### SCIENCE:

### Attitudes and misconceptions

by Dan Falk

#### Science-Phobia

Science and technology play a more important role in our lives today than ever before, and they will be critical in shaping the future of our society. Yet while few would argue with this, we still find that a significant portion of the population is scientifically illiterate. Many people — even university graduates — cannot do high-school level math problems, and lack even a basic understanding of concepts such as nuclear energy or the greenhouse effect.

We hear a lot about the underfunding of science programs at all levels in our education system, but the problem goes deeper than that. For many people, science is something to avoid, even to fear.

Dalhousie's Dean of Science, Dr. Donald Betts, agreed that the problem is both serious and widespread. "There's a lack of appreciation of science, a lack of understanding, among the general public," he says. How do people develop this sciencephobia, and what can be done about it?

#### Science Education

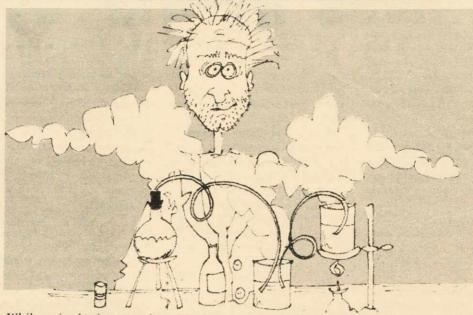
It is tempting to point to the school system, since a child's interest (of lack of interest) in science takes root at an early age. Are the science teachers in our schools qualified to be teaching their subject matter? At the elementary level, most teachers have no science background. In Halifax, for example, only two out of the city's 400 elementary school teachers have had formal training in science beyond high school. At the junior high level, 50 per cent of those teaching science courses have an undergraduate science degree, but the figure is much lower for other parts of the province.

# "... science is something to avoid, even to fear."

Eleanor Nicoll, Science and Technology Supervisor for the Halifax City School Board, agreed that underqualified teachers are a cause for concern. "In elementary schools, it results in a lack of confidence in their own ability to teach science. Many of them are frightened of it." She adds that most elementary school teachers are women, who in general have had less training in science than men.

Nicoll also points out the extreme demands placed on teachers: "Science teachers at the junior high level are required to know every branch of science. They must have a knowledge of everything from astronomy to physics, chemistry, and biology." So even teachers who have a degree in one of the sciences may find it difficult to teach material from other areas.

However, poorly qualified teachers are not the whole problem. "I think it's an oversimplification to suggest that a lack of good science education on the part of the teachers is what prevents youngsters from going into science," says Nicoll. One of the most important factors in motivating young people to study science, she says, is whether teachers display enthusiasm for the subject. It is also important for teachers to present science not just as a body of facts, but as an exciting, creative endeavour.



While trained science teachers may have the necessary material, says Nicoll, they may lack knowledge of the processes of science or problem-solving procedures.

Even with science teachers trying to present material in ways that will spark students' imaginations, there is a long way to go. In the US, a National Assessment of Educational Progress report found that by the tenth grade, four out of five high school students show no interest in studying science.

Female students, in particular, are not given encouragement. The statistics showing the under-representation of women in certain branches of science are staggering. In high school science classes (particularly math, physics, and chemistry), female students are a minority. In Canada, men and women attend university in about equal numbers, but men outnumber women almost three to one in mathematics and the physical sciences.

Those students (male or female) who do choose science tend towards the social and life sciences; the physical sciences attract far fewer. In Canadian universities, almost one third of undergraduates are enrolled in the social sciences, while only one in fifteen studies the physical sciences or mathematics. The number in engineering and the applied sciences is somewhat higher.

The disparity may stem from the belief that subjects like physics and chemistry are inherently harder than biology or psychology. The physical sciences do rely heavily on mathematics, but better preparation in high school could certainly take some of the "scare factor" out of these subjects.

To a certain extent, this situation is self-perpetuating. The most popular first-year courses attract so many students that the courses have to be taught at a less challenging level than would be possible if the classes were smaller. For example, the exams for Biology 1000 must necessarily be graded by computer — hence, multiple-choice questions. For this reason, labels of "easy" or "hard" associated with a particular subject may be difficult to alter.

### The Communication Gap

It could be argued that there is a gap in our society — a split between scientists and non-scientists. Many scientists discuss their research only with other scientists. Most people, even those who would like to keep informed of scientific advances, have little to go on, perhaps only a quick inter-

view with a scientist on *The Journal* after some major breakthrough is made. The result is an underinformed, or even misinformed, public.

Dr. Betts is working with several groups trying to close the gap. The Atlantic Provinces Inter-University Committee on the Sciences (APICS) and the Royal Society of Canada are promoting programs designed to increase public awareness of science. Dr. Betts says many bright science students are drawn to medicine or other areas seen as having more to offer in terms of money and prestige.

One potential barrier between scientists and the public is the jargon scientists use when discussing their research. Dr. Peter Mulhern, a research associate in the Physics Department, says the use of technical terms necessary for productive science may be a turn-off to many. He says while doctors and lawyers have their own jargon, the average person has at least some motivation to try to understand them, since most people will deal with these professionals at some time. Scientists, on the other hand, can be avoided, and so the public is less willing to learn the meanings of their terms.

Dr. John Farley, a biology professor at Dalhousie, agrees that the communication gap is not unique to science. "Experts in any field — law, medicine, business — rarely talk to specialists in other fields." He says many Canadians are not aware of the history of science in their country. The US and Europe have more "science heroes" in their history books.

The mistrust some people have for science and scientists is not new. Sean Punch, a fourth-year physics student, says people have always had a certain amount of distrust for those who claim to understand things the average person does not.

## scientists portrayed as losers or madmen

"The people we call scientists today can be traced back to the alchemists of the middle ages, and before that to ancient wizards and sorcerers." While modern science has evolved considerably, Punch says people are still carrying a "left-over fear" of scient-

ists. He says people will naturally be hesitant to finance (through their taxes) scientific projects they don't understand. "People don't always see the connection between the scientific advances they make use of in their daily lives and the research that took place five or ten yeaars ago that made those advances possible."

### Science and the Media

Does science have an image problem? Most scientists agree the problem at least exists, though they hold a range of opinions as to its severity. Undoubtedly the public perception of what scientists do and what sort of people they are has been strongly influenced by the media.

### "Does science have an image problem?"

Many of us hear only bad things about science — chemical spills, additives in food, toxic wastes. While these are legitimate concerns, one wonders why the positive side of science doesn't get much media coverage. As things stand, we can hardly be surprised to see people, even young children, hostile toward science.

"News editors and producers deliver what they think the public wants," says Dr. Robert Fournier, Associate Vice-President (research) of Dalhousie. "As long as people don't complain, the cycle continues." Dr. Fournier, who is also an oceanography professor, has worked extensively with the media, including the CBC. He also stresses the importance of science for Canadians as we move from a reseource-based economy to one that depends critically upon the sciece and technology of the "information age".

Robin Hicks, a fourth-year chemistry student, points to the coverage of recent PCB spills as an example of the public being misled by the media. After seeing the fire on TV, and hearing phrases like "cloud of toxic gas", people aren't sure if they can believe scientists who say the danger is not as great as initially reported, says Hicks. He added that, when properly handled, PCBs are safer than many common substances that receive no media attention.

Another problem is the portrayal of scientists in movies and on television.

Hollywood has been particularly unkind. Most movies, of course, do not have any scientists in them (we all know what boring people scientists are!) and, when scientists are portrayed, it is often as the eccentric outcast (the "mad scientist") or the lonely computer geek. It's almost always a man. For nearly thirty years, James Bond movies have been teaching us that scientific genius goes hand in hand with a desire for world domination. Even Back to the Future's inventor-scientist, one of the good guys, is played as an eccentric, the stereotypical mad scientist. E.T., the biggest movie ever, is also one of the biggest offenders. Here, there is no doubt who the bad guys are - it's those nasty government scientists who want to cut up our extraterrestrial hero to see what makes him tick. Some movies, like Revenge of the Nerds and its spin-offs, are at least wellintentioned; they try to dispel the belief continued on page 10

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