

Essay 3

Science and Religion

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### Normal Science vs. Extraordinary Science

In Thomas Kuhn's novel The Structure of Scientific Revolutions he explains in depth his concept of normal science and how it is this normal science that helps science progress. It is this normal science that provides a framework for experiments to run in. The normal science is founded in a paradigm, and once a paradigm is established it is hard to upset/change. In his piece The Danger of Normal Science Karl Popper refutes Kuhn's idea of normal science. Popper believes that Kuhn's idea of extraordinary science (experimenting outside of a paradigm to cause a revolution) is in fact much more common than Kuhn hints at. To Popper science is always potentially on the verge of a scientific revolution. In most scientific fields we find that Popper's "counter hypothesis" does not hold true. A paradigm predicts the answer to a puzzle; it is almost impossible for the human mind to devise an experiment in which we don't already know the answer. As Kuhn demonstrates revolutions are in fact few and far between and most often come from an anomaly or mistake. Popper even goes as far as to explain the dangers of normal science, and to criticize it, but what popper does not realize is that without normal science nothing would get done.

To begin with, Normal Science, Kuhn's concept and extraordinary science, as well as each of their ideas on "scientific revolutions" must be defined. What Kuhn calls normal science and devotes an entire chapter in his novel on really just boils down to problems solving, or, "working out chains of argument implicit in previous work." It lays a baseline for scientist to experiment on. Under normal science revolutions are few and far between, where most scientist are not trying to refute current theories but are instead testing under those theories. A revolution only occurs when in most cases a young bold new scientist is just introduced to the field and notices some anomaly that is not concurrent with the existing paradigm. Poppers idea is quite the contrary, he embraces that many little revolutions occur along the way. To Popper science is always on the verge of a revolution and normal science poses a boring task to scientists, he even goes as far as to say, "the normal scientist has been poorly taught."

To Popper the normal scientist has been taught in a dogmatic fashion, and in his experiment solves puzzles but fails to questions reasons why. What Popper does not take into account is that is very hard for a scientist to work outside of normal science, or outside of a paradigm. It is far easier to have an answer put for, and work toward solving way things act a certain way than it is to come up with experimentation and laws out of no where.

Lets take for example the field of quantum mechanics. Erwin Schrodinger is regarded by many to be the father of quantum mechanics his wave function equation, known as Schrödinger's equation laid the ground work for the field of

quantum mechanics as we know it. Richard Feynman, a Nobel prize winner in physics once said of this equation, “Where did we get it from? It is not possible to derive it from anything you know. It came out of the mind of Schrodinger.” This equation would in the field of quantum mechanics represent a revolution; it started the field and created the first paradigm. Now if we were to assume Popper’s theory was right and that science worked under “extraordinary” conditions following this first insight this field should have been constantly on the verge of another new just as “random” discovery. This is not the case though still to this day this law is as central to quantum mechanics as Newton’s laws are to classical mechanics. While this is still a relatively new field it has been around for approximately 80 years, which is about equal to 1/5 the total, time that modern science has existed. One would have thought that at some point a new revolution would have occurred.

Evolution is another contradiction to Popper’s theory of extraordinary science and in turn of Kuhn’s ideas. Einstein published On The Origin of Species in November of 1859 and since then no one has been able to disprove his ideas. Work has been done on the basis of Darwin’s theory of evolution and once the gene was discovered it only added more proof to the theory. This theory, which has now been around for 150 years, has yet to be invalidated. Not only has there been no “revolution” to overturn this theory scientists would have a hard time imagining a replacement for it. As once was asked in Science and Religion, if not evolution, then what else no one had an answer. Scientists have no been

working to overturn this theory and cause a new revolution, but instead it is normal science that is at work. Evolutionary biologists commit themselves to strengthen this theory. Some even go as far as taking evolution as such fact that they try to apply it to other areas. For example Dawkins has coined the word meme, which what could be called a cultural/idea in the form of a gene. By no means is a scientist's paramount purpose to refute existing theories. It is a Kuhn described in his definition of normal science to work within n existing paradigm until a rare anomaly or young genius comes along and produces a better one.

So is Popper right in his views that revolutions are common and should be the goal of all scientists and in fact that normal science is dangerous. No. The fields of science all work under an overall paradigm that helps them experiment easier and makes it more effective for them to do research. Without normal science and a paradigm science would get nowhere. Pre-paradigm science is based on guess and check, fact gathering, it is very inefficient. Normal science is crucial to the progression of science, as we know it. Every scientist works under a paradigm and by no means is this normal science dangerous.

