# The Dismal State of Scientific Literacy

*Studies find only 6% of Americans and 7% of British meet standard for science literacy*

"WELL UNDER HALF of the American public and only one-third of the British know that the earth revolves around the sun once a year," Oxford University professor John Durant reported at the AAAS annual meeting in San Francisco. "Even fewer in Britain have much knowledge of medicine. Most of the people surveyed think that antibiotics kill viruses," he added.

There is more. Jon D. Miller of Northern Illinois University reported that 12% of Americans, asked a survey question about scientific process, correctly recognized that astrology is "not at all scientific." A rapid arithmetical calculation shows that a whopping 88% got it wrong.

About 35% of both Americans and British think that radioactive milk can be made safe by boiling. (It cannot.) But a reassuring 97% of people in both countries know that hot air rises.

For about a decade, Miller has been trying to develop measures of scientific literacy. He calls his survey, which tests an understanding of the process and methods of science, a basic vocabulary, and recognition of the impact of science and technology on society, the best measure so far. But he acknowledges that even better measures need to be developed. Miller's "three-dimensional" survey, developed with funds from the National Science Foundation was used last summer to assess science literacy among more than 2000 adult Americans. A compatible survey was used by Durant and his Oxford colleague, Geoffrey Evans, to get comparable data from 2000 adults in Britain.

The results? Miller reported that only 6% of Americans can be called literate about science. Durant's figure of 7% of adults in Britain is, for all practical purposes, the same. To be sure, some differences did show up. Americans, for example, are more interested in medicine but think they are more informed than the survey data say they are. Furthermore, the data suggest that ideology plays a more important role in one's reaction to certain science issues in America than in Britain.

Durant and Miller fielded two questions designed to test "acceptance of the scientific world-picture." They asked whether people agree or disagree with the proposition that "The universe began with a huge explosion," and that "Human beings as we know them today developed from earlier species of animals." Durant reported that "moderately" more people in Britain accept the Big Bang theory and that at least three-quarters of the British accept evolution. But in America the split is closer to 50–50. "There are almost as many Americans who reject the idea of human evolution as there are who accept it," he told a stunned audience.

(It might be noted that the public is not uniquely ignorant about science. Studies have shown substantial weakness in knowledge of history and geography as well. Miller noted that "Most people can't name the states that border their own.)

In addition to rating public knowledge about and attitudes toward science, the researchers also tried to figure out what makes some people more literate about science than others. Miller examined five variables: gender, age, level of education, science courses in college, and employment in a science-related company. A college-level science course is the "predominant, single most important" predictor of science literacy, Miller reported—more important than a college education in general, and more important than science in high school in his view. Overall, men in Miller's study were more literate about science than women, which he explains by invoking the historical "stereotyping of science as a male realm."

What does one make of it all? No one offered an easy answer. What about the finding that it is science in college that makes the difference? Said Miller, "I take that as a descriptive result, not a prescriptive conclusion." He believes science education has to be beefed up altogether "if the proportion of Americans who are scientifically literate is to increase."

Many policy-makers and virtually all scientists would agree with Miller's view that "There is a growing recognition in the industrialized world that scientific literacy is an important component of long-term economic growth and of effective citizenship." Few would be happy with the central conclusion of his report. "The important point is that in two of the world's oldest and most prominent democracies at least nine out of ten citizens lack the scientific literacy to understand and participate in the formulation of public policy on a very important segment of their national political agendas."

Is Japan any better? According to a paper at the AAAS meeting by Atsushi Naoi of the University of Osaka and Fujio Niwa of the University of Tsukuba, the level of knowledge and support of science among the Japanese public may be lower than in the West. Miller is collaborating with Japanese researchers to find out. Tune in next year.

*Answers*: T,F,T,F,T

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## Are You Scientifically Literate?

One measure of science literacy is factual knowledge. Another is an ability to respond to open-ended questions. Among those posed in Jon Miller's NSF-sponsored study are these:

Electrons are smaller than atoms. **T F**

Lasers work by focusing sound waves. **T F**

The continents on which we live have been moving their location for millions of years and will continue to move in the future. **T F**

The earliest human beings lived at the same time as the dinosaurs. **T F**

The oxygen we breathe comes from plants. **T F**

Explain: DNA

Explain: Radiation

Explain: GNP