

The Nature of Science: Lessons from Pluto

The history of Pluto the planet is not just fascinating, it is also quite useful for understanding how scientific investigation and knowledge proceeds and develops, and in this, provides a valuable lesson in the nature of science.

As we've been learning,

- Science is a system of knowledge about how the world works. It seeks to produce reliable and accurate information about the world.
- Science is empirical. This means it is based on the use of our senses, or the extension of our senses, such as through microscopes or telescopes that magnify our vision of natural objects.
- Science is cumulative. It builds on previous observations, ideas, experiments, and theories.
- Science is limited. It can only investigate objects and events that can be explored empirically and that are part of the natural, physical world. Any event or phenomena outside this realm is beyond the scope of science.
- Science is historical. Science is also limited in that it can only develop hypotheses and explanations based on the facts, evidence and information we have at any given point in time.
- Scientific explanations or theories can and do change. Since facts can and do change and new evidence and information is constantly being discovered (partly due to advances in our instruments of investigation, i.e. technology), our explanations or theories should change to reflect this new information as well.

Indeed, this last point is one of the strengths of science---its ability to accommodate new evidence and information. Such discoveries are constantly challenging scientists to "rethink what they thought they knew," and so, some theories will have to be modified while others may need to be rejected entirely based on new findings of tested hypotheses.

One important thing we need to remember is that science is done by humans. Any time humans are involved, there is room for bias and for error because as we know, humans are fallible. Of course, the scientific method attempts to minimize as much of this human bias as possible, but there is no way for humans to ever be completely objective. That's because what lies behind our eyes very much influences what we see before them. The important thing is to recognize how that affects our understanding and interpretations of scientific data.

We also need to be aware that there are some scientists who use scientific information to make conclusions that support their own personal beliefs or agendas. That is, they interpret scientific data to suit their own ends or cause. This is simply bad science. Doing research on the *researchers*, although time consuming, is in many cases, a very worthwhile endeavor. It can give us some background or biographical information about the individuals who are conducting the research, what institutions they represent, and what the source of their funding for research is. All of these factors can influence the kinds of questions they ask, the hypotheses they propose, and the conclusions they make.

For this part of the assignment, I'd like you to read about the history of Pluto and consider how our understanding of the solar system changed dramatically over the course of the past 3,000 years. Also, pay attention to the defining characteristics of scientific explanations or theories (listed above) and how they play out in the story of Pluto. You'll be answering some questions at the end of the reading.