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PHILOSOPHY OF SCIENCE AND CYBERNETICS: TWO SIDES OF THE SAME COIN?

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ABSTRACT

Key concepts in the philosophy of science have been called into question by recent advancements in cybernetics. The theory of knowledge that makes up science philosophy is frequently referred to as realism. There are numerous points of view in the philosophy of science; however, it is not a unifying discipline. Constructivism is an ideology that is emerging in modern cybernetics. This research paper contrasts cybernetics with two influential schools of scientific philosophy, identifies a number of misconceptions that exist between scientists and cyberneticians, and offers a solution that does not deny science but rather expands it.

***KEYWORDS**:* cybernetics, philosophy of science, realism

INTRODUCTION

There are numerous viewpoints and schools of thought in the history and philosophy of science. The breadth of this paper does not allow for a thorough explanation of the perspectives of different contributors (Suppe, 1974). To contrast the philosophical perspective of modern cybernetics with these two positions, I will simply outline the two viewpoints that, in my opinion, dominate science philosophy at the moment. I will place a strong emphasis on the writings of Thomas S. Kuhn and Karl Popper in order to describe the two views within the philosophy of science. The theory of science philosophy describes the origins and development of knowledge. We shouldn't easily disregard this work. Criticism of any viewpoint will also be most convincing if it is supported by a counterargument. Until there is something better to replace it with, it is challenging to convince people to give up something that has served them well. One accomplishment of scientific philosophy is that it has addressed the issue of demarcation, or how can we tell science from non-science (Miller, 1985). The falsifiability criterion was put forth by Popper. Non-scientific claims cannot be

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falsified, whereas scientific claims can. Both of these concepts—verification through experimentation and the earlier concept—have positively impacted social systems.

Science developed into a method of producing knowledge independent of coercion or arguments based on appeals to authority, faith, or supernaturalism through testing. This concept supported the development of democratic nations by releasing science from ecclesiastical and governmental authority. For individuals who were prepared to use critical thought, science provided a means of transcending shared belief and ideology. The concept of trial and error, of hypotheses and denials, has liberated society and enabled technological advancement in recent centuries. Science has given us a technique to distinguish between what we know and what we don't.

The Structure of Scientific Revolutions, written by Thomas Kuhn in 1970, has been the source of the most heated debate in recent years about science. Kuhn defined epistemology sociologically, or how scientists act as a social system, as opposed to the positivists' normative definition, which focused on how scientists should conduct themselves. When reading the original scientific works, Kuhn found a contradiction between how scientific progress was described in textbooks and how it actually emerged. The development of science is typically portrayed in textbooks as having happened in an orderly, step-by-step fashion, with each new discovery building on previous ideas. However, there is a lot of disagreement and dispute in the original writings. According to Kuhn, science advances through a succession of revolutions interspersed with periods of "normal science." When scientists are utilizing a widely acknowledged "paradigm," normal science is an activity of puzzle solving, according to him. A paradigm, according to Kuhn, is anything that is more than a theory but less than a worldview.

The significance of Kuhn's work might be attributed to the attention it brought to the function of scientific communities. According to Kuhn, theories advance not just via the accumulation of data, but also because consecutive theories are incomparable. For instance, in Newton's theory of physics, mass, length, and time are constants, but they are not in Einstein's theory of relativity. The transition from one theory to another, according to Kuhn, is comparable to the process of religious conversion. Kuhn stated that even data and experiments are open to interpretation, contrary to positivists who maintain that theories can be tested by experimentation.

HYPOTHESIS DEVELOPMENT

CYBERNETICS: A CRITIQUE OF SCIENCE

1. Cybernetics and philosophy of science

Cyberneticians have recently advocated a biological perspective of epistemology as opposed to a normative or social one. They studied the neurological system by applying the traditional scientific philosophy, which they accepted seriously. They then came to the conclusion that one of the key assumptions of the philosophy of science, the notion that observations are independent of the attributes of the observer, needed to be rejected (Von Foerster, 1981). Cyberneticians now pay attention to both the observer and what is observed (Segal, 1986). They are creating a constructivist philosophy to counter reality (Von Glasersfeld, 1987). Cyberneticians contend that scientific rules are created to explain patterns in human experiences, as opposed to being discovered, as one might discover an island in the water. Cyberneticians contend that each person creates a personal "world" that corresponds to his or her experiences rather than holding that science represents reality. The idea that if people embrace this viewpoint, they will become more tolerant of others is one of the driving forces behind the development of this philosophy.

H1: As per cyberneticians, science is created to explain patter in human experiences only.

2. First-order and second-order cybernetics

The phrase "second-order cybernetics" has been used by cyberneticians to separate modern work in cybernetics on constructivist epistemologies from older work on control systems. First-order cybernetics, according to Heinz Von Foerster, is the study of observed systems, while second-order cybernetics is the study of observing systems (Von Foerster, 1979). According to Von Foerster, the term "observing systems" can refer to either systems that observe or systems that perform the act of observation. When he said that second-order cybernetics deals with the intention of the modeler, Gordon Pask made a similar distinction between first- and second-order cybernetics. According to Francisco Varela, first-order cybernetics focuses on controlled systems, while second-order cybernetics focuses on autonomous systems. I've put up two more ideas for second-order cybernetics (Umpleby, 1979).

The final definition focuses on the n-brain problem of communities or societies rather than the one-brain problem of psychology or artificial intelligence. Theories of social systems can be used to illustrate first-order cybernetics, whereas second-order cybernetics focuses on the interplay between ideas and society. Some individuals get the impression that modern cybernetics and the philosophy of science are in opposition at times. Particularly, it is frequently difficult for scientists to comprehend what cyberneticians are saying.

H2: Second-order cybernetics is said to be concerned with the interaction between the observer and the observed, whereas first-order cybernetics is considered to be concerned with interactions among the variables in a system.

3. Cybernetics and fallacies

Comparing the underlying premise of cybernetics with the work in philosophy on informal fallacies can help one understand why. There is no solid philosophical foundation for informal fallacies. They are merely a series of recommendations meant to aid in the creation of strong arguments.

Von classifies the fallacies into three groups:
1. Ambiguity fallacies involving linguistic issues.
2. Presumption fallacies that are focused on mental mistakes.
3. Fallacies of relevance that stir up strong feelings.

A fundamental principle of cybernetics appears to be excluded by at least three fallacies, one in each category. The fallacy of accent is one of the language fallacies, and it arises from a misunderstanding of context. Engel cites phrases like "You never looked better," "I wish you all the good success you deserve," "Warning: Under Title 18 of the U.S. Code, it is a Federal felony to assault a postal employee while on duty," and others as examples.

The fallacy of accent is an attempt to categorise specific verbal constructions as improper, or at the very least coniksing and so bad form. Changing the degree of analysis is one way to lose track of context. Self-referential statements require investigation on at least two different levels. Therefore, the accentuation fallacy would appear to rule out any scientific theory that attempted to account for self-referential assertions. "Begging the question" is one of the cognitive fallacies and is used as an illustration of obfuscating the truth. Claiming that A is true because of B when B is dependent on A is one way to avoid answering the issue. Engel uses the textbook quote, "Every assertion in this book is true," as one of his examples. The quote "Every statement in this book is true"; "The crime this man committed is the result of his childhood environment; for all such crimes are rooted in childhood environment, as this man's case proves"; "Reality in itself must be as it appears to the five senses; for if it were not, then there would be no other way that we would know it"; and "Every statement in this book is true" are all statements in this book. Engel's definition of this mistake appears to disqualify circular causality. He frequently uses circular reasoning and context misinterpretations in his instances. Circular causality is crucial to cybernetics.

The ad hominem fallacy is one of the relevant fallacies that cause emotional distress. As an illustration of a fallacy involving a personal assault, Engel cites the ad hominem fallacy. Engel gives the following examples. "As a producer, you ought to have backed this legislation calling for greater tariffs." Since you would personally profit from a reduction in real estate taxes, it seems to reason that you would support one. Since conscientious objectors are obviously attempting to avoid conscription, one cannot believe their claims. According to the ad hominem fallacy, it is wrong to turn the spotlight from a statement to the person who made it.

Second-order cybernetics, on the other hand, contends that it is not fallacious but rather appropriate to concentrate on the observer. The problems they aim to solve have been connected with verbal abuse, shoddy reasoning, and emotional manipulation. Maybe it's not surprising that so many scientists find it challenging to accept modern cybernetics. Cyberneticians must not only communicate their concepts but also get past the listener's level of education. It appears that the moment has come to challenge the implicit epistemology that underlies informal fallacies and to suggest a fresh set of rules for formulating helpful claims.

H3: In each of the three major categories of informal fallacies, cyberneticians have trouble.

4. Social and cognitive systems

However, the disagreement between cybernetics and the philosophy of science extends beyond the common misconceptions. Two other issues come up, especially if one is interested in social systems as well as cognitive. Theories were thought to have no influence on the systems they described in the traditional philosophy of science. It seemed logical to suppose that the adoption of the quantum theory by physicists had no effect on how atoms behaved. However, it is evident that social theories and social systems interact (Soros, 1987). When people adopted the views proposed by Adam Smith, Karl Marx, John Maynard Keynes, and Milton Friedman, economic systems underwent a change. In actuality, the desire to alter social structures is frequently a key driver in the development of social theories.

The conversation between ideas and society is something that cyberneticians are extremely at ease with. In fact, this phenomenon can be seen as an illustration of self-reference, circular causality, and the observer's function. The evolution of theories that explain the evolution of ideas would be an even more severe example of the interplay between theory and phenomenon.
The unity of method, as defined by Popper, is another area of contention between cyberneticians and philosophers. According to Popper, the techniques created for the physical

sciences can and ought to be used in the social sciences as well. Social systems, in contrast to physical systems, are made up of participants who think.

The fact that everyone else is attempting to do the same thing complicates attempts by one observer to forecast the behaviour of a social system, such as the stock market. Unlike physical systems, which do not have thinking individuals, social systems do. Because of this, attempting to resolve the differences between the physical and social sciences by merely recommending a unity of method is insufficient.

H4: Cybernetics and science do not see eye to eye, and this goes beyond the fallacies.

METHODOLOGY

1. Secondary Data Collection

The methodology supposed for this analysis is doctrinal and analytical in nature. It focuses on the philosophy laid down by scientists as well as cyberneticians, along with the available literature on the topic. Primary sources (which include the texts of the philosophers, and several leading cases, prior to and post the) have been relied on. Secondary sources such as books, journal articles, websites, and databases were also useful in its successful completion.

2. Analysis

The analysis is theoretical in nature. It focuses on the theoretical divide between cybernetics and the philosophy of science. It focuses, on the difference in the approach to science as well as social sciences adopted by the two fields. It aims to highlight the areas of such divide and attempts a reconciliation between the two different fields.

FINDINGS AND ANALYSIS

Many people now contest the relevance of science to social systems (Morgan, 1983). Many authors have come to the conclusion that social system researchers should abandon science. Science, however, is not a rigid system. It was created by people, and it is always evolving as scientists explore new fields of study like social systems. The traditional perspective of science describes how theories modify themselves to take into account novel concepts. The correspondence principle is the method. Niels Bohr utilised it for the first time while the quantum theory was being developed. Any new theory should, in circumstances when it is known that the old theory holds true, reduce to the old theory.

Thus, when a newly defined dimension reduces to zero, the old theory is transformed into a specific instance of a new, more comprehensive theory. Consider a chemistry example to drive home the notion. The underlying premise of the gas laws was that gas molecules were simply pointed masses without any diameter. This presumption was accurate for many years. However, as technology advanced, gases could be compressed to significant diameters. The gas laws needed to be revised to account for molecular sizes. Science appears to advance in an orderly manner when new hypotheses are developed in accordance with the correspondence principle. The fact that all of the evidence supporting the previous theory also supports the new one is a benefit of such theories.

However, only one group of people who research the history of science uses the correspondence principle as a central concept in their cognitive processes. The sociologists, led by Kuhn, contend that old and new ideas cannot be reconciled, while the philosophers insist that by utilising the correspondence between them, old and new theories may be reconciled. It is feasible to trace the development of scientific knowledge in an organised manner. These two concepts can, in my opinion, be blended. There are two transitions: from conventional science to revolutionary science and the other way around. Kuhn underlined how the introduction of incomparable ideas marked the shift from conventional science to revolutionary science.

Through the correspondence principle, Popper, Krajewski, and others describe the shift from outdated to contemporary theories. Examples of the second sort of transition from a revolutionary time to a new era of regular science, in my opinion, are transitions that make use of the correspondence principle. Normal science, the scientific revolution, and normal science are mental creations in an order that is quite close to Hegel's idea of dialectics, which is the thesis, antithesis, and synthesis. Relativity theory and constructivist cybernetics are two examples.
In the case of relativity theory, a significant change in the presumptions of mass, length, and time signalled the move from conventional science to revolutionary science. In Newtonian physics, time, space, and matter were constants. In the theory of relativity, time, length, and mass are variable. Some academics highlight the mismatch between the old and new theories.

Others emphasise that it is possible to demonstrate that the relativistic equations for mass, length, and time decrease to Newtonian equations when the relative velocity is minimal by applying transformations that Lorentz first presented. The old theory can be seen as a specific instance of the new theory when the additional factor of relative velocity is taken into account. Although relative velocity was taken into consideration in the Newtonian worldview, it had no impact on mass, length, or time. By applying the correspondence principle, when a newly defined or newly interpreted dimension is very small, the old theory becomes an instance of the new theory. For many years, cyberneticians have stressed the distinctions between first-order and second-order cybernetics in the context of cybernetics.

The distinction between the traditional scientific approach of realism and the new cybernetics perspective of constructivism has become customary at cybernetics gatherings. The definition of the incommensurability of these two viewpoints marks the change from conventional science to revolutionary science. I think the new revolutionary viewpoint is now clearly established and that moving forward will necessitate starting a new era of "normal science." Define a new dimension or reinterpret an existing dimension in order to move from a time of revolutionary science to a new period of normal science. Such a dimension might be "the degree to which the observer's characteristics affect descriptions of the observed" or, put another way, "the degree of interaction between the observer and observed."

The ramifications of this viewpoint are two. First, it might be argued that constructivist cybernetics—along with concepts produced in related fields but under various names—created a scientific revolution, much as relativity theory did. Because the new dimension of interaction between the observer and observed affects all of the science rather than just one particular scientific subject, the new revolution is extremely significant. Second, there are now linkages that can be drawn between social and natural disciplines. We are now in a position to more precisely characterise how these two disciplines of science are similar and how they differ, as opposed to letting them continue to evolve independently from one another.

CONCLUSION

These concepts, in my opinion, enable us to reconcile the conflict that has recently arisen between science and cybernetics. This conflict can be seen as a transition from a stage of conventional science to a stage of revolutionary science. In order to ease the tension, I suggest that we transition from the current era of revolutionary science to a new era of "regular science." In order to take this step, science must be expanded or redefined to include the interaction between the observer and the observed. By doing this, we uphold the noble traditions of science and philosophy.

Modifying the philosophy of science rather than coming up with a whole new alternative is more likely to be successful in the near future, given the time and effort already put into developing it. The fact that we have a single conceptual structure with clear connections between the various fields of knowledge, as opposed to having a gap between our knowledge of the social world and our knowledge of the physical world, is another advantage of changing rather than rejecting the philosophy of science. In my opinion, this approach demonstrates two things that appear to be in apparent contradiction with second-order cybernetics and science. First, cybernetics can be regarded as a branch of science since it is consistent with science's most fundamental traditions.

Second, we show how science is based on cybernetics. Wiener (1948) first referred to cybernetics as the science of controlling and communicating. By altering and expanding science, we have more control over its content and can convey its fundamental principles to academics who have questioned the suitability of the traditional paradigm of science for understanding social processes.

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