

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

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## science, ethics, & education

Scientific discoveries always have played an important role in our lives. With today's advances, awareness of how much science affects our world is increasing. To explore these concerns and the role of the individual scientist, new areas of academic study have emerged. Science and ethics programs and courses have become commonplace on today's campuses. And the field of science, technology, and society (STS), which explores the role science and technology play in shaping society, has expanded worldwide.

In the past, younger scientists learned about ethics and social responsibility through informal means—primarily by observing the actions of experienced scientists in their fields. Today, while that tradition still is seen as critical, many feel that formal education is instrumental in training scientists to act in socially responsible ways. However, some question the effectiveness of teaching ethics to scientists because too often it may be taught in a biased way. Other critics see science as "pure" and believe that social and ethical considerations belong in the realm of social science and not in the laboratory.

Whether or not these topics are taught in schools, many think that they should be addressed in the professional world through mentoring, professional codes of conduct, and pledges, such as the Hippocratic Oath. These pledges and oaths vary widely from profession to profession. Some have specific guidelines and others are more open to broader interpretation. There also have been many attempts at setting national and international standards for ethics in the scientific profession. However, a lack of consensus on how ethics should be practiced complicates the universal endorsement of these codes. Continued scientific and technological advances in the 21st century promise to bolster these debates further.

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.

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## go figure!

Over recent years, the membership and reach of professional societies promoting social responsibility and ethics have increased. Even the number of people signing physician codes and oaths has dramatically increased over this century. According to one study on allopathic and osteopathic schools of medicine in the US and Canada, graduates of 98 percent of the 150 responding schools took an oath in 1993. While no one can say for certain the impact such pledges may have in practice, this trend is increasing throughout the science and engineering professions.

An annual survey of people's opinions on honesty and ethics among the professions is conducted by the Gallup Organization. According to Gallup, science and engineering professionals, such as pharmacists and medical doctors, have been considered some of the most honest and ethical professions since the poll's inception in 1976. Some say that these high ratings oblige people in these professions to act accordingly.

**... but is  
it an  
honorable  
profession?**

### scientific societies and professional codes of conduct and ethics

	Number of Members	Professional Code of Conduct/Ethics
American Chemical Society	151,000	yes
American Physical Society	40,000	yes
Association for Computing Machinery	80,000	yes
The Institute of Electrical and Electronics Engineers	320,000	yes
National Society of Professional Engineers	60,000	yes

**Source:** Sandra J. Ionno and Constance Lassiter, "Overview and Examples of Professional Codes of Ethics," paper presented at the Pugwash Workshop on Science and Ethics, Debrecen, Hungary, February 7-8, 1998. Found at [www.spusa.org/pugwash/](http://www.spusa.org/pugwash/).

### honesty and ethical standards poll, 1990-1997 (percentage of respondents who considered occupation as highly or very highly honest and ethical)

	1990	1991	1992	1993	1994	1995	1996	1997
1. Pharmacists	62	60	66	65	62	66	64	69
2. Clergy	55	57	54	53	54	56	56	59
3. Medical doctors	52	54	52	51	47	54	55	56
4. College teachers	51	45	50	52	50	52	56	55
5. Dentists	52	50	50	50	51	54	53	54
6. Engineers	50	45	48	49	49	53	48	49
22. Senators	24	19	13	18	12	12	15	14
24. Congressmen*	20	19	11	14	9	10	14	12

**Source:** Leslie McAneny and Lydia Saad, "Honesty & Ethics Poll: Pharmacists Strengthen Their Position as the Most Highly Rated Occupation." Found at [www.gallup.com/POLL\\_ARCHIVES/1997/971213.htm](http://www.gallup.com/POLL_ARCHIVES/1997/971213.htm), January 4, 1999. (The poll, based on a randomly selected national sample of 1,003 adults, 18 years and older, has a sampling error of plus or minus 3 percentage points.) (\*) Denotes Gallup's choice of word.

# in control or out of it ?

In response to the growing concern about issues such as the environment, energy, and the social responsibility of scientists and engineers, the field of science, technology, and society studies emerged in the early 1970s. There are national and international organizations that promote these kinds of studies. In the US, the National Association for Science, Technology, and Society is one example. In addition, unregulated misconduct in research instigated many science and engineering departments at universities to incorporate ethics studies into their curricula in the early 1990s. Course subjects range from "Computers, Ethics, and Social Responsibility" at Stanford University to "Engineering Ethics" at MIT. Hundreds of these types of courses are being offered at colleges and universities around the world.

One of the major sources for funding of these programs comes from the federal government itself, including the National Science Foundation and the National Institutes of Health. The NSF's Societal Dimensions of Engineering, Science, and Technology (SDEST) program includes an Ethics and Values Studies component and another that explores decision-making. Recently, SDEST has made approximately 40 new awards each year, with a budget of approximately \$2.3 million. The NIH's National Human Genome Research Institute committed 5 percent of its annual research budget to study the "ethical, legal, and social implications" of genome research. The NIH also requires every school with federal training grants to provide science and ethics courses. The Department of Energy also funds the study of the social impact of genome research. This type of government funding, however, is still relatively modest compared to scientific research budgets.

Advisory commissions, review boards, and other means have been proposed and established to supervise scientific research to ensure that scientists follow ethical guidelines and operate within social norms. The biomedical field, partly as a result of the Nuremburg trials following World War II, has paid particular attention to this. For example, the US National Bioethics Advisory Commission was created in 1995 mostly to provide advice and recommendations to appropriate government entities regarding bioethical issues arising from human biology and behavior research,

## learn the lingo

**accountable**—answerable, being required to answer for one's actions.

**ethics**—the term "ethics" is used in several different ways. First, it means the study of morals. Second, it is used to mean the standards for ethical or moral behavior of a particular group. Third, some use the term more loosely to mean any code of behavior, even one that does not claim to have moral justification.

**\*institutional review board**—a specially constituted review body established or designated by an entity to protect the welfare of human subjects recruited to participate in biomedical or behavioral research.

**professional responsibility**—a paradigm case of the moral responsibility that arises from the special knowledge that one possesses. It is a mastery of a special body of advanced knowledge, particularly knowledge which bears directly on the well-being of others, that demarcates a profession. As custodians of special knowledge which bears on human well-being, professionals are constrained by special moral responsibilities; that is, moral requirements to apply their knowledge in ways that benefit the rest of the society.

**standard**—something established as a basis of comparison in measuring or judging capacity, quantity, content, value, quality, etc.: a specified set of safety or performance qualities which a device or process must possess. These must generally be demonstrated by a series of tests conducted under predetermined conditions.

**Source:** \*Glossary of IRB Terms, National Institutes of Health, found at [www.nih.gov/grants/oprr/irb/irb\\_glossary.htm](http://www.nih.gov/grants/oprr/irb/irb_glossary.htm), February 19, 1999. All other definitions obtained from *Glossary of Terms*, Online Ethics Center for Engineering and Science, found at [www.cwru.edu/affil/wwwethcis/glosary.html](http://www.cwru.edu/affil/wwwethcis/glosary.html), January 20, 1999.

and to identify broad principles to govern the ethical conduct of research. Another example is the Health Research Extension Act of 1985 passed by US Congress to require persons doing biomedical or behavioral research to establish an institutional review board in order to protect the rights of human subjects. These review boards affect students by controlling what type of research they are allowed to pursue. They also serve as a training tool by setting an example for what is acceptable professional conduct. Many think that other fields can learn from the example the biomedical field has set.

Global efforts also are under way to expand this effort. For instance, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) recently proposed the establishment of a World Commission on the Ethics of Scientific Knowledge and Technology. The main purpose of the World Commission will be to ensure that the advancement and sharing of scientific knowledge is consistent fully with respect for fundamental human rights and freedoms and to draw up action-oriented recommendations for national or regional policy-makers.

Student Pugwash USA also initiated a worldwide pledge campaign promoting social responsibility among scientists that reads: "I promise to work for a better world, where science and technology are used in socially responsible ways. I will not use my education for any purpose intended to harm human beings or the environment. Throughout my career, I will consider the ethical implications of my work before I take action. While the demands placed upon me may be great, I recognize that individual responsibility is the first step on the path to peace." The number of worldwide initiatives to raise ethical awareness and practice in the scientific and engineering communities continues to grow.

### **who's training the trainers?**

An increase in science and ethics curricula has created a need for programs that prepare professors and professional scientists to teach these courses. Workshops and materials are available in many forms. For instance, the University of Michigan's Policy and Research Responsibility Program includes an annual series of information and discussion sessions on responsibility in the conduct and administration of research for all disciplines. Texas A&M University completed a project in August 1992 entitled, "Introducing Ethics Case Studies Into Required Engineering Undergraduate Courses." The project yielded instruction materials for teachers who want to introduce these issues to engineering students and professionals. The Health Ethics Leadership Program is a faculty development initiative of the Medical Ethics program at the Indiana University School of Medicine. The multi-disciplinary group helps medical school faculty gain a better understanding of medical ethics and professionalism and suggests teaching techniques. The Summer Faculty Institute at the Dartmouth Ethics Institute provides a course called "Teaching the Ethical, Legal, and Social Implications of the Human Genome Project."

### **lessons for the real world**

Major questions about the ethical use of science can originate from academic research done by students. As described in a recent *Science* article, Jose Cibelli, a student at the University of Massachusetts, Amherst in the early 1990s, was carrying out nuclear DNA transfer in rabbits in a lab. When he ran out of donor cells, he "borrowed" cheek cells from a technician, almost as a joke, and transferred their DNA into rabbit oocytes. Surprisingly, the cells began dividing into what looked like embryos. When his professor, developmental biologist, James Robl, learned of Cibelli's creation, he got very nervous and shut down the experiment. Dr. Cibelli and Professor Robl returned to this line of research at Advanced Cell Technology, Inc. and fused human cells with cow cells to create a new type of human cell. Their work now lies at the core of a major ethical debate on human embryonic stem cell research.

# (anything but a) conclusion

There are many challenges to consider when thinking about how to prepare young scientists to grapple with complex social and ethical questions relating to their work. Distinguishing between ethical and non-ethical applications of science brings forward the compelling debate of who—educators, politicians, scientists, the general public, or all—should be responsible for deciding these standards and how they should be enforced. Education is one way to ensure that the scientists of tomorrow have at least thought about the social implications of science and technology. It equally is important, however, that scientists continue to examine the impact of their work throughout their careers.

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



Do you think members of the public have enough scientific background to be involved in decisions at the heart of some of the most difficult questions scientists face? Do they have a right to be involved, despite their lack of expertise? Why or why not? How can their diverse viewpoints be channeled into the discussions and decision-making process?

Are individual scientists in a position to determine what is ethical? Should a scientist be held responsible for the direct outcomes of his or her work? Why or why not? What if there are unintended future consequences?



Some feel that imposing ethical standards may impede scientific progress. They say limiting scientists' work may preclude opportunities for research that is vital and beneficial for society. Is this so? Can you think of examples?

How do you think an increase in women and minorities in science would affect science and ethics education, if at all?



•••••  
• Does the funding of academic scientific  
• research by private companies raise  
• special ethical considerations? Would  
• you say these or other considerations  
• arise if the funding comes from the  
• government? Why or why not?  
•••••

Why do scientists choose to study some things and not others? Do you think these choices are made as a result of their personal ethical standards? Do you think the general public influences what research scientists pursue? What do you think scientists should do when their personal views conflict with public standards?

Do educational institutions have a special responsibility to provide ethical training in science? Should it be mandatory that students take these courses? Why or why not? If yes, at what level and how do you think these subjects should be taught?



How does the media affect the way we think about science? What are the pros and cons of the role the media plays in the dissemination of scientific information? Do you think the media is capable of accurately portraying the ethical challenges raised by the advances of science?

Is it possible to enforce social responsibility in science through professional codes, laws, and punishment of misconduct? Is there a special responsibility to protect whistleblowers? If so, who bears the responsibility for guaranteeing this protection—the government, professional societies, or employers?



On the verge of a new millennium full of scientific possibility are we setting the stage for a "Brave New World" or paradise? How do you think incorporating ethics and societal issues into scientific education can influence the course we take?

**appease your ethical appetite**

- *Cantor's Dilemma*, Carl Djerassi—A fictitious story written by a Pugwashite about a molecular biologist's competitive, political and ego driven race for a Nobel Prize. New York: Penguin Books, 1989.
- *Computer Ethics, 2nd Edition*, Tom Forester and Perry Morrison—Explores the ethical, social, and professional issues arising from the computer revolution. Cambridge: MIT Press, 1993.
- *Judging Science*, Kenneth R. Foster and Peter W. Huber—The authors look at the reliability of admitting scientific evidence as scientific knowledge in federal courts. Cambridge: MIT Press, 1999.
- *On Being a Scientist: Responsible Conduct in Research*, second edition, Bruce Alberts, Kenneth Shine, Robert White. Washington, DC: National Academy Press, 1995. Available on-line at [www.nap.edu/readingroom/books/obas/](http://www.nap.edu/readingroom/books/obas/).
- *Princeton Journal of Bioethics*—a project of the Bioethics Forum of Princeton University which provides undergrads a forum in which to explore bioethics issues. Subscription is available on-line at [www.princeton.edu/~bioethic](http://www.princeton.edu/~bioethic).
- *Professional Ethics Report*—a quarterly update on current ethics issues and cases being addressed in the professional world published by Scientific Freedom, Responsibility, and Law Program in collaboration with the Professional Society Ethics Group, American Association for the Advancement of Science. Back issues available on-line at [www.aaas.org/spp/dspp/sfrr/per/per.htm](http://www.aaas.org/spp/dspp/sfrr/per/per.htm).
- *Research Ethics: Cases and Commentaries, Volumes I and II*, Brian Schrag (editor)—an exploration of cases in research ethics, such as authorship and compromising research, highlighting the common and differing views of scientists, philosophers, and ethicists. Association for Practical and Professional Ethics, Bloomington, IN. 1996; 1997. Both available on-line at <http://php.ucs.indiana.edu/~appe/cases.html>
- *Research Ethics: Cases and Materials*, Robin Levin Penslar (editor)—a comprehensive casebook for teaching research ethics in the sciences and humanities. Bloomington: Indiana University Press, 1995.
- *Research Ethics: A Reader*, Deni Elliot and Judy E. Stern (editors)—a thorough overview of the ethical dilemmas research scientists face today. Hanover, NH: University Press of New England for the Institute for the Study of Applied and Professional Ethics at Dartmouth College, 1997.

**scan the ethical screen**

- *Real Genius*—Val Kilmer stars in this wacky comedy as an eccentric science student that creates a laser technique that his professor steals to be used in an illegal secret weapons scheme.
- *Integrity in Scientific Research: Five Video Vignettes*—Five videos exploring issues in science, such as, disclosure of privileged information, loyalty and honesty, legal obligations, authorship, and the use of animals in research. American Association for the Advancement of Science. For more information go to: [www.aaas.org/spp/video/video2.htm](http://www.aaas.org/spp/video/video2.htm).
- *Miss Evers' Boys*—Alfre Woodard stars in this true life story about a nurse that co-conspired, until urged by her conscience, in a shameful medical experiment on a group of African-American men with syphilis that the US Public Health Service kept secret.

**top picks**

- Applied Ethics Resources on the Web (biomedical, computer, environmental, and decision-making ethics)—[www.ethics.ubc.ca/AppliedEthics.html](http://www.ethics.ubc.ca/AppliedEthics.html)
- Online Ethics Center for Engineering and Science, Case Western Reserve University (endless amounts of information on case studies, sampling of ethical codes, learning resources, many ethics-related links, and more!)—[www.cwru.edu/afil/wwwethics/](http://www.cwru.edu/afil/wwwethics/)

## the world of the web awaits you

**best of the rest**

- American Chemical Society (check out their code)—[www.acs.org](http://www.acs.org)
- Applied Ethics Case of the Month (participate in a bimonthly survey on cases taken directly from actual professional practice experience)—[www.engr.washington.edu/~uw-epp/Pepl/Ethics/ethics1.html](http://www.engr.washington.edu/~uw-epp/Pepl/Ethics/ethics1.html)
- Association of Computing Machinery (also have a code)—[www.acm.org](http://www.acm.org)
- Association for Practical and Professional Ethics (facilitates communication and joint ventures among centers, schools, colleges, and individual faculty concerned with teaching practical and professional ethics)—<http://php.indiana.edu/~appe/home.html>.
- The Dartmouth Ethics Institute (description of on and off-campus services for students and faculty interested in scientific ethics)—[www.dartmouth.edu/artsci/ethics-inst/about.html](http://www.dartmouth.edu/artsci/ethics-inst/about.html)
- Ethics Updates (provides an awesome on-line discussion forum, along with updates on current literature)—[www.ethics.acusd.edu/](http://www.ethics.acusd.edu/)
- Illinois Institute of Technology (tons of codes of ethics, current publications, and info on their Center for the Study of Ethics in the Professions)—<http://csep.iit.edu/codes/codes/html>.
- Institute of Electrical and Electronics Engineers (see their professional code)—[www.ieee.org](http://www.ieee.org)
- International Network of Engineers and Scientists for Global Responsibility (yet another code)—[www.mindspring.com/~us016262/ines.html](http://www.mindspring.com/~us016262/ines.html)
- National Society of Professional Engineers (ditto)—[www.nspe.org/eh1-code.htm](http://www.nspe.org/eh1-code.htm)
- Societal Dimensions of Engineering, Science, and Technology (sponsored by the National Science Foundation)—[www.cep.unt.edu/EVS.html](http://www.cep.unt.edu/EVS.html)
- Student Pugwash USA (of course!)—[www.spusa.org/pugwash/](http://www.spusa.org/pugwash/)
- Texas A&M, Engineering Ethics (includes case studies and essays)—[www.tamu.edu/cstpe/](http://www.tamu.edu/cstpe/)
- United Nations Educational, Scientific and Cultural Organization (information on educational programs and commissions related to ethics in science)—[www.unesco.org](http://www.unesco.org)
- University of Michigan, Policies and Research Responsibility Program (lots of info on "the ethical dilemmas of eager junior researchers and their faculty mentors")—[www.responsibility.research.umich.edu](http://www.responsibility.research.umich.edu)

# check it out !

# cyberspace

This **mind•full** was written by Heather Stewart, program coordinator and accounts manager at Student Pugwash USA. Special thanks to Michael Kalichman, PhD, Coordinator of the Research Ethics Program at the University of California, San Diego and Nicholas H. Steneck, PhD, Professor of History, LSA, and Professional Ethics, Engineering at the University of Michigan for their comments. Any errors are the responsibility of Student Pugwash USA. ©1999 Student Pugwash USA.

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## but wait, there's more!

- **mind•full: a brainsnack for future leaders with ethical appetites.** Volume one issue available, includes: international weapons trade; emerging infectious diseases; access and the Internet; public's role in science; future of nuclear weapons; water quality and availability; war and disease; renewable energy. Volume two issues available: pugwash conferences; exploring human genetics; science, technology, & culture; communications technologies; beyond nuclear weapons; nuclear energy; computers and human genetics; energy and international security.
- **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 approximately 200 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.
- **Science, Technology, and Ethical Priorities: Proceedings of Student Pugwash USA's Ninth International Conference.**
- **Pugwatch.** The chapter newsletter.
- **Chapter Organizing Guide.** Newly updated, provides chapter members with an A to Z guide to getting a campus-based chapter up and running.

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