

# mind•full: a brainsnack for future leaders with ethical appetites

Volume 1 • Number Four • September 1996 • Student Pugwash USA

## the public's role in science

Decisions about the future of science and technology are made everyday. In our modern society, people are confronted with changes in their lives brought about by new scientific and technological innovations. Technology provides a potential for economic wealth and influences our living conditions in other ways, such as the quality of the water we drink, the air we breathe, and the health care we receive.

Billions of dollars fund scientific research, either by taxpayers through federal or state governments or by private foundations and corporations. Current research projects include curing cancer, designing new weapons, and studying the far reaches of outer space.

For many adults, science education consists of stories on the evening news. The public frequently learns of specific research projects when breakthroughs are announced in that field of study, as was the case with the possible discovery of ancient life on Mars, identification of an "obesity gene," and chemically induced thinning of the ozone layer.

Science touches everyone's life, from vaccinating children to heating people's houses or ensuring the safety of food and drinking water. Many believe that citizens should be partners with scientists and government leaders in making decisions about the future of research. Others believe that science and technology issues are too complex and that those making the decisions should be experts in the field. If the public is to be included, mechanisms must be established to engage and educate people on issues of science and technology.

The mission of Student Pugwash USA is to promote the socially responsible application of science and technology in the 21st century. As a student organization, Student Pugwash USA encourages young people to examine the ethical, social, and global implications of science and technology, and to make these concerns a guiding focus of their academic and professional endeavors.

The **mind•full** series encourages readers to explore crucial ethical dilemmas associated with the application of science and technology.

STUDENT



PUGWASH

U S A

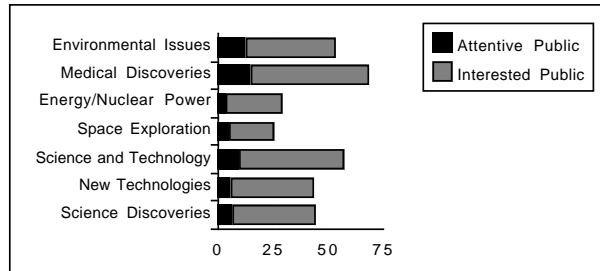
# go figure!

It is difficult to measure public participation in scientific decision making, partly because of the diversity of issues and forms of involvement. The National Science Foundation's biennial compilation of indicators regarding science and engineering tracks the public's attention to scientific issues and policy. The majority of people who are interested in the areas of scientific and technological research are well-educated. Compared to government and other institutions, the scientific community is held in relatively high esteem. This approval rating is significantly higher than that of industry, which funds most of the scientific research and development.

Less than High School	5%
High School Graduate	8%
Baccalaureate	18%
Graduate/Professional	27%

## percentage of people attentive to science/technology policy, by education level

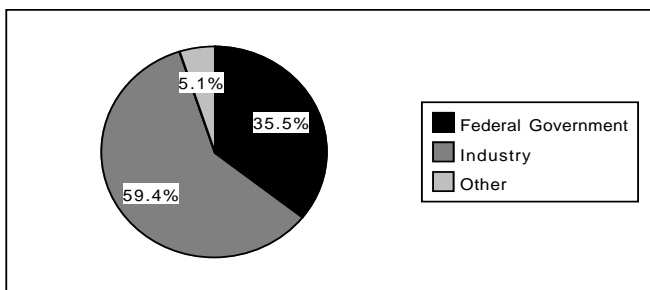
## percentage of public attentive to or interested in select science issues



	Attentive Public	Interested Public
Science Discoveries	7	37
New Technologies	6	37
Science and Technology	10	47
Space Exploration	5	20
Energy/Nuclear Power	4	25
Medical Discoveries	15	53
Environmental Issues	13	40

**1995**

## national expenditures for research & development, by funder



	(millions of current dollars)
Federal Government	60,700
Industry	101,650
Other	8,650

## "why would he have a science degree?"

This question was recently asked of us by a congressional staff member when we called congressional offices to find statistics on how many members of the US House of Representatives Committee on Science and the US Senate Committee on Commerce, Science, and Transportation actually have science degrees. These committees have jurisdiction over a number of matters and subjects that affect scientific research and development. Out of the 49 members of the House that were appointed to the Committee on Science, 13 of those representatives hold science degrees. Only 3 of 21 members (or 14.3%) of the Senate Committee on Commerce, Science and Transportation have science-related degrees.

# in control or out of it ?

There are a number of ways people can control the direction of scientific research, whether acting as individuals or as members of groups. In their efforts to influence policy, people gain knowledge of complex issue areas. These informal learning opportunities supplement formal education in the sciences, which is increasing as schools require that more science and math courses are taken.

Three roles individuals can play are: consumer, citizen, and lobbyist. If consumers dislike the policies of an industry, they can refuse to buy their products. Through sheer numbers, this reactive position can be influential. In a democracy, members of the public vote to elect politicians to represent their views in the legislature. If they disagree with the policies of one party, they can change their allegiance. Lobbying and educating political leaders through direct dialogue can sometimes be very effective, particularly with local issues.

As a community, people can work together to influence science and technology policy by surveying neighbors' opinions, acquiring information, holding workshops and attending public hearings. Surveys conducted on various topics allow the public to convey to policy makers that which they find acceptable. In order to participate in decision making, people require access to information, as scientific issues are usually complex and data can be easily misinterpreted. To better understand the issues that directly effect them, local communities may invite scientists to attend workshops as a way of educating their neighborhood. These workshops tend to be most effective around a single issue, such as nuclear waste. When projects have significant environmental impacts, governments may hold public inquiries or hearings to allow local communities and groups to present evidence for or against the sites.

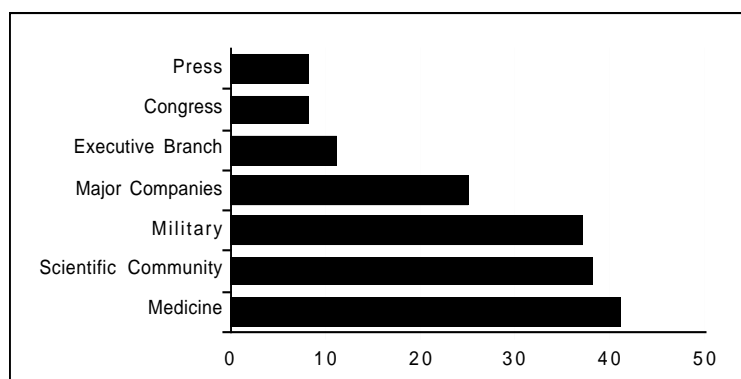
## geek speak

**attentive public**—individual[s] must indicate that they are "very interested" in that issue area, report that they are "very well informed" about it, and be a regular reader of a daily newspaper or relevant national magazines.

**interested public**—citizens who report that they are "very interested" in an issue area, but who do not think they are very well informed about it.

All definitions taken from National Science Board, Science & Engineering Indicators—1996. Washington, DC: US Government Printing Office, 1996. (NSB 96-21)

## public confidence in people running various institutions, 1994



Medicine	41%
Scientific Community	38%
Military	37%
Major Companies	25%
Executive Branch	11%
Congress	8%
Press	8%

**Source** for charts and tables on pages 2 and 3: National Science Board, Science & Engineering Indicators—1996. Washington, DC: US Government Printing Office, 1996. (NSB 96-21)

## nsf

The National Science Foundation (NSF) was established in 1950 by an act of Congress to "promote and advance scientific and engineering progress in the United States." In order to fulfill its mission, the NSF awards grants-in-aid to scientific research, education, and other activities that support the goals of the agency. In addition, the NSF produces resources that address issues of science and technology, science education in schools, and scientific literacy among US citizens.

Although the NSF distributes funds to researchers around the country, the agency has strict requirements on how its money can be spent. The NSF receives its policy instructions and guideline requirements through laws crafted by members of Congress and the executive branch who are concerned about various scientific issues, the scope of research designs, and the direction of future experimentation. Thus, the citizens may find their views represented if their legislators express public opinions in the legislation.

The NSF guidelines for research projects include a number of precautionary measures to ensure that the "mad scientists" are kept in check. For example, there are limitations on the use of recombinant DNA techniques; the use of animals in experiments; the use of human research subjects; and the environmental affects, i.e. adhering to the clean air and clean water laws and conducting environmental impact studies. In addition, there are regulations governing the use of contractors, patent and copyright agreements, and equal opportunity employment.

**Source:** NSF 95-26, Grant policy Manual, Washington, DC: Government Printing Office, 1995.

Science shops—Dutch universities have established over 50 public 'science shops' that conduct, coordinate, and summarize research on social and technological issues. Research is conducted in response to specific questions and concerns posed by community and public interest organizations, local government offices, and individuals. Staff members at each shop screen questions and refer challenging problems to faculty members and students. An average shop provides answers to several thousand inquiries each year. For a question to be accepted, the inquiring group must show that it lacks the resources to pay for research, is not commercially motivated, and will be able to use the results productively. The close collaboration between the Dutch communities and universities has been suggested as a model for the US. The Loka Institute, a public affairs research and advocacy group, is promoting this effort.

## globally speaking

Consensus conferences—Governments, private trusts, companies, and other organizations or institutions invite members of the public to attend a conference on various science and technology issues. Citizen participants receive background documents and then meet with experts in intensive sessions to ask specific questions during the two-day to three-week long conference. At the end of these sessions, the assembly must try to obtain consensus on a policy document for the group sponsoring the conference. These consensus conferences have been used for twenty years by the National Institutes Of Health (NIH) in the US.

### Countries involved with Consensus Conferences (as of 1994)

United Kingdom	New Zealand	Sweden
Denmark	Austria	Norway
Netherlands	Switzerland	Canada
United States	Australia	Germany

**Source:** Simon Joss & John Durant (editors). 1995. "Public Participation in Science: the Role of Consensus Conferences in Europe". Science Museum Press (UK).

# (anything but a) conclusion

The spread of technology, the desire for consultation on science policy by the public, and current scientific literacy levels highlight some of the issues raised by public involvement in scientific decision making. Methods to deal with interactions between the government, scientific community, corporations, and the public will need to be enhanced or formulated in order for individuals to be involved in the decision making process. Educating citizens so that they can take a more active role in this arena will have consequences, both economically and to the culture of science. Who do you think should shape the future of science and technology?

## How do **you** answer the **tough questions**



In the US, citizens elect local, state, and national representatives to make decisions for them. Do you believe that a citizen bears further responsibilities for scientific decision making? If a citizen's duty is only to elect appropriate officials, do you think the citizenry is lax in allowing the major science committees in Congress to be comprised of a majority of people without scientific backgrounds?

What is stopping the public from being more involved in scientific decision making? Do you think it is based on a lack of knowledge, apathy, or an ineffective mechanism for being heard? Who bears responsibility for addressing these stumbling blocks? If the public has the opportunity to get involved and doesn't, does this mean the decision makers have the right to do whatever they want?

In your opinion, what responsibility does the media bear in presenting scientific information to the public? Should media outlets allow only trained scientists to write about scientific information? Should editors have scientific backgrounds?



Scientific research often takes decades to translate into proven technologies that affect people's daily lives. Is the public to be trusted to keep the long term vision in mind while voting on research priorities? If the public votes to fund a cure for the common cold rather than advancing gene therapies that might some day save millions of lives, is this acceptable to you? What if this research was done at the expense of studying alternative energy sources? Are you willing to accept the results of public participation in scientific decision making?

If you believe the public should be involved in scientific decision making, should any special protections be established to protect the minority or to ensure participation of diverse segments of society? The Human Genome Diversity Project is seeking to map the genome of many minority groups. Some groups strongly object to being involved in the study. In another example, the international scientific community has expressed strong interest in examining bones from the Australian Aborigines, but the tribes want the bones returned. Who should decide the direction of this research?



As advances in science accelerate and become more commonplace, do you believe that we are in danger of creating a new class of disenfranchised people who have no say in determining their future?

**up front on screen**

- *Doomwatch*—a British television series from the 1970s available on video.
- *The Island of Dr. Moreau*, the movie, starring Marlon Brando—a scientist decides to leave modern society because of the restrictions placed on his genetic research by the public.
- *The Gods Must Be Crazy*, the movie—an African tribesman discovers a coke bottle that falls from the sky and takes it back to his tribe, resulting in a major debate on the consequences of this western technology.
- 1984, George Orwell—available in movie and book formats. One man tries to become an individual in a society controlled by science & technology. New York: Penguin (Signet Classics), 1992.
- *Xenocide*, 1991. Orson Scott Card—does society ever have a right to determine the fate of a whole species? New York: Tor Books, 1991.

**in depth**

- *Scientific American*—one of the most readable and popular science magazines in the world. Available at <http://www.sciam.com/WEB/> or Scientific American Inc. 415 Madison Ave, New York, NY 1001-1111.
- *The Economist*—though more a world affairs magazine, the economist has good articles on government science policy and research. Available at <http://www.economist.com> or *The Economist*, 111 West 57 St, New York, NY 10019
- *Public Participation in Science: the Role of Consensus Conferences in Europe*, Simon Joss and John Durant (editors)—cool! London (UK): Science Museum Press, 1995.
- *The Social Shaping of Technology: How the Refrigerator Got Its Hum*, Donald MacKenzie and Judy Wajcman (editors)—the relationship between technology and society clearly explained. Washington, DC: Open University Press, 1985.
- *Democracy and Technology*, Richard E. Sclove—a debate on the usefulness of technology in a democracy. New York: The Guilford Press, 1995.
- *Guide to the Culture of Science, Technology, and Medicine*, P.T. Durbin (editor)—a good introduction to the culture of science. New York, NY: Free Press, 1980.
- *Handbook of Science and Technology Studies*, Sheila Jasanoff, Gerald Markle, and James Peterson (editors)—your standard undergrad textbook. Thousand Oaks, CA: Sage, 1994.
- *The Golem: What Everyone Should Know about Science*, Trevor Pinch and Harry Collins—brings up interesting questions on how educated people should be. New York, NY: Cambridge University Press, 1993.
- *Cancer Wars: How Politics Shapes What We Know and Don't Know about Cancer*, Robert Procter—a gripping discussion of the priorities and conflicts involved in cancer research. New York, NY: Basic Books, 1995.
- *An Introduction to the History and Social Studies of Science*, J.S. Schuster—well-written introduction to the topic. STS Program, University of Wollongong, Australia, 1995.
- *Society and Technological Change*, Rudi Volti—how do people cope with change? This book looks at some examples. New York, NY: St. Martins, 1992.
- *The Third Chimpanzee: The Evolution & Future of the Human Animal*, Jared M. Diamond—an excellent book describing how humans have adapted to change through history. New York, NY: Harper & Row, 1992.

**check it out !**

# cyberspace

**top picks**

- One World (non-profit organizations linked together to provide a detailed resource)—<http://www.one-world.com>
- Loka Institute (a non-profit group planning science shops in the US)—<http://www.amherst.edu/~loka/home.html>
- American Association for the Advancement of Science (check out the Scientific Freedom, Responsibility and Law Program and *Science* magazine)—<http://sci.aaas.org/>

**Listserves**

News@OSTP.pop.gov provides information on science & technology policy from the government.

**weave the web!****best of the rest**

- Student Pugwash USA (our personal favorite!)—<http://www.spusa.org/>
- New Scientist (one of the best-designed web sites around)—<http://www.newscientist.com/>
- Library of Congress—<http://lcweb.loc.gov>
- Feds World (links to all federal government sites)—<http://www.fedworld.gov>
- The White House—<http://www.whitehouse.gov>
- EU Information Society Project Office (info on science & technology policy)—<http://www.ispo.cec.be/>
- Ethics Site Index—<http://condor.depaul.edu/ethics/contents.html>
- The Dartmouth Ethics Institute—<http://www.dartmouth.edu/artsci/ethics-inst/>
- Ethics in Science—<http://www.chem.vt.edu/ethics/ethics.html>
- National Academy of Sciences—<http://www.nas.edu>
- National Science Foundation—<http://www.nsf.gov>
- Department of Energy—<http://www.doe.gov>
- National Institutes of Health—<http://www.nih.gov>
- Office of Science and Technology Policy (they advise the President)—[http://www.whitehouse.gov/WH/EOP/OTIP/html/OSTP\\_Home.html](http://www.whitehouse.gov/WH/EOP/OTIP/html/OSTP_Home.html)
- National Association for Science, Technology, and Society—<http://www2.nas.edu/cuselib/25d6.html>
- Center for Science in the Public Interest—<http://www.cspinet.org>
- Federation of American Scientists—<http://www.fas.org>
- Union of Concerned Scientists (yes, concerned scientists do exist)—<http://www.ucsusa.org>

## board of directors

Constance Pechura, Chair  
Edward Bales  
Michael Berger  
Richard Bryant  
Anne Cahn  
Peter Carpenter  
Rebecca Derrig-Green  
Mohamed El-Ashry  
Paul Jellinek  
Alan McGowan  
Ann Moore  
Bob Murching  
Indira Nair  
Dann Sklarew  
Anna Yusim

## board of advisors

Sissela Bok  
Honorable George Brown  
Audna England  
Richard Graham  
Hal Harvey  
John Holdren  
Walter Kohn  
Sally Lilienthal  
Shirley Malcom  
Richard Nelson  
Victor Rabinowitch  
Robert Rosensweig  
Frank von Hippel  
Victor Weisskopf  
Herbert York

## but wait, there's more!

- **mind•full: a brainsnack for future leaders with ethical appetites.** International weapons trade, emerging infectious diseases, and access and the Internet issues available upon request. Upcoming issues in fall 1996 will address: the future of nuclear weapons, water quality and availability, and alternative energy sources.
- **Jobs You Can Live With: Working at the Crossroads of Science, Technology, and Society.** The fifth edition of the Student Pugwash USA internship directory. It highlights organizations that work to promote the ethical use of science and technology and provides suggestions on how to go about the internship and job search (available fall 1996).
- **The Global Issues Guidebook.** A student-authored discussion and classroom resource on science, technology, and society issues.
- **Pugwatch.** The chapter newsletter.
- **Chapter Organizing Guide.** Provides chapter members with an A to Z guide to getting a campus-based chapter up and running.
- **Tough Questions.** Student Pugwash USA's newsletter.

## supporters

Apple Computer, Inc.  
Carpenter Family Trust  
Ciba Educational Foundation  
Ciba Limited  
Department of Energy (US)  
Cyrus Eaton Foundation  
W. Alton Jones Foundation  
Henry P. Kendall Foundation  
Jeffrey Leifer (founder)  
John D. and Catherine T.  
MacArthur Foundation  
Stewart R. Mott Charitable Trust  
National Science Foundation  
New-Land Foundation  
Ploughshares Fund  
Rockefeller Family Associates  
Samuel Rubin Foundation  
United States Institute of Peace  
University of Wisconsin  
World Bank  
Individual Contributors

STUDENT



PUGWASH  
U S A

**student pugwash usa**  
**815 15th street, nw, suite 814**  
**washington, dc, 20005 usa**

**address correction requested**

## how to find us

telephone: 202-393-6555 or 1-800-wow-a-pug • fax: 202-393-6550  
e-mail: [spusa@spusa.org](mailto:spusa@spusa.org) • Web: <http://www.spusa.org/pugwash/>