Right reasoning: S. I. Hayakawa, Charles Sanders Peirce and the Scientific Method

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IN "The Aims and Tasks of General Semantics: Implications of the Time-Binding Theory," S. I. Hayakawa (1906–1992) distinguishes between three orientations—prescientific, antiscientific, and scientific—and what implication each orientation holds for the prospect of human agreement (1951 & 2001). Similar themes that Hayakawa's article addresses can be found in an essay written more than six decades earlier by the nineteenth-century American logician and mathematician, Charles Sanders Peirce (1839–1914). Peirce (pronounced "purse") is widely considered to be one of the most original thinkers in the history of philosophy and the greatest philosopher the United States has ever produced (Brent 1993, p.xiv; Popper 1972, p.212). Among his many and varied accomplishments, he is best known for writing the founding documents of American pragmatism, "a method," Peirce tells us, "of ascertaining the meaning of hard words and abstract conceptions" (CP, vol.5, par.464).[1]

Peirce sought to understand the meaning of words and concepts according to their practical significance. Hayakawa sought to explore the relationship between words, human thought, and practical action. Peirce's original work in semiotics is by far the most thoroughgoing and sustained early attempt to give an account of signs and their interrelations. When assessing the truth or falsehood of an idea, Peirce held that what matters most is the consequences that follow from the idea, as distinguished from the idea itself. Peirce, like Hayakawa, believed that of all the methods available for analyzing various kinds of claims, assertions, beliefs, and ideas, only one method has a distinct advantage over all others in addressing humankind's common problems, and that is the method of science.

Peirce's Four Methods of Fixing Belief

In his now famous 1887 article, "The Fixation of Belief," Peirce examines four ways that people form beliefs. For Peirce, "fixation" means quite literally the prevalent tendency of people to "fix on" to certain opinions or beliefs. Similarly, Peirce employs the word "belief" as "that which a man is prepared to act" (Wiener 1958, p.91).

1. ***Tenacity***. The first method of fixing belief is what Peirce calls the method of *tenacity*. This method operates most simply and directly when a person forms an opinion and stubbornly clings to it, despite all external influences. Facts and experiences that do not accord with one's beliefs are discarded in favor of those with which one feels most comfortable. This is akin to what Hayakawa called "wishful thinking" or what Mark Twain satirically referred to as "corn-pone" opinions (Anderson 1972, p.5). It can be seen operating where fervent beliefs, once formed, permit little to no outer verification or falsification. Like that of the proverbial ostrich with its head in the sand, this method is a welcome refuge from the rigors of individual thought and decision.
2. ***Authority***. The second method, the method of *authority*, differs from the first in that it commands assent through insti-

tutional means. This method, Peirce explains, "has… been one of the chief means of upholding correct theological and political doctrines." These kinds of beliefs are enforced through the "will of the state," a ruling aristocracy, an organized guild, or a professional priesthood (CP, vol.5, par.379). The purpose of such institutions, in large measure, is to instill "correct" beliefs. This is accomplished through systematic indoctrination to keep the population in ignorance of everything that may create doubt. The method of authority is similar to Hayakawa's orientation of dependency, in which statements are accepted based on some form of authority, be it a parent, sacred text, political or religious leader (p.179). As history has shown, dissenters who question such systems of belief are often dealt with harshly. Punishment can take various forms, from the public humiliation that results f rom being tarred and feathered, to the formal ritual of an inquisition, to the ghastly horror of genocide (CP, vol.5, par.379).

3. ***A Priori***. In addition to the methods of tenacity and authority is the third method, what Peirce calls *a priori*. This method rests on propositions from philosophical discourse that are thought up prior to experience. The extent to which this method works depends on what thinkers find "agreeable to reason" (CP, vol.5, par.382). While the *a priori* method has the advantage of being more intellectual than the first two methods, it also has the disadvantage of being based on "taste" or intellectual "fashion." The notion that fashion alone should dominate opinion has an immediate benefit; it makes thought unnecessary by putting the highest intelligence in reach of everyone. Further, people who follow the *a priori* method choose to believe that which is plausible and reasonable, but do not consult experience to see whether their beliefs agree with the facts. Hayakawa calls this the "scholastic tradition," whereby abstruse expression and arcane language are employed for the purpose of claiming to have penetrated the meaning of what is in truth devoid of any (p.181). Or, as the British philosopher Bertrand Russell once wrote, "The more profound the philosopher, the more intricate and subtle his fallacies be in order to produce in him the desired state of intellectual acquiescence" (1995, pp.56–57).
4. ***Scientific Investigation***. The forth and final method is that of scientific investigation. The method of science is based on "real things," according to Peirce, "whose characters are entirely independent of our opinions about them" (CP, vol.5, par.384). Only this method, Peirce asserts, allows for "bad reasoning" as well as "good reasoning," by testing whether the reasoning fits with "rough facts" external to the feelings and purposes of the method (CP, vol.5, par.385). Peirce reasoned that of the four methods of forming and maintaining belief, the scientific method has one important advantage over the others. Where the other three methods have no objective controls or criteria for assessing beliefs and therefore little reason for thinking they are true, the method of science is the only one that is self-correcting because it is open to refutation on the basis of factual evidence. "It is the only method," as one observer put it, "that allows people to arrive at conclusions that they have any reason to think are true" (Thayer 1973, p.115).

Limitations of Three of the Methods

The other three methods fail to meet the test of experience.

1. The method of *tenacity*, for instance, turns out to be unworkable because it isolates people within the narrow confines of their preconceived thoughts and is therefore at odds with the larger social life of the human community. In Peirce's words: "The social impulse is against it… Unless we make ourselves hermits, we shall necessarily influence each other's opinions; so that the problem becomes how to fix belief, not in the individual merely, but in the community" (CP, vol.5, par.378). Nor, as Hayakawa points out, does this method help to make human agreement possible. Circumstances inevitably arise in which purely traditional beliefs are discredited by their manifest conflict with the facts of experience.
2. The method of *authority* is also unsustainable. First, no institution can possibly legislate public opinion on all questions. Since people have to form their opinions on many different and complex questions, they will necessarily have to do this by some other method, a method which will in some cases come to compete with the official one. Thus Hayakawa agrees with Peirce: "Under this orientation widespread human agreement would be possible if, and only if, everybody in the world accepted the same parent-figure as authority" (p.180). Second, as different communities come into contact with one another, some of their inhabitants will discover that one and the same method leads to one opinion at home and the opposite opinion abroad, and this too will create doubts about the method (CP, vol.5, par.381). This is similar to what Hayakawa means when he writes, "… people throughout history have never been able to get together in the acceptance of a common father-figure" (p.180).
3. Nor has history been kind to the *a priori* method. Throughout the centuries, this method has tended to isolate thinkers and their systems. The reason lies, according to Peirce, in the assumption of a single principle from which all valid knowledge is supposed to be deduced prior to experience. Still, this is the method which most philosophers have followed down through the ages. While it has resulted in some of the most consoling one-answer systems, this method has been less edifying when it comes to establishing belief. Instead of creating lasting agreement, the *a priori* method has produced only a succession of changing intellectual fashions. Belief has been fixed for certain periods, only to be disrupted by the next change in fashion (CP, vol.5, par.383).

The Scientific Method as Right Reasoning

Of all the methods available to humankind, the scientific method is the only valid method of fixing belief, for it is the only method by which beliefs must be tested and corrected by

what experience presents. Unlike the other three methods of fixing belief, the method of science always remains open to challenges devised by others. Indeed, Peirce saw the method of science as a continuous self-corrective activity governed by the norms of a critical community of inquirers. Peirce's scientific optimism consists only in the conviction that every erroneous hypothesis will sooner or later be refuted, if subjected to sufficiently thorough testing. Thus Peirce writes, "It is true that agreement does not show the guess is right; but if it is wrong it must ultimately get found out" (CP, vol.1, par. 121). Hence, knowledge cannot be a matter of personal conviction, however sincere. Nor can the origin or pedigree of knowledge be unimpeachable, for there are no ultimate sources of knowledge. It is the assertion itself—not its source—that must be brought under critical scrutiny. For anything to qualify as knowledge it has to be open to examination, and to the risk of disproof, by the most rigorous possible critics.

Scientific hypothesis and theories are framed in terms that facilitate their own refutation by defining what a counter-example would be.

Crucial to the scientific method is not verification but falsification. Genuine scientific hypothesis and theories are framed in terms that facilitate their own refutation by defining what a counter-example would be. One counterexample is all it takes to overthrow what no finite number of positive instances could prove. Peirce believed that the best hypothesis a scientist can entertain "is the one which can be the most readily refuted if it is false."

Scientific hypotheses, in other words, last just so long as they are not refuted. This, according to Peirce, is precisely "what the man of science is gunning for more particularly" (CP, vol.1, par. 120). By contrast, the other three methods of fixing belief are careful to avoid such refutation. Their ideas and theories are framed with a view to adjusting them in the face of evidence. The use of ambiguous and indeterminate language, for instance, permits them to survive the unsettling prospect of a temporary disproof.

Conclusion

Peirce was an investigative scientist. He was competent in logic, mathematics, and the physical sciences, especially chemistry, geodesy, metrology, and astronomy. His membership in learned societies included the American Academy of Arts and Sciences, the National Academy of Sciences, and the London Mathematical Society. Still, Peirce's comprehensive grasp of the scientific enterprise led him to expect no specific guarantees of unfailing correctness from the scientific method. "It is a great mistake," Peirce tells us, "to suppose that the mind of the active scientist is filled with propositions which, if not proved beyond all reasonable cavil, are a least extremely probable" (CP, vol.1, par.120).

The provisional nature of science Peirce calls "fallibility," meaning that none of our beliefs should be regarded as beyond the reach of questioning (CP, vol.1, par.145). The explanatory power of science is useful so long as it works, so long as it yields accurate results. As a pragmatist, Peirce insisted that we constantly test the reliability of our beliefs, and we discard those that fail the test. Thus Peirce writes, "[T]he scientific spirit requires a man to be at all times ready to dump his whole cartload of beliefs, the moment experience is against him" (CP, vol.1, par.55). Through constant modification of its own conclusions, the method of science is the best one for advancing the prospect of human agreement. This is what Hayakawa emphasizes when he quotes Korzybski in referring to science as "… simply the orientation of sanity" (p.180).

NOTE

1. When citing Peirce, I have used the abbreviation "CP" for Collected Papers, followed by volume and paragraph numbers. Subsequent citations indicate volume and paragraph numbers.

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