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# A PHILOSOPHICAL APPROACH TO THE MEANING OF SCIENCE

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It would seem to be a rather simple matter to define *what science is and how it operates*. After all, a good portion of our high school and college careers have been spent in science classrooms and laboratories. Possible answers might be that science is an organized body of knowledge and that it operates by discovering the truth about nature through the use of scientific method. It seems equally simple to visualize science as a massive pile of bricks with each scientist adding a new brick each time he discovers a new fact or invents a new theory. Further, if one has ever taken the time to read the history of a discipline in a textbook, the picture portrayed is one of a steady progression in a logical and straightforward manner from ignorance to present-day truth. Probably most of us view science in such a way.

This paper will attempt to give a different view of what science is and how it operates. This other view of science is based on the premise that without instrumentation, man is limited in what he can "know" because he is limited in what his senses perceive.(Only certain phenomena are detected by man's sensory receptors.) For example, only a small portion of electromagnetic radiation (visible light) is detectable by man's eyes. In addition, there are phenomena that man does not perceive at all, such as magnetic pull, gravity and atomic radiation. There may be, and most likely are, other phenomena that exist in nature of which we are completely unaware. These unknown phenomena may be as important or more important in determining and shaping our existence. Because man is limited in what his senses perceive, he will probably never know ultimate reality (the way nature really is).

What then does science study? Science studies those judgments (inferences) about our sense perceptions upon which universal agreement can be attained. In practice, scientists do not use this idealized procedure for determining what science will study. Scientists use another screening technique, that is, they use laws. **Laws** are invariable associations between two objects or events (for example; gases expand when heated). Regardless of which screening technique is used, the same objects or events are admitted into science for study.

## What is Science?

The definition of science (or what science is) is different from what the subject matter of science is. Science can be divided into two levels, an empirical level and a theoretical level. The empirical level deals only with "observables" (for example; rabbits, stars, bacteria). The activities of the empirical level include observation, classification, data collection and experimentation. Such activities culminate in the discovery of laws. Laws serve as both a starting point of science (subject matter) and as a final product of science.

The theoretical level of science deals with non-observables (for example; atoms, orbits of planets). The activities include the invention of theories and the empirical verification of predictions made from theories. Campbell (1) defines a theory as a system of general and abstract statements capable of: (i) "explaining", (ii) summarizing a body of existing laws, and (iii) forming new laws. The part of science that remains and continues to be expanded upon are its laws. Since man is limited in what his senses perceive, the theories that he invents to explain phenomena may not represent ultimate reality. Theories are the part of science that change; that is, theories are continually being revised.

With a better understanding of what laws and theories are, we can now find out more about science and how it operates.

Thomas S. Kuhn (2), a philosopher of science, believes that the pattern of a mature science is one of successive transition from one **paradigm** to another via revolutions. A paradigm is defined as any achievement that: (i) guides the research of a discipline; and (ii) attracts an enduring group of scientists away from competing modes of scientific thought. Theories can be paradigms as well as anything else, if they satisfy the above two criteria.

The period during which one paradigm is replaced by another is called a revolutionary period. A revolutionary period in science is somewhat analogous to a political revolution. "Political revolutions are inaugurated by a growing sense, often restricted to a segment of the political community, that existing institutions have adequately ceased to meet the problems posed by an environment that they in part created" (2, p. 92). This is also true of scientific revolutions. Scientific revolutions are inaugurated by a growing awareness that the existing paradigm is no longer adequately explaining newly discovered phenomena. Today, most of us are not aware of past scientific revolutions because the problems and solutions of early scientists are viewed from the paradigms of today. However, they were periods of great turmoil. A classic example was the overthrow of the paradigm that viewed the earth as the center of the universe. This revolutionary period was not confined to the scientific community but affected many facets of society.

## Conclusion

The normal pattern of science then is for the old paradigm (theory) to be replaced in whole or in part by a new and incompatible paradigm. The new paradigm causes a re-evaluation of prior face and a shift in the problems available for investigation.

With this introduction, we can now trace the history of a discipline (for example; microbiology) from a more philosophical point of view. In doing so, the history of a discipline becomes more dynamic.

## Literature Cited

1. Campbell, N. 1952. *What is science?* Dover Publications, Inc., New York.

2. Kuhn, T. A. 1970. *The Structure of Scientific Revolutions*, 2nd Edition. The University of Chicago Press, Chicago.