When Science and Beliefs Collide

A large and growing share of the population rejects aspects of science

By JANET RALOFF

Raymond Eve first became interested in alternative ways of thinking about science when he read about a Chicago woman who ties knots in her electric cords to reduce her monthly utility bill.

Since then, this social psychologist at the University of Texas at Arlington has collected a series of equally fanciful anecdotes. They include the woman who concluded that NASA faked pictures of the moon landings. Because her television couldn't receive signals transmitted by stations in New York, she reasoned that it certainly hadn't picked up live broadcasts from the moon.

What most scientists fail to realize, observes sociologist Susan Carol Losh of Florida State University in Tallahassee, is how many people seriously misunderstand or consciously reject many of the basic precepts and findings of science. In the United States, she observes, their numbers are large and growing—currently approaching half the population. "Many of these people are likely to be your neighbors," influencing social mores and community policies.

Eve says that although the scientific community has traditionally written most of these people off as "ignorant, stupid, or mentally deranged," his data argue that misconceptions about science often trace to deeply held belief systems through which an individual interprets the world.

Losh sees evidence of this in her ongoing analyses of nearly 40 local religious congregations, roughly half of them spiritual home to Christian fundamentalists. For these fundamentalists, she says, the way to interpret the world "is to quote the appropriate chapter and verse in the Bible," rather than to form hypotheses and test them.

Other types of doctrines also pose a challenge to science, according to a panel of researchers at the American Association for the Advancement of Science (AAAS) annual meeting earlier this year. Some radical feminists, blacks, and others see science as a means by which white men have asserted their dominance in Western society.

Physicist and science historian Gerald Holton of Harvard University is particularly concerned about the school of thought known as postmodernism, among other names. In *Einstein, History and Other Passions: The Rebellion Against Science at the End of the Twentieth Century* (New York: Addison-Wesley), a book published last week, he notes that proponents of postmodernism have described science as a useful myth and argue that the distinction between science and fiction should be abolished.

This attack on the legitimacy of science is not idle rhetoric, he contends. Its adherents "have infiltrated most universities, and in some cases taken them over," he told SCIENCE NEWS. The result is that people who study electrons, gravity, and other invisible entities or forces are dismissed as building careers on "nothing more than socially constructed fictions," Holton explains.

Rejection of scientific truths and logic is also eroding support for the teaching of critical thinking and objective analysis—the bedrock of basic research, maintains philosopher Paul Kurtz of the State University of New York at Buffalo. Unless the problem is addressed quickly, he says, the United States may find itself unable to compete in an ever more complicated and technology-driven global economy.

Such concerns are premature, says political scientist Jon D. Miller, vice president of the Chicago Academy of Sciences.

His new survey data, just unveiled in separate reports issued by the National Science Foundation (see p. 367) and the European Union, indicate that, overall, the U.S. public not only accepts the validity of science but happily supports its inquiries, even those that have no obvious, near-term benefits.

One point on which all of the researchers agree is that scientists need to work at effectively winning over critics who challenge the validity of science.

To probe how beliefs affect attitudes about science, Eve and his coworkers administered a questionnaire to two divergent populations of believers. One consisted of attendees at a creationism fair last summer in Glen Rose, Texas. The second was made up of Wiccans (white witches), pagans, and adherents of other goddess sects who were attending a magical-arts fair outside Austin, Texas.

Eve found that belief in creationism "cuts across social class lines and religious denominations much more than most people think." Indeed, he detected only a small correlation with Christian fundamentalism. What most united the creationists was respect for tradition and authority.

Wiccan-pagans reject Christianity and other mainstream "patriarchal" religions. In Eve's survey, they also tended to reject fundamentalism, while subscribing to postmodernism and an abiding respect for nature. Believing objective reality to be largely "an individual matter," they expressed somewhat more antiscientific attitudes than creationists—for example, holding that astrology accurately predicts personality and behavior.

Moreover, their attitudes cannot be ascribed to ignorance. Many of the Wiccan-pagans that Eve polled were very well educated.

On issues associated with traditional family values and morality, the creationist and Wiccan-pagan groups represented polar extremes. Attitudes toward social issues rooted in biomedical science also divided the two groups. Wiccan-pagans, for example, were far more receptive than creationists to genetic engineering and fetal transplants.

Creationists and Wiccan-pagans came together, though, in their opposition to aspects of modern science. While it's hardly surprising that more than 80 percent of the creationists believe Earth is not at least 4 billion years old, the survey indicated that more than 60 percent of the largely noncreationist Wiccan-pagans shared this view. Roughly one-quarter of both groups

thought science causes spiritual decline, and some 40 percent of each said scientists possess dangerous powers.

Science classes in schools have served as the most important means of imparting a basic understanding of science and technology and the reasoning skills that underpin them. Eve observes that the people he has polled were exposed to such teaching, yet in many cases chose to reject or ignore it. He cites one fundamentalist Christian on his campus, for instance, who correctly answered questions about the human fossil record on an archaeology exam, only to point out at the bottom of the test sheet: "Of course, I don't believe any of this. I believe in the Bible."

Holton, in contrast, blames educators for much of today's antipathy to or misunderstandings about science. To begin with, he says, elementary and high school science teaching tends to intimidate students by making subjects abstract, imposing, and inaccessible. The reason, he says, is that often "teachers themselves are intimidated by the subject" and poorly trained to teach science.

While the situation might be ameliorated somewhat among those who continue their education, he points out that "it's only in about 30 percent of U.S. colleges that you have to take even a single course in science or math." Even Harvard, he notes, will graduate nonscience majors with just one physical and one biological or social science class.

Holton also worries about the insidious creep of postmodernism into science education. He notes, for instance, that a 1992 draft of the new National Science Standards (SN: 2/3/96, p. 72) announced that they would be "based on the postmodernist view"—one that "questions the objectivity of observation and the truth of scientific knowledge." Though the final draft excised these phrases, Holton says it still advocates that science students construct a personal meaning from observations rather than search for universal truths.

Viewed through this interpretive filter, he maintains, "Madame Curie did not discover radium, she 'constructed' it."

Religious beliefs also have served as a potent barrier to the acceptance of more circumscribed areas of science, observes anthropologist Eugenie C. Scott, executive director of the National Center for Science Education in El Cerrito, Calif. This nonprofit clearinghouse is working to keep evolution in public schools and creationism out.

To many fundamentalist Christians, she observes, accepting evolution places an individual on a slippery slope from God's word to sin. "So by fighting evolution, they're saving souls," she says. "We on the proevolution side have a far tougher row to hoe in terms of motivation."

Miller, whose study compares scientific literacy in 15 industrialized nations, argues that creationism "is a peculiarity of the American landscape." His data indicate that U.S. creationists often accept some aspects of science that do not address biological evolution. In fact, he suspects that the adamancy of belief in creationism traces to the litmus test that many U.S. fundamentalist sects use for membership: literal acceptance of the biblical account in Genesis of God's week-long creation of the universe and everything in it some 6,000 to 10,000 years ago.

"Those people who reject evolution tell us at the same time that there are thousands of planets in the universe on which life might have developed—which is not a Genesis point of view," says Miller. "They will also agree with the statement that the continents on which we live have been moving in their locations for millions of years." This popular version of plate tectonics also violates the biblical timetable. The good news, Miller says, is that 80 percent of U.S. adults, including many creationists, believe the benefits of science outweigh its harms.

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While Losh accepts Miller's data, she does not share his generally rosy view of what they imply for scientific literacy and appreciation.

What fundamentalists really like, her results suggest, is not science but the fruits of science, such as vaccines against infectious diseases, cleaner water, and especially technology. Her studies indicate that they don't welcome the untethered inquiry that led to those fruits—and that scares her.

Creationists prefer thinking that is geared toward accepting the word of church-approved authorities without question, Losh finds. This approach to learning may produce good technologists, she argues, "but it doesn't tend to generate good science."

A flurry of recent popular feminist books has interpreted the development of Western science in terms of male chauvinism and aggression against women, notes chemist Noretta Koertge, a historian of science at Indiana University in Bloomington.

At the AAAS meeting, she cited one radical feminist interpretation of why fluid dynamics matured as a research discipline much later than the mechanics of solids. Men were more comfortable working with rigid environments, which reflect their "sex organs that protrude and become rigid," Koertge recounted. In contrast, early scientists associated fluidity with women and their menstrual blood and vaginal secretions. "In the same way that women are erased within masculinist theories and language, existing only as not-men, so fluids had been erased from science, existing only as not-solids," she explained.

Koertge worries that propounding such machismo interpretations of science may lead women to associate any problems they have in understanding physics, for instance, with the philosophy of a textbook writer or theorist. That could prove a major disservice if the real problem were, say, a weak grounding in math. Moreover, she argues, this sort of feminism can alienate women from science by characterizing its logic-based method of inquiry as "incompatible with women's ways of knowing."

The research community needs to recognize that whole segments of society today may be unreceptive to all or parts of science, Eve says. Until scientists understand why, he says, "we won't make much progress gaining political support for science or see much of an improvement in science literacy."

In other words, he argues, "we need to be anthropologists in our own land," exploring believers' cultures from their own points of view.

Many might feel more inclined to accept the explanations offered by science if they felt that doing so wouldn't subsume their religion. The job of the scientific community, then, may be to find ways of showing how science and faith can coexist, says Scott.

It's a topic Cornell University astronomer Carl Sagan tackles in his new book, *The Demon-Haunted World* (New York: Random House). In it, he argues that "science is not only compatible with spirituality, it is a profound source of spirituality."

Science is not religion, however, and scientists need to make it clear that they have never meant science to be portrayed as such, Scott maintains.

Indeed, Eve observes, "Science can't tell you what the meaning of life is, why we're here, or how to handle bereavement or guilt. Those things are for theology." □