

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

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science, technology, & culture

Science and technology can contribute to the preservation and advancement of a culture. At the same time they also can help cause its mutation and destruction. In addition, culture can shape the direction of science and technology. The inevitable tensions between science, technology, and culture arise when new discoveries and applications are at odds with established cultural norms. These subtle conflicts can lead to the imposition of political, economic, or social limitations on scientific and technological development or to the slow loss of traditional languages, symbols, and economic and social systems.

In the West, the pervasiveness of technologies like televisions, telephones, and computers is affecting the ways we perceive the world and how we interact. In addition, many new developments, like cloning, challenge fundamental cultural beliefs and traditions. While Western nations have become relatively accustomed to technological change since the industrial revolution, developing nations are just beginning to grapple with the problems of the rapid introduction of industrial and scientific technologies. Encouraged by international bodies and institutions, many developing nations place a high economic and social priority on importing and developing large, capital-intensive technologies. This emphasis is facilitating a change from agricultural- to industrial-based societies and is accelerating the breakdown and loss of traditional ethnic, political, and social systems.

There is a growing awareness of the consequences of the interaction between science, technology, and culture. However, we are just beginning to understand how to reconcile the benefits of science and technology—such as higher standards of living, longer life spans, more leisure time, and improved communications—with the possibility of reshaping many cultures and possibly redefining fundamental aspects of society.

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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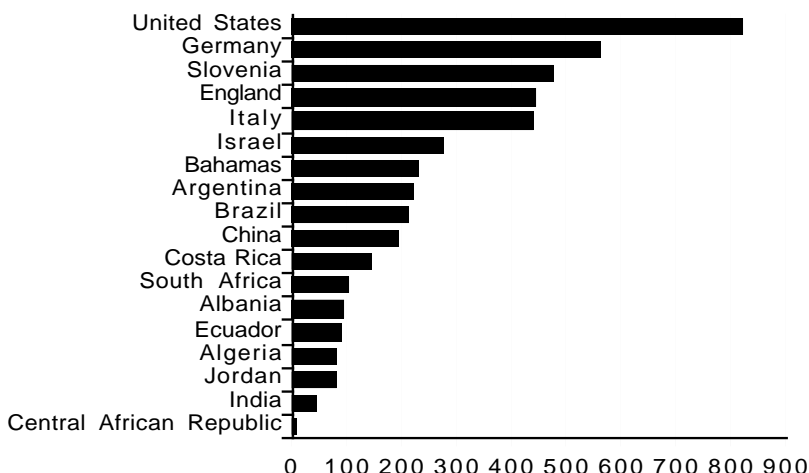
go figure!

The effects of the interplay between science, technology, and culture are hard to quantify. There are no numbers that indicate a specific level of tension or cooperation. However, it is possible to partially understand the relationship by comparing statistics which measure the technological infiltration of a society, such as the number of televisions or phones per household, or those which measure cultural change, such as the rate of urbanization. These figures signal a shift toward technological services and products as well as the culture implicit in city life. Even more potent cultural effects are less measurable but can be noted by looking at symbols, languages, traditions, and ceremonies and how they change over time.

television receivers per 1,000 inhabitants, 1994

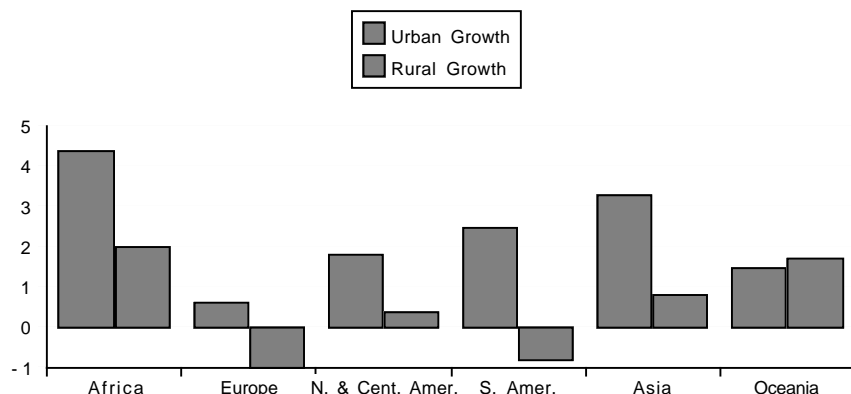
movin'
on up?

Central African Republic	3.4
India	40
Jordan	76
Algeria	79
Ecuador	88
Albania	91
South Africa	101
Costa Rica	142
China	189
Brazil	209
Argentina	219
Bahamas	226
Israel	275
Italy	437
England	439
Slovenia	474
Germany	560
United States	817



Source: *Table on Selected Indicators*. Published on the United Nations Educational, Scientific, and Cultural Organization Web site (<http://www.unesco.org/general/eng/stats/>).

urban and rural growth rates, 1990-1995



	Urban Growth Rate	Rural Growth Rate
Africa	4.4	2
Europe	0.6	- 1
North & Central America	1.8	0.4
South America	2.5	-0.8
Asia	3.3	0.8
Oceania	1.5	1.7

Source: United Nations Population Division and United Nations Development Program as quoted in *World Resources: A Guide to the Global Environment, The Urban Environment, 1996-1997*. A joint publication by the World Resources Institute, The United Nations Environment Program, The United Nations Development Program, and the World Bank. New York: Oxford University Press, 1996. Data Table A.1.

in control or out of it ?

Efforts to ease tensions between science, technology, and culture are not new. The debate surrounds issues such as: how culture influences and shapes science; how and at what rate a culture should evolve; if technology does or should alter this "natural" rate of change and, as a result, possibly threaten group and individual rights and diversity; and when, if at all, science and technology should take priority.

According to development specialist Arturo Escobar, science and technology are too often used to measure a civilization's advancement. This may be changing. Private groups as well as institutions, such as the United Nations Educational, Scientific, and Cultural Organization (UNESCO) champion the role of culture in scientific and technological endeavors. Through education and recommendations to the UN and other international bodies, UNESCO articulates the right of communities to determine and protect their cultures and highlights the importance of existing indigenous knowledge. The World Bank, one of the most influential international financial institutions, has begun to weigh more seriously the cultural repercussions of large-scale, capital-intensive projects. It also has begun to encourage the use of appropriate and sustainable technologies.

However, despite these steps, many governments (encouraged by international political and financial institutions) continue to place primary importance on technological development. For example, indigenous cultures are sometimes displaced to allow for large-scale technologies like factories or dams with the hopes that the benefits of technology, such as a higher standard of living, outweigh the costs. Critics, such as Ian Barbour, believe that technological developments like these accelerate the concentration of political and economic power, disrupt cultures, and contribute to the loss of traditions, languages, and wisdom.

There are a number of citizens' groups committed to preserving indigenous cultures and to helping shape scientific and cultural development. Sometimes, religious or ethnic groups do not want to accept a new technology because they fear it will destroy their culture. More often, it is not that technology is unwanted, but that it has not been adapted to fit the culture to which it is applied. For example, Appropriate Technology Exchange, an organization that collaborates with communities in Chiapas, Mexico, draws upon indigenous self-determination to build small projects using technologies largely based on the knowledge and materials available in the community. In other cases, a new technology spawns new cultural groups, such as cyberculture—largely a result of the mass introduction and relative affordability of computers. Many groups seek to protect the right of this new culture to define its own values.

nerd's words

appropriate technology a favorable judgment of the effects of a technology in a social, cultural, and environmental setting. †

culture historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men [sic] communicate, perpetuate, and develop their knowledge and attitude towards life. . . . Culture is the fabric of meaning in terms of which human beings interpret their experience and guide their action.*

social structure the form that action takes, the actually existing network of social relations.*

†Definition taken from *Technology, Environment, and Human Values*, Ian Barbour, Praeger Publishers, 1980.

* Definitions taken from *The Interpretation of Cultures*, Clifford Geertz, Best Books, 1973.

culture be darned?

In 1990, the World Bank and Mexico's Federal Electricity Commission (FEC) started the process of building a large hydroelectric dam in Zimpan, an area 100 miles north of Mexico City. The design and funding largely came from Western investors. To build the dam at this location, three villages, with a total population of 2,400 individuals, were displaced. While efforts were made to take into account existing cultures, many traditions and tribal identities were destroyed. The three villages were combined into one locale with very little farm land in the immediate area. The actual agricultural land was located 25 miles from the new town, requiring transportation. Farming in the new environment required different skills than farming in the original territories. Beyond these changes, many voiced fears that adverse effects that have been linked to other hydroelectric dams will occur here as well. These possible problems include: loss of crop lands, increase in waterborne diseases, and possible long-term change in the local and national ecosystems.

culture shapes science

In 1997, scientific advances made it likely that human beings could be cloned in the future. That possibility initiated a social, scientific, and political debate that is rooted in basic cultural beliefs. Many individuals fear that the integrity of their religious, individual, and family values are threatened. For example, the *Report and the Recommendations of the National Bioethics Advisory Commission* states that while some religious and secularist thinkers find no moral or religious dilemmas with cloning under most circumstances, others find "every possible act of cloning humans as intrinsically evil." Many fear that this new technology would produce changes that would radically upset current cultural norms and values, such as family relationships. At the same time, some individuals believe that this is an opportunity to develop and grow as a society. Until this cultural debate is settled, research on human cloning is likely to continue to be severely restricted in the United States.

(ain't) got culture?

avoiding another "lost world"

In 1994, Steven Spielberg founded the Survivors of the Shoah Visual History Foundation, a nonprofit organization dedicated to archiving the oral cultural history of survivors of the Holocaust by using digital technology. By doing so, the Shoah Foundation is helping provide a "continuity between past and present" so that future generations are able to experience the thoughts of tens of thousands of Holocaust survivors, in the setting and language of the survivors' choice. More than a documentary on the effects of the Holocaust, the archives will help record and preserve a cultural heritage—traditions, myths, rituals, and languages—that might otherwise be lost when the generations directly involved in, and immediately affected by, World War II pass on. To make the catalogued interviews accessible to the public, the Shoah Foundation will make the materia available on-line and via interactive networks and CD-ROMS.

science bombs culture

After the use of atomic bombs in Hiroshima and Nagasaki and the end of World War II, the world's social, political, economic, and cultural structures underwent drastic changes and entered the period referred to as the Cold War. Art, literature, architecture, language, philosophy, and traditions were affected by the threat of nuclear war. For example, bomb shelters were designed and installed; individuals began to learn about "nuclear winters" and "nuclear powers." This period saw the rise of the antinuclear counter culture and the alignment of developing nations with either democratic or communist beliefs, values, and systems. This cultural heritage has made a lasting impact on how we perceive the world. This is seen in our language (e.g., "nuke the food in the microwave," and "the problem mushroomed out of control"), in our symbols (no nukes signs, nuclear power symbols), and even in our oral folklore.

(anything but a) conclusion

As science and technology continue to advance, the ways in which people communicate, perpetuate, and develop their knowledge and attitudes toward individuals, as well as local, national, and international communities, will continue to undergo radical change. The continuing development of science and technology is not inherently bad. However, it has the potential to endanger our diversity and traditional knowledge. We must work together to determine how to preserve and foster our cultural heritages at the same time we embrace the future.

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



In many cases, young people adapt to new scientific and technological developments while the older generations adjust much more slowly, if at all. One of the effects of rapid change in some regions of the world is that the younger people are losing language skills needed to communicate with the older generations and are moving away from traditional communities at a rapid rate. What impact do you think science and technology have on the widening generation gap? What effects, if any, do you think this has on culture? In what ways do you think it has an effect on the transmission of cultural values from one generation to the next?

The traditional image of a scientist is an older, Caucasian male from a developed state in the Western hemisphere. Does this stereotype limit the abilities of science and technology? How? What role does gender and ethnicity play in the development and application of science and technology, if any?

Many people in traditionally technology-poor communities experience a tension between wanting the benefits of expensive new technologies and wanting to maintain cultural norms and independence from technology-rich states. Recently, there has been an emphasis on exporting appropriate technology to those who are less-advanced in these areas. Does this meet the communities' conflicting needs? What else can be done to create global scientific and technological equity without eliminating multiculturalism?



At a Chicago exposition, the following phrase was seen, "Science Finds—Industry Applies—Man Conforms." To what extent do you believe this to be true? Do you believe that this is a positive or negative perspective on the role of existing cultural practices and values? Why?



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• The advent of affordable computers, user-friendly software, and the Internet has been a catalyst for the creation of a new cyberculture that relies on unique language, symbols, beliefs, and attitudes. One of the attitudes prevalent on the Internet is an almost anarchist sense of freedom. However, the Internet is becoming increasingly regulated and controlled by a small group of legislators and technology and business experts. How do you think that this will affect or change the culture of the Internet?

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Recent attention has been paid to traditional knowledge of medicinal plants that may help in the treatment of diseases such as cancer. This material and the continuation of this knowledge are threatened as the environment is destroyed and communities are displaced in order to provide technological advancement and economic stability. Do you think it is wrong to stop the progress of science and technology if it preserves the environment from which cultural lore promises such medical benefits? Why or why not?

At what point do you overrule an individual or group decision against life-altering or lifesaving technologies? For example, if you had the opportunity to save a young child's life with the use of a certain medicine, yet the parents refuse its application because it is against their moral and cultural beliefs, what would you do?



Modern technology is making it possible to preserve art, music, and literature in many new ways. It is also making it possible to create new forms of art through advanced computer and other technologies. Do you think that computer-generated art or music is still "art?" Are there any ways in which you think these developments will have a negative impact on the evolution of culture? If communications technologies are able to bring fine arts to more people, do you think this will encourage culture or commodify it? What would be the effects of this?

When discussing science and technology and the possibility for advancement, Gabriel Marce, an eighteenth century philosopher, expressed fear that we have begun to exclude the sense of the sacred. Is this a valid concern that applies currently? Why? Whose responsibility is it to protect the "sense of the sacred"?



Many people believe that new technologies are raising popular exposure to violence—through graphic television shows, instant news coverage of wars and other crises, and by accelerating the pace with which we are exposed to violent imagery. Do you agree? In what ways do you think new technologies might be contributing to a new culture of violence?

culture in print

- 1984, George Orwell—A classic book about science and technology in the future (or in the past, if you go by the cover date). A must read! New York: Penguin (Signet Classic), 1992.
- *Being Digital*, Nicholas Negroponte—how computers will alter every aspect of our lives from the choices we make to how we perceive the world. New York: Alfred A. Knopf, 1995.
- *Contact*, Carl Sagan—a look at technology, scientists, and society. Be sure to read the book, not just watch the movie—Pugwash is mentioned briefly. New York: Simon and Schuster, 1985.
- *Democracy and Technology*, Richard E. Sclove—this book examines how participatory technological development affects political structures and, as a result, societal structures and philosophy. New York: Guilford Press, 1995.
- *Disappearing Through the Skylight*, O.B. Hardison, Jr.—an exploration of science and technology as it interacts with "high culture" (art, poetry, architecture, etc.) as well as the use of artificial technology and the evolution of modern human cultural perspectives. New York: Penguin Books, 1989.
- *Encountering Development: The Making and Unmaking of the Third World*, Arturo Escobar—a study of how cultural and economic systems interact. He includes a brief but powerful discussion on the use of science and technology to determine how advanced a culture is. Excellent! Princeton: Princeton University Press, 1995.
- *Feminism and the Technological Fix*, Carol A. Stable—beneath the "isms" and other buzz words, there is a very interesting and poignant examination of women's thoughts about their bodies and how they have changed as new technologies, such as reproductive technologies, have been introduced. New York: Manchester University Press, 1994.
- *Genesis and Development of a Scientific Fact*, Ludwik Fleck—a classic text which discusses science as a cultural construction. Chicago: University of Chicago Press, 1979.
- *The Interpretation of Culture*, Clifford Geertz—a classic sociological, anthropological study of culture. A great and enjoyable reference book. New York, Basic Books, 1973.
- *Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance*, Michael Adas—this is what some believe to be a revolutionary work on the use of science and technology as a measure to judge other cultures. Ithaca: Cornell University Press, 1989.
- *Nuclear Language and How I Learned to Pat the Bomb*, Carol Cohn—a feminist critique about how male-dominated language influences nuclear weapons policy. In *Peace and Security: The Next Generation*, edited by George Lopez and Nancy Myers. Lanham: Rowman and Littlefield Publishers, 1997.
- *Science as Culture*—a quarterly journal with an interesting and liberal analysis. London: Free Association Books, in cooperation with Guilford Publications.
- *Secrets of Life, Secrets of Death: Essays on Language, Gender, and Science*, Evelyn Fox Keller—essays on the role of gender and language in science as well as the ways culture and science relate. New York: Routledge, 1992.
- *Technology, Environment, and Human Values*, Ian G. Barbour—a little old, but provides an excellent explanation of philosophies of scientific technology, development, and culture. New York: Praeger Publications, 1980.
- *Technopoly: The Surrender of Culture to Technology*, Neil Postman—an interesting evaluation of technology and the loss of important cultural values. New York: Alfred K. Knopf Press, 1992.

tv or not tv?

- *Star Trek or Deep Space Nine*—look at all the cool gadgets, dreadful weapons, and nifty toys that help create culture among the crews (and in places where no one has gone before).
- *2001*—this was considered one of the more revolutionary technology flicks. Check out the scene where the machines won't stop!

top picks

- United Nations Educational, Scientific, and Cultural Organization (UNESCO) (a great introduction to the subject of culture and its many roles as well as other projects sponsored by UNESCO)—<http://www.unesco.org>
- Voice of the Shuttle (a metapage with extensive list of Web resources about science, technology, and culture)—<http://humanitas.ucsb.edu/shuttle/science.html>
- *Wired* (a computer magazine and example of current cultural documentation of the role of technology as a cultural medium, available on-line or in print)—<http://www.wired.com>

cyberspace

best of the rest

- American Association for the Advancement of Science—<http://www.aaas.org>.
- Appropriate Technology Exchange (Intercambio de Tecnologia Apropriada)—<http://burn.ucsd.edu/~ita/navbar.html>
- Electronic Frontier Foundation (EFF) (take a look at the Blue Ribbon Campaign and the Golden Key Campaign)—<http://www.eff.org/goldkey.html>
- Committee on Women in Science and Engineering, National Academy of Sciences (a listing of organizations that encourage involvement by women in science)—<http://www2.nas.edu/cwse/>
- Issues in Science and Technology (on-line journal)—<http://www.utdallas.edu/research/issues/>
- Loka Institute (an interesting page with great connections)—<http://www.amherst.edu/~loka/menu.html>
- Overseas Development Committee (this links you to the big international organizations including the UN Development Program, the International Monetary Fund, Overseas Development Institute, and others)—<http://www.odc.org/links.htm>
- Satisrun (metapage of science, technology, and society resources)—<http://www.personal.u-net.com/~nchadd/>
- Speed (on line zine about science, technology, and culture with a focus on the Internet)—<http://tunisia.sdc.ucsb.edu/speed/speedSTD.html>
- World Bank (check out the speeches and reports)—<http://www.worldbank.org>

www.culture.common?

This **mind•full** was written by Jennifer Seltzer, editor and accounts coordinator at Student Pugwash USA. Special thanks to Dr. Stuart Shapiro, a Student Pugwash USA alumni and visiting faculty at the University of British Columbia, and Alan McGowan, Program Director at the American Association for the Advancement of Science and Student Pugwash USA board member, for their comments. Any errors are the responsibility of Student Pugwash USA. ©1997 Student Pugwash USA

check it out !

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but wait, there's more!

- **mind•full: a brainsnack for future leaders with ethical appetites.** Volume one 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. Others available this fall: pugwash conferences; human genetics.
- **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.
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