eight forces, but he concedes that some, such as the Cocos, Nazca, and the Pacific plates, are rather similar. They vary widely in size but little in velocity. Attempts have been made by several groups to get around this problem, with little success so far, by also employing shapes and velocities inferred from the geologic record of plates believed to have existed in the past.

A number of present-day plates have been cited as behaving contrary to the general predictions of the plate models, but the increasingly detailed picture of observed plate movements is making this

Speaking of Science

The Media: The Image of the Scientist Is Bad

Science and scientists, many observers argue, have been taking a beating in the media. The press, the movies, and, especially, television convey the image that scientific progress is hazardous and that scientists are frequently foolish, inept, or even villainous. This portrayal, critics contend, is eroding public support for science and may be turning away many potential Einsteins, Paulings, and Pasteurs before they mature enough to appreciate the joys and wonder of science. This concern has been the focus of several magazine articles and a symposium at the recent annual AAAS meeting. Some examples:

Science gets "a lousy press," science fiction author and *Analog* editor Ben Bova told the AAAS symposium. "A Russian satellite falls on Canada and scientists get clobbered." The movies are even worse, he adds; in them, "scientists are portrayed as having moral sensitivities no higher than a Hollywood producer's."

Many of the scientists portrayed in Saturday morning cartoon shows, Carl Sagan wrote in a recent issue of *TV Guide*, are "moral cripples driven by a lust for power or gifted with a spectacular insensitivity for the feelings of others—and the message conveyed to the moppet audience is that science is dangerous."

The reasons for this portrayal are many. One of the most important, Bova says, is that "people fear science because it makes changes." While the law, education, and other fields of endeavor look backward for precedents and justification, science looks to the future and tries to establish new precedents. That change, he argues, is frightening. The misperception conveyed by the media is possible, he adds, because most Americans have never met a scientist. "The closest they ever come is a high school science teacher, and maybe that's why scientists have such a bad image."

Equally important is the nature of the media and the people who work in it. Science fiction—the predominant form in which science is displayed in movies and television—is primarily a drama of ideas, television script editor and science fiction author David Gerrold told the AAAS meeting, and "Ideas, in and of themselves, do not photograph well." Most science fiction stories in movies and on television thus are westerns, soap operas, and other conventional plot forms to which science fiction trappings have been added almost as an afterthought. Scriptwriters, furthermore, seem to have a uniform lack of scientific background. "The primary qualification for success as a television scriptwriter," he says, "is the ability to turn out 56 pages of typewritten dialogue in 10 days." Producers and directors also "suffer from an impoverished world view; they do not even have an idea of Newton's three laws of motion," which is why we have such spectacular—albeit nonsensical—dogfights in space in the movie *Star Wars*. It is thus not suprising that there are so many inaccuracies and errors in science fiction dramas, errors that give the lay public a warped sense of science.

Gerrold cited one science fiction script submitted to him (and mercifully rejected) which "began by telling us that all life on earth was in dire peril because there was about to be an eclipse of the galaxy. . . ." An infamous example cited frequently is the use of "parsecs" as a unit of speed in *Star Wars*. Isaac Asimov cataloged other blunders in another recent article in *TV Guide*. One example from the Saturday morning series *Space Academy* had two space ships passing through a black hole and later returning. Similar situations have occured in the British import *Space 1999* and the new series *Quark*. It would seem, Asimov says, "that the hard-working, but uneducated, people behind the shows think that a black hole is a gap among the stars, or perhaps a space whirlpool, through which one can scoot and return."

Scientific advisers are rarely used on such shows, Gerrold says, perhaps because the creators themselves share the attitudes being purveyed. Scientists are also frequently unable to adapt to the needs of the shows. Gerrold cited the live-action series *Land of the Lost*, in which a father, son, and daughter on a camping trip are swept into a prehistoric land populated by dinosaurs and cavemen. An anthropologist was called in to create a realistic language for the cavemen. The anthropologist decided that the new "Pakuni" language, for scientific reasons, should have no "l" or "h" sounds. Unfortunately, Gerrold says, the lead characters in the series were named Will, Holly, and Marshall. The cavemen's dialogue, furthermore, translated into long speeches that were virtually unpronounceable by the actors. The anthropologist refused to modify the language, Gerrold says, and the eventual result was that the cavemen's speeches deteriorated into an inarticulate series of grunts.

What can be done to improve the situation? The most likely solution, both the panel and the audience at the AAAS symposium agreed, appears to be for individuals and organizations such as AAAS to protest to movie studios and networks when inaccuracies appear and when scientists are portrayed in a denigrating fashion. "When people tell a network, 'This is wrong,' " Gerrold says, "they appoint a vice-president to listen to you. They don't want anybody to make waves. All they want is to see the money keep rolling in."

This technique has been used successfully by minority organizations of blacks, chicanos, women, and gays—to the point where scripts portraying members of such minorities are submitted to the groups to ensure that they do not present stereotypes. Scientists are more of a minority than any of these groups, Gerrold adds, and with enough pressure, could create a similar situation for themselves.

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