (or transitory) responses to qualitative (*means-directed*) options,
2. *directly*–by selecting short to intermediate range goals derived from simple replication of both ends and means,
3. *analytically*–by replicating complex long-range goals, which include short and intermediate sub-goals, and selecting among alternative means for achieving these,
4. *relationally*–by intensely directed response to qualitatively (means-directed) options based upon overarching attitude and interests.

Spontaneous (or transitory) goal acquisition is a highly unpredictable method in terms of the methods that will be attempted and the outcomes that will be produced. This method of goal selection is accompanied by a shallow degree of intensity. (Although the acquisition of transitory goals are means-directed and, as such often result from a response to anomalous events, few habitual reasoners of this sort have the stamina or discipline to engage in the rigorous processes of abductive reasoning that follows the recognition of a surprising event (Peirce, 1892/1958, pp. 360-366).

On the other hand, each of the goal-directed processes has a certain degree of predictability–for outcomes, sequences, or both. Goals that are acquired *directly* (because they are replicative of both ends and means) produce highly predictable outcomes and require only moderate intensity throughout a process. *Analytically* acquired goals produce predictable outcomes over the long term, but are not predictable in terms of the mid-to-short-term execution of the methods and means that

will be applied to achieve them. People who habitually operate from these sorts of long-range goals habitually apply strong intensity for the explication and planning stages of their goals and only moderate attention for the achievement stages.

Relationally-derived goals are generative, evolving out of the application of high intensity for the confrontation of options. As such, relationally acquired goals are highly unpredictable in terms of both eventual outcomes and the methods used to achieve these.

Thus, when I distinguish here between goal-directed and means-directed processes, I am not saying that means-directed processes are goal-less, only that, in the case of means-directed acquisition of goals, the "goal" begins with a response to qualities, rather than to pre-existing form or content. A means-directed process ususally concludes in one of two ways:

- Capriciously–with a random and *spontaneous* (transitory) response to quality(ies), beginning and ending nowhere in particular, or
- Abductively–with an aesthetically mediated culmination of a series of highly selective choices made from the ongoing and deliberate juxtaposition of the qualities of materials, including those qualities synthesized from prior relationships made within the series and elsewhere.

Now, let us see how Dewey's concept of a means-end continuum might apply to the goal-directed and means-directed inferencing methods of Peirce's *logica docens* and Davis's parallel model of *logica utens*.

When Goals Direct the Means Selected

When an end is selected, or as Dewey would say "prized," the projected end becomes the guide that defines the means that will be required (or preferred) for achieving that end. The degree to which a particular end is prized in relation to other possible ends or options contributes to the tenacity with which it will be pursued. When a particular end is "prized" to such a degree that all means are selected with the direct intention of achieving that end, we can expect a case of "ends justifying the means." In other words, by ignoring anomalies and not addressing potential problems along the way, an individual is likely to produce the sorts of unintended negative consequences which tend to be defended by arguing that the "end justifies the means" (Chiasson & Davis, 1980). Dewey (1939) wrote:

> ...it is at least a sign of immaturity when an individual fails to view his end as also a moving

> condition of further consequences, thereby treating it as final in the sense in which ‘final’ signifies that the course of events has come to a complete stop.”

Countless examples of tenacious goal achievement exist throughout our society. That people should unquestioningly prize and achieve certain pre-set goals (such as making lots of money or otherwise achieving the “American Dream”) is almost a sacred value within American culture[2]. Not to be clearly goal-directed sets one apart as a sort of *slacker*–as someone lacking focus, ambition, or, perhaps, even common sense.

The degree of flexibility with which someone addresses alternatives during a goal-directed activity depends upon the clarity of the goal and the tenacity with which it is held. For example, the goal-directed process of those skilled at applying deductive reasoning usually allows for great flexibility in the selection of means for achieving the goal. Those who habitually rely upon the fixed categories by which inductive reasoning operates will maintain such a rigid connection between a desired outcome and the “proper” means for achieving it that only specific tools and materials are acceptable to them (Chiasson & Davis, 1980).

Regardless of how rigid or how flexible a *goal achievement* process is, however, nothing completely *original* can come out of a goal-directed (inductive or deductive) process. The reason for this is because a goal defines, however loosely, the means by which it can be achieved[3]. Peirce tells us, “Deduction explicates; Induction evaluates: that is all” (Peirce, 1892/1958, p. 370). Nothing new can come out of deduction, induction, or their parallels of simple and complex replication. Once engaged in a goal directed process, we are replicating, to a greater or lesser degree, an internal or external concept. As long as the process remains goal-directed, the selection of options is limited by the fixity of the goal (including the degree of fixity of existing premises and categories).

Thus, whenever a goal is initially acquired inductively or deductively, rather than abductively, all that can possibly result is a replication of some sort. Replications can be complex–as in the creation of a new version of an existing idea (a better mousetrap, a safer bug spray, or a bigger arena, or a revised process). Or replications can be very simple–as are direct copies of existing things (such as stenciling flowers on a piece of green-ware, or following a pattern or a recipe without deviation). Whether simple or complex, however, whenever a goal directs an activity, then the methods and materials selected for achieving that goal will be defined by the requirements of the goal. This subordination of the selection of means to the achievement of a goal is not compatible with abductive reasoning. In fact, Davis’s model demonstrates that people who instinctively rely upon goals to direct the selection of means find it difficult to engage in

the uncertain and messy process of abductive reasoning. The clarity and efficiency of a goal-directed process is often enough to discourage habitual goal-seekers from dipping into the untidy part of the continuum–where uncertainty and indeterminacy reside–even when anomalies, interesting (but seemingly unrelated) qualities, or surprising results pop up that might otherwise indicate they could do so. Goal-directed individuals tend to push full steam ahead towards the accomplishment of a goal, ignoring (or perhaps not even noticing) signs that they should rethink the goal. Rather than re-evaluate a goal (or methods for achieving it) when problems interfere with completion, many goal-directed individuals will abandon that goal altogether and choose a new one that seems less difficult for them to accomplish (Chiasson & Davis, 1980).

When Means Direct the Formation of Goals

When means direct the formation of a goal, however, anomalies (including problems) are welcome. The means-directed reasoner dives into “the continuum of uncertainty and indeterminacy within which all things dwell” (Peirce, 1897/1955, p. 356). This second way of using the means-end continuum, requires a flexible mind. *Spontaneous* thinkers, who have mental flexibility, but no corresponding ability (or inclination) to focus intensely when confronting options, may recognize “surprising facts,” but their response to these will be shallow and transitory. On the other hand, those who make habitual abductive inferences possess both the flexibility and the depth to recognize and address anomalies. An anomaly is a “surprising fact” concerning the characteristics (or qualities) of some thing, idea, or event which brings about a question (doubt) in the mind of the reasoner. The anomaly (rather than a pre-set goal, or pre-set categories) guides the next step of the process–and that step, in turn, guides the next. Whether transitory or abductive, the means-directed process is guided by doubt, rather than certainty. For abductive reasoning, the means-directed process is the process by which doubt is explored, and in the case of science, brought into the form of an explanatory hypothesis (or conditional purpose (Peirce, 1905/1955, p. 258) ready for explication and evaluation. Thus, a person capable of abductive reasoning, is synonymous with Peirce’s Critical Common-sensist–someone who has “high esteem for doubt.”

So, rather than ignoring a phenomenon or an interesting option because it does not fit a goal (and rather than side-stepping the issue by working around it so that the end-in-view can still be achieved) the abductive reasoner dives into the continuum of uncertainty and indeterminacy. Within this continuum, Peirce contended, “all things swim.” Those capable of abductive reasoning must be comfortable enough with

ambiguity and uncertainty to swim among the yet-to-be-explored options and possibilities within this continuum, juxtaposing the information synthesized from one or more relationships with whatever new information, alternatives, or possibilities arise during the process.

Sometimes the matter of an anomaly can be settled by a quick round of analytical thought. Sometimes years are required to develop a hypothesis out of the evolving relationships made within this continuum. Peirce tells us that his “doctrine of continuity rests upon observed fact,” but that it is fallibilism that “opens our eyes to the significance of that fact” (Peirce, 1897/1955, p. 356). However long it takes, whenever means (observed or present facts and materials) direct the formation of a goal, thought is directed by inquiry (or tentative testing) arising from anomalies and from the relationships these engender, rather than from selecting from options based upon what is required for accomplishing an end-in-view. In this sense, when means direct the formation of goals in abductive reasoning, they do so by “objectifying fallibilism.” “Fallibilism,” Peirce tells us, “is the doctrine that our knowledge is never absolute but swims, as it were in a continuum of uncertainty and if indeterminacy” (Peirce, 1897/1955, p. 356) To “objectify fallibilism,” therefore, is to externalize the reality that our knowledge is fallible. Since abduction is the only inference method by which new concepts can be engendered, only abduction can bring about an awareness of the fallibility of existing knowledge. Thus, abduction, by making use of doubt and uncertainty, enables the means-directed reasoner to dip into “the continuum of uncertainty and indeterminacy” and (by the making of new relationships) construct out of the continuum conditional purposes which can then be explicated and tested by means of deduction and induction.

As mentioned before, Peirce wrote that “[t]he doctrine of continuity rests upon observed fact… But what opens our eyes to the significance of that fact is fallibilism” (Peirce, 1897/1955, p. 356). However, for fallibilism to open our eyes, we must be open to allowing it to do so. Anyone who maintains a rigid set of beliefs about what must absolutely be true–or a set of expectations (or goals) as to what will be discovered or accomplished during an activity–will surely miss out on the gifts which fallibilism holds. Clear goals and expectations tend to blind us to anomalies–especially to anomalies that seem to reside outside pre-set beliefs, goals, or expectations. Those who are comfortable with abductive reasoning, with the condition of “uncertainty and of indeterminacy,” refuse to rest in the arms of absolutism, remaining always open possibilities as these evolve from “non-existence to existence” (Peirce, 1897/1955, p. 356).

The Continuum

So, let us imagine Peirce’s “continuum of uncertainty and indeterminacy” as if it were similar to Dewey’s means-end continuum. However, let us define this continuum as a region which, on its surface contains what is already known (or believed) to be true, and beneath its surface contains every other thing and every other possibility in the universe. Thus, on the surface of this continuum resides what we know as reality and believe to be a future possibility (or Peirce’s “thirdness” as habit and regularity). Let us imagine that this surface region of the continuum is the location of familiar signs and of the contexts within which we already know, or can readily infer, their meanings.

If we remain on the surface of the continuum with what is already known or can already be made known, we will observe the “future” in terms of the past and present. The relationship of “then” to “now” and “now” to “tomorrow” provides a comfortable (but often undependable) sense of regularity. For those who lack the necessary skills for swimming within “the continuum of uncertainty and indeterminacy,” past and present experiences are likely to remain fixed and to shape their vision of the future into clear goals and expectations, even when they are presented with good reason for expecting otherwise. For such people, continuity is experienced only as regularity–or the accumulation of more experiences which repeat (in form, if not in content) previous ones.

Of course, an “expectation of” sameness does not guarantee that sameness will occur. In fact, the more fixed someone’s beliefs and the more absolute the certainty that the future will (or should) replicate the present and past, the more likely that the individual will encounter many nasty surprises. Those with the highest degree of certainty about what will occur in the future, have the least ability to recognize signs indicating otherwise (Goode, 2000, p.7). Much of the time such beliefs are “acritical indubitabilities,” which is to say that the belief has never been examined because the it seems so patently evident that it has never occurred to the individual (or, in some cases to anyone) to call it into question (Peirce, 1897/1955, p. 355).

This condition of what seems to be a *patently evident* belief (or any acritically “fixed” belief for which all doubt has been extinguished (Peirce, 1877/1955, p. 5) that the past will continue in the future can be very comforting, at least up to the point that it is proven dead wrong. Because of the comfortable nature of certainty, it is easy to understand why most people will resist dipping into uncertainty and refuse to heed warnings that a change of course is necessary until a problem is directly upon them–and by then, often unavoidable. (We need only think of the issue of *global warming* to get an

idea of what this refusal to recognize or heed warnings portends.)

On the other hand, we cannot (or should not) attempt to explore the unknownsans any connection to the known. In a discussion of the economy of research, Peirce wrote:

> Nothing unknown can ever become known except through its analogy with other things known. Therefore, do not attempt to explain phenomena isolated and disconnected with common experience. It is a waste of energy, besides being extremely compromising. Turn a deaf ear to people who say, “scientific men ought to investigate this because it is so strange.” That is the very reason why the study should wait. It will not be ripe until it ceases to be strange” (Peirce, D MS L75.267-269).

Peirce is describing here one principle of his doctrine of continuity–that “inexplicabilities are not to be considered as possible explanations. If we attempt to explain a “strange” phenomenon before there is sufficient experiential scaffolding from which to investigate it and then relate it to some aspect of existing general principles, we will lack the necessary tools for making the event meaningful. For, “the form under which alone anything can be understood is the form of generality, which is the same as continuity” (Peirce, 1897/1955, p. 355).

However, apparent *discontinuities* (emerging from the continuum of uncertainty and indeterminacy in which our knowledge always swims) are the external expressions of fallibilism which, when noticed, provide us with a reason to “open our eyes to the significance” of a surprising fact. A discontinuity will disrupt a goal-directed process–if it is recognized, that is. Some goal-directed individuals habitually maintain such a tight hold on a projected goal and the methods for achieving it, that they completely miss discontinuities. If the discontinuity interferes with the achievement of the outcome, they may entirely change course and select a new goal that allows them to avoid dealing with the discontinuity altogether. Thus the disruption of a discontinuity does not necessarily mean that an individual will go for a leisurely swim in the waters of uncertainty. On the contrary, the tendency of some individuals to ignore anomalies and to inductively sort what can be sorted into familiar categories nearly guarantees that anomalies will be ignored or avoided whenever possible. When it becomes impossible to retain a familiar goal, such individuals (because they remain tightly attached to clear goals and pre-set categories) will seek the security of another clear goal right away. They will acquire this goal by either copying something or by setting out to make a new version of something that has already been conceived or produced in another form. Thus, if a problem proves to be one they cannot solve with what they already know, such individuals are likely to drop it and move onto something else that is familiar and predictable (Chiasson &

Davis, 1980).

Although new version-making requires a much higher level of complexity than direct-copying does, it is still a goal-directed process and, as such (like any deductive process), cannot produce original ideas (although such thinking can produce clever solutions to existing problems). Goal-directed individuals (whether simple or complex) habitually experience the means-end continuum from the perspective of the visible aspects of the continuum (in this case, thirdness)–that is from the perspective of ends (meaning goals, expectations, or ends-in-view) directing the choice of means for reaching an end. Such individuals do not begin with present facts as starting points (as a fallibilist would) but rather with beliefs, goals, and expectations concerning a future outcome that may or may not accommodate a particular fact. Because they are selecting and rejecting facts and other materials based upon an already existing beliefs, goals, or expectations, such individuals are usually unable to see the significance of whatever it is they are ignoring or rejecting during the selection process.

The capability for making abductive inferences means that an individual has the necessary skill for “swimming in the continuum of uncertainty and indeterminacy” and for making relationships from there. Abduction always begins with the “means,” that is to say: the surprising fact, the qualities of a material, the sticky problem, or the anomaly. The abductive inference begins by exploring and experiencing the qualities of materials, ideas, and methods, rather than using materials and methods to accomplish a purpose.

The process of abduction involves addressing qualities by relating these in various (often unique and unusual) ways. In this sense, abduction could be considered in one sense as an interplay of firstness (quality) and secondness (relation) that evolves, by means of the relating, into thirdness (relationship). Though, of course, all purposeful activity (including relating the qualities of things) relies upon signs (which are themselves thirdnesses), thirdnesses as a new relationship, thought, mediation, or interpretation, are also *by-products* of abductive reasoning. In other words, for abduction, even signs are used as raw materials, not as directing goals.

Often an episode of abductive reasoning begins with a mistake; sometimes with a daydream, or because one is bored. Sometimes abduction begins as a decision to just sit among, or play with, one’s “stuff” for a while and see what comes up. Sometimes abduction begins with a surprising result or an unusual phenomenon. Yet, any of these situations can occur and NOT produce abductive reasoning, so the key to understanding abduction resides in understanding what it means to swim within the continuum of

uncertainty and indeterminacy. From the abductive perspective of this continuum, the means (materials, tools, facts, knowledge, possibilities, prior goals) direct the formation of a purpose–that is, a conditional purpose or hypothesis–which may or may not turn out to be useful, valid, or worthy. For as Peirce said, “abduction does not afford security. It must be tested” (Peirce, 1892/1958 p. 368).

Continuity and Retroduction

In the case of experimental science, once a conditional purpose has been formed by means of abductive reasoning, “testing” must start with deductive reasoning–with “an examination of the hypothesis and a muster of all sorts of conditional experiential consequences which would follow from its truth” (Peirce, 1892/1958 p. 368). Inductive reasoning follows during the actual testing of these conditions and the evaluation of results.

Abductive inferences are, in one sense, fragile and tentative because they result from an evolutionary-like process of interrelating and synthesizing qualities based upon their relationships to one another, rather than upon purposes dictated by a goal, or end-in-view. Their fragility consists in the fact that they offer no security and must be tested before they can be secured. In another sense, however, abductive inferences are valiant and powerful, braiding together facts and fields of ideas and qualities in ways that have not been done before. Whichever way you choose to view them (as fragile or valiant), however, abductive inferences always make use of uncertainty–of the fallibilism inherent in all knowledge–from which to construct possibilities in the form of hypotheses (which Peirce also referred to as “conditional purposes” (Chiasson, 2001, pp. 155-166). If this were not so, no idea could be “new.” “Deduction explicates; Induction evaluates: that is all” (Peirce, 1892/1958 p. 368), wrote Peirce. He claimed that only abduction advances knowledge. We cannot ever discover anything new by means of deduction or induction. We can develop new versions of something, perhaps, or develop better ways of explaining an idea–but nothing new can come out of deduction or induction. Only abduction can present us with new ideas for explication and evaluation. Retroduction (Chiasson, 2000b), on the other hand, is the full expression of continuity as the form of evolution by which “theories and conceptions are engendered” (Fann, 1979, p. 47). This means that retroduction is the overarching method guiding the cyclical interaction of abduction, deduction, and induction in the course of developing new ideas into full blown hypotheses ready for explication and evaluation (Peirce, 1897/1955, p. 355).

Conclusion

New knowledge can only be discovered by swimming within that part of the continuum that is made up of uncertainty and indeterminacy. New ideas are constructed by making connections and syntheses among the qualities of various possibilities there as well as among what already is (or can be) known. We only make new discoveries when we permit the means to direct the formation of goals. These means take us into the invisible part of the continuum made up of yet unknown actions and yet unrelated qualities from which, according to Peirce, things evolve (or unfold) into reality. Anyone who does not know how to swim within this part of the continuum, cannot make abductive inferences–cannot produce original ideas. Goal-directed selection of means occurs from the surface of the continuum and is not compatible with abductive reasoning unless it operates in service to an abductively derived idea.

Only when means are allowed to abductively direct the formation of goals and purposes can new discoveries occur. Yet, only when these abductively derived discoveries are *secured* by means of deduction and induction will the understanding of the reality (or general meaning) of the discovery unfold. For, “the form under which alone anything can be understood is the form of generality, which is the same as continuity” (Chiasson & Davis, 1980). “Reality,” wrote Peirce, “is persistence, is regularity. In the original chaos, where there was no regularity, there was no existence. It was all a confused dream. But as things are getting more regular, more persistent, they are getting less dreamy and more real” (Peirce, 1897/1955, p. 355). We, too, will get “less dreamy and more real” as we eliminate vagueness from our beliefs by learning to employ abductive reasoning in the generative-reciprocal-recursive activity of retroduction. A mind operating retroductively within the full scope of the means-ends continuum corresponds to someone using Peirce’s concept of “right reasoning.” Right reasoning (synonymous with this writer’s interpretation of “retroductive reasoning” as Peirce’s methodeutic) is the overarching method directing the interplay of abduction, deduction, and induction in the course of developing a hypothesis. Once formed, explicated, and evaluated, a hypothesis can eventually bring about new conceptual regularities which become “provisional truths”–those beliefs which have been fixed by “the method of science.” The overarching method of retroduction requires that means-direct the formation of a worthy purpose and that, during the construction of that purpose (or hypothesis) the goal-directed activities of explication and evaluation interact with abduction in the course of this development. For, throughout the course of any inquiry, the overarching method of retroductive reasoning is at various times generative, reciprocal, and

recursive–depending upon what is discovered at each step along the way. Therefore, retroduction (meaning the appropriate application of abduction, deduction, and induction during inquiry (Chiasson, 2000b) is the method by which the means-end continuum is used for discovering new ideas, which then evolve (by means of goal-directed explication and evaluation) into the form and persistence that we call Reality.

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Notes

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1. In both the goal-generating process of abductive reasoning and the impulsive response to options of capricious (or transient) goal selection, the means (that is: materials, tools, ideas, facts, anomalies, prior goals, new discoveries‹or whatever else might be available) direct the selection of the goal. ↩
2. The reverse (that goals should, themselves, be developed and determined as worthy or not by first examining interrelationships among means and materials and the potential consequences of a goal upon whole systems) is generally dismissed as inefficient and non-productive in this society. ↩
3. Of course, when an initial goal is released in favor of pursuing an anomaly arising out of the course of an inquiry, that goal is no longer directing the selection of means. In such cases, means become the director of the development of the goal (in this case, th settling of the question) until such time as the previous goal is re-established or a new goal (or hypothesis) is constructed. ↩