

How Science Works and How Can Science Most Effectively Inform Policy?

In the ongoing debate about the teaching of evolution, one frequently heard comment was “Evolution is a theory, not a fact.” That is, of course, true. But it is also true for “atomic theory” that tries to explain the basic structure of atoms, with electrons moving about a nucleus made up of protons and neutrons, and even for the theory about how our solar system works, with planets moving in elliptical orbits around the sun.

All science depends on a process of careful observations, of generating hypotheses to explain these observations, of testing these hypotheses in various ways to arrive at “scientific proofs,” and of developing theories based on these “proofs” that try to make sense of and best explain the observations. Theories are constantly being re-tested and refined as a result of new observations and new hypotheses, so that it must be said that attempts by science to understand how the physical, chemical, and biological systems of the world operate are always “works in progress.”

This briefing has been organized for two reasons. The first is to provide a basic review of “how science works,” as there is widespread misunderstanding about this subject (by two thirds of Americans, for example, in a 2001 National Science Foundation survey), and this misunderstanding makes it difficult for people to evaluate and to trust what scientists are saying about the world. This is a dangerous situation, as many issues that now confront us, like global climate change and the threat of an avian flu pandemic, demand a deep level of scientific understanding, particularly among policy-makers, so that wise, informed decisions can be made to prevent, or at least to lessen, their potentially catastrophic impacts.

The second reason is to explore the role of scientists and of scientific advisory bodies such as the Institute of Medicine and the National Research Council in their capacity of informing policy-makers. How does this relationship currently work? How can and should it work best? These are questions of great and ongoing interest to the Congress.

Underlying both of these themes is the level of scientific literacy in the United States, and how the scientific community, the media, and our educational system contribute to this literacy. There is growing concern that science education in all its aspects needs much greater attention and investment.

Readings

1. National Science Foundation 2004 Study of Science and Technology: Public Understanding and Attitudes <http://www.nsf.gov/statistics/seind04/c7/c7h.htm> and <http://www.nsf.gov/statistics/seind04/c7/c7s2.htm#c7s213>
2. “Doing More for Kate”, Thomas Cech and Donald Kennedy, **Science** 2005; 310:1741
3. Institute of Medicine, “Informing the Future: Critical Issues in Health” (3rd edition) 2005.