Bennett
APS

SCIENCE AND SOCIETY

Sagan Recommends "Baloney Detection Kit"

People's irrational beliefs in things such as demons, alien abduction and astrology pose dangers for themselves and society, astronomer Carl Sagan claimed in his book *The Demon-Haunted World*. People who uncritically believe in such things can waste vast sums of money, and make deadly medical decisions and ill-informed political choices.

Sagan recommended that people use principles of scientific inquiry to develop "baloney detection kits" that would help them examine and evaluate extraordinary claims.

Sagan is a respected astronomer at Cornell University in New York. He has won numerous awards including the highest award given by the U.S. National Academy of Sciences, the Public Welfare Medal.

Science and pseudoscience

Scientific inquiry attempts to explain how things work. Scientists observe natural events and develop theories to explain what is going on. Scientific theories explain how natural processes produce observable results. Scientific theories allow people to make predictions. Those predictions can then be tested with experiments. If the predicted results occur, the theories are considered valid. If the predicted results do not occur, the theories can be altered or even discarded. The reliance on theory, prediction and experimental testing gives the scientific method a built-in error-correcting mechanism. Scientific inquiry has proven to be an effective tool for understanding the universe around us.

Some beliefs are called "pseudoscience" because they seem scientific, but in fact have no basis in science. *Pseudo-* means false. Pseudoscientific beliefs lack science's error-correcting machinery. They are unreliable and can lead people to make irrational decisions.

For example, on the surface astrology resembles astronomy. The two subjects even have common origins. Astrologers claim that they can predict many things about a person based on the positions of stars and planets when the person was born. Astronomy is the study of the universe outside of Earth's atmosphere. Astronomy is scientific and astrology is pseudoscientific.

Astronomical theories can be tested and corrected. Before the 1500s, people thought that the Sun and the planets revolve around Earth. However, this theory failed to accurately predict the observed motion of the planets. In 1543, Polish astronomer Nicolaus Copernicus published his theory that Earth and the other planets actually revolve around the Sun. His theory accurately predicted the planets' movements and thus was held to be correct.

In his book, Sagan outlined how astrology fails crucial scientific tests. For example, different astrologers generate different predictions about the same person. Twins have different personalities and different experiences, even though they were born at the same time and place.

Dangerous gullibility

Sagan contends that people who cannot rationally assess extraordinary claims create a dangerous situation. People spend huge sums of money getting advice from psychics and astrologers. However, there is no reliable evidence that psychics or astrologers can indeed predict the future.

What is even more dangerous is that desperately ill people sometimes spend their last dollars on questionable medical treatments from quacks. Quacks are people who falsely claim to have medical knowledge. In his book Sagan described quacks who claimed they could cure disease and injury by waving magnets over people's bodies.

A quack's treatments are no more likely to provide relief than are dummy treatments. Quackery stands a good chance of causing great physical harm. Sometimes the treatments are harmful. At other times, sick people delay proven treatments in favor of the unproven quackery.

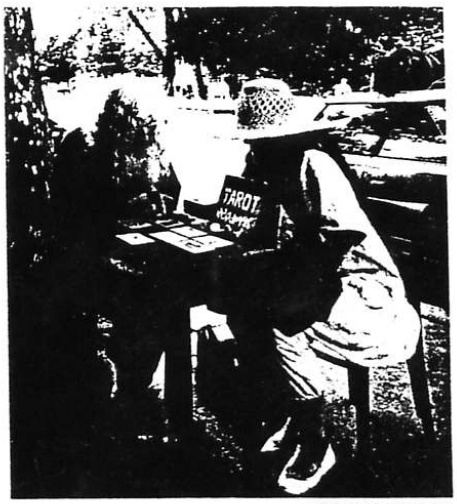
Sagan claimed that people's irrationality also poses a danger to society. When people cannot examine social or political issues rationally and skeptically, they risk making poor voting decisions. Such decisions can effect entire communities or countries.

Baloney detection

Sagan recommended that people develop "baloney detection kits." Such kits would rely on the tools of scientific inquiry.

One such tool is skeptical thinking. A skeptical thinker always wants to confirm the "facts." Skeptics do not blindly accept what everyone says. They investigate matters for themselves and find out the truth. Skeptical thinkers also question authority. Sagan pointed out that "'authorities' have made mistakes in the past." Sagan even cautioned against taking the things he says for granted.

A second baloney-detecting tool based on the scientific method is making sure that ideas can be modified or overturned if new evidence arises. No matter how certain a theory seems, there is always a chance that it is wrong; people make mistakes. Ideas that cannot be corrected if contradictory new evidence arises lack the valuable flexibility of scientific theories. [See story, July 1996, page 256]



Rafael Macia/Photo Researchers

There is no evidence that anyone can predict the future. However, people still spend a lot of money on fortune tellers.

Common mistakes

Sagan further contended that good baloney detectors are aware of common mistakes in logic. One common mistake Sagan detailed is "attacking the arguer and not the argument." An example of this mistake would be dismissing a young person's idea by saying, "Well, you're too young to have figured that out." Instead, Sagan advised people to examine ideas on their own merits.

Another common mistake Sagan mentioned is claiming that something is true simply because it has not been proven false. For example, it would be a mistake to argue, "Scientists have not proven that ghosts do not exist, therefore ghosts must exist."

People often assume that something that happens after something else must have been caused by the earlier event. This is not always true. When two situations seem linked, scientists use experiments to prove or disprove that one causes the other.

For example, Sagan described in his book how researchers showed that smoking causes cancer. Researchers first noticed that lung cancer seemed to afflict smokers more than it did nonsmokers. However, this did not prove that the cancer was caused by smoking. The causal link was secured in the early 1950s when researchers experimented on rats. Scientists shaved rats and painted tar from cigarettes on their skin. The rats developed cancer.

Examine scientifically

Although Sagan recommended skepticism, he also warned against dismissing outlandish ideas without examining them carefully. Many ideas that are now widely accepted seemed fantastic and improbable at first.

When the theory of "continental drift" was first suggested, people laughed at the idea that land masses could move about on the surface of the planet. Subsequently, however, a whole branch of geology known as plate tectonics was developed to explain that continents do move. [See story, June 1995, page 234] Similarly, before microscopes revealed bacteria and viruses, surgeons scoffed at the idea that they should wash their hands before operating on patients!

Sagan concluded that people with both an openness to new ideas and a well-developed sense of skepticism are the ones best equipped to protect themselves and their community. ✳

FURTHER READING:

"The X-File Factor." Wayne R. Anderson. *New York Times*, August 29, 1996, page A25.

"Equal Time for Nonsense." Lawrence Krauss. *New York Times*, July 29, 1996, page A19.

"Is There Anything to It? Evidence, Please." Sharon Begley. *Newsweek*, July 8, 1996, page 54

"A Battle Cry for Reason and Rationality." James Randi. *Skeptical Inquirer*, July/August 1996, page 46.

The Demon-Haunted World. Carl Sagan. Random House, Inc., 1995.

KEYWORDS To find related information in other publications and electronic databases, search for these terms: *pseudoscience, antiscience, crop circles* and *hoax, astrology* and *astronomy, alien abduction* and *hypnosis, Carl Sagan, CSICOP, Committee for the Scientific Investigation of Claims of the Paranormal, James Randi, the Amazing Randi.*

“Baloney Detection Kit”
Questions

- What is “pseudoscience”? How does true science differ from “pseudoscience”?

- Explain two ways that astrology fails scientific tests.

- Explain two ways that a person could be harmed by not questioning extraordinary claims.

- What two tools does the author recommend for a “baloney detection kit”? Why?

- Should ideas that seem outlandish always be dismissed? Why or why not? Give an example.