

# TECHNOLOGICAL CHANGE AND AMERICA'S FUTURE

AN INTERVIEW WITH GEORGE GILDER

**Public Perspective:** To begin with, could you summarize briefly what you see as the impact of technological change on the lives of Americans?

**George Gilder:** Essentially there is a new culture emerging, spearheaded by the personal computer which will improve its cost effectiveness approximately a million fold in the next ten years. At the same time, communications technology will give each fiber-optical thread one thousand times the communications capacity of all the frequencies currently used in the air, from AM radio to KU-band satellite. Advances in mobile wireless technology mean that the idea of spectrum as beach front property that has to be parceled out by lawyers and politicians will dissolve before an explosive expansion. These technologies have been created and proven; their unfolding is inexorable. The key to all these developments is the personal, programmable computer. I would compare this with the Model T of an earlier era. You didn't just drive the Model T; you had to be able to take it apart and put it back together again. In mastering it you developed mechanical skills that fueled the US victories in the world wars. It was an absorbing part of one's life. The PC offers this same kind of technology, and makes it the major force in the contemporary culture.

**PP:** Are we talking about doing the same old things faster and cheaper, or about things which are qualitatively as well as quantitatively different from the old ones?

**GG:** The latter. What people call mass culture will dissolve. Mass culture degrades and depraves because it necessarily gravitates to the lowest common denominator, essentially prurient interest and morbid fears and anxieties. Moreover, mass culture entertainments must be cen-

tralized, because they have to be distributed by a broadcast tool and cost so much to produce. In contrast, the teleputer (as I call the PC connected to fiber-optic lines) allows you to get what you want when you want it. That is a radical change.

**PP:** What about *where* you want it? Will technology change this dimension?

**GG:** When I lecture, I am often at some little podium, with a huge screen above me on which the entire audience is focused. They don't even notice me at the bottom. Within the next few years I will be able to meet a good part of my speaking schedule without leaving my own home. Teleconferencing is already a booming business. But the reason teleconferencing is still somewhat unattractive is that the computer is crippled by slow telephone connections. Overcome that barrier, and the computer can readily perform anything that television can—not only receive digital video but store, shape, edit and even transmit it—as well as perform hundreds of other functions.

**PP:** So the parallel is not just to the car but to the roads that let you use the car?

**GG:** A leading computer network expert uses an interesting analogy. If you encountered a car for the first time in a jungle, you might find it quite a spectacular technology. You have light, radio, air conditioning, comfortable seats, and even a loud horn to frighten away fierce animals. But the real magic of automobiles comes only with roads. For the last few decades we have been using computers like cars in the jungle. My last book [*Microcosm: The Quantum Revolution in Economics and Technology*, New York, Simon and Schuster, 1989.] propounded the law of the microcosm: If you take "N" transistors and put them on a single sili-

con sliver, you get "N"-squared performance and value. The law of the *Telecosm* (my forthcoming book) is that if you take "N" computers and interconnect them you get "N"-squared performance and value, since every computer on the network is a resource for all the others.

**PP:** Individuals could then access much more information and have more choice.

**GG:** Its not just that. The video business will resemble the book business. Fifty-five thousand tradebooks are published each year, along with scores of thousands of magazines addressing every special interest and curiosity, technical discipline and cultural aspiration. This is a rich and resourceful culture compared to the vast wasteland that television essentially provides. The main reason television news is so bad is the two-minute rule, which applies not because people *want* two-minute stories, but only because people won't sit through two minutes of the stories they *don't* want. When a story actually interests you, the coverage is all too brief. You wait 20 minutes for your story, they give 35 seconds to it, and you are scarcely better off than when you started. Lurid sex and crime stories are all that television offers in depth, since people would rather watch such stories than exalted reports on some subject that doesn't interest them at the moment. Your exalted interests and aspirations are mostly special to you, and current broadcast media are utterly incapable of reaching them.

Some worry that through the unfolding technology all sorts of exotic and ugly fare will be made available to those who want it. Now you have ugly and degraded fare made available to everybody almost on a compulsory basis. The people who like to think that current mass media somehow affirm community, and play an inte-

grating and uplifting role in our society chiefly like it because it's regulated. The governing classes will find it much harder to regulate the emergent technologies.

**PP:** What barriers, if any, do you see to really exploiting the emergent technology fully? Does the US have the capacity to take full advantage of this?

**GG:** I think it mostly does. The United States is probably ten years ahead of Japan in providing broad-band connection to homes, and five years ahead in computer networking. The best thing that could happen would be that the regulations preventing telecommunications companies from collaborating with cable companies are removed. That would give us broad-band information superhighways within a few years. No other country in the world can do that.

**PP:** But there has been so much worry about the loss of US technological supremacy.

**GG:** Some academic authorities have been claiming this for a decade, and it isn't happening. The US semi-conductor industry is stronger than the Japanese semi-conductor industry. When *Microcosm* came out, a lot of reviewers said, in effect, "He doesn't understand this or that and the Japanese really are taking over." But in 1993, the United States was the biggest market in the world for semi-conductors, and was the biggest producer of semi-conductors. We command all the leading-edge semi-conductor products by a bigger margin than before. The US has something like ten times as many computer networks and computers connected to networks per capita than the Japanese do.

The impression that the United States is falling behind was an optical illusion created by the collapse of the dollar vis a vis the yen in the mid-1980s--which meant that suddenly all Japanese semi-conductor production was valued at twice as much as it was before.

**PP:** As the technology unfolds, if people interact more with one another through

electronic means, won't society as a whole lose a dimension of personality? If technology can be a bridge, can it not also be a barrier for some people?

**GG:** Technology allows the emergence of all sorts of new communities which are quite intimate and responsive, and possess a great richness of communication that doesn't happen otherwise. Even without faces and voices and high resolution images, existing text communications have already created a golden age of letters: E-mail is incredibly effective and almost addictive. You discipline yourself to get your point across in a few hundred words, and then that letter is posted. This promotes in-depth exploration of issues and philosophies and ideas that doesn't occur any other way.

*If you encountered a car for the first time in a jungle, you might find it quite a spectacular technology. You have light, radio, air conditioning, comfortable seats, and even a loud horn to frighten away fierce animals. But the real magic of automobiles comes only with roads. For the last few decades we have been using computers like cars in the jungle.*

**PP:** There has been a lot of concern about the privacy issue.

**GG:** In the first place, a lot of things that people reject are results of *too little* information. I want government to be able to invade the privacy of the criminal. The danger of having excessive violations of privacy is mostly bogus. Technology in general empowers individuals against government or other large institutions, whose relative increase in power is dwarfed by the increase in power commanded by every individual. Television is a tool of tyrants. You can measure the degree of democracy in a country by determining how many televisions there are compared

to how many telephones and computers. Authoritarian countries have televisions everywhere and very few telephones.

**PP:** Do you see the general public opinion climate as supportive of the new technological developments? Is it unappreciative of it, or would "fearful" be closer?

**GG:** It's very supportive. The public may be unsupportive of incredibly badly run megaprojects, like the space program, but it accepts personal computers with amazing avidity and is buying them at an unprecedented pace--and learning to use them. There is great receptivity to this change. There is also great frustration with the mass media, and a tendency to somehow associate technologies with existing abuses of them.

Now, various *elites* benefit from the existing order in telecommunications and try to raise fear. The fragmentation issue really comes down to the fact that the elites who run the networks and the newspapers tend to resist anything that threatens their control. There is a lot of creative destruction underway, and this leads to a lot of anguish among its victims. But the beneficiaries are much more numerous.

**PP:** Some people take easily to new technologies, finding them an attractive way to do things they like. Others find them hard or intimidating to use. Does this pose a problem in terms of differential access?

**GG:** The key thing is that the million-fold rise in the cost effectiveness of computing will be heavily committed to improving input/output systems. Over the next few years, you will be able to talk to your computer more easily and with greater precision. That will fundamentally lower the barrier. You used to have to know how to put the Model T together and take it apart again in order to run it. Today you still have to know more about how the computer works than you will as computer technology matures. Moreover, as the technology is domesticated, I think women will embrace it with increasing enthusiasm. It just has been mostly a male pursuit created and spearheaded by men.

It has not been embraced as readily by women—but it will be.

**PP:** Historically, technologies represented a world view that was materialistic. There was the scientist on the one hand and the believer on the other. Are the developments you have discussed threatening to, or supportive of traditional religious values and attitudes?

**GG:** I think they are supportive, if anything. Provo, Utah, has long been cited as the ultimate reactionary city — dominated as it is by Mormons. Yet it may be the fastest growing technology center in the United States. Technology tends to gravitate to social structures with very long time horizons, long commitments, and rigorous discipline. It's a product of intellectual and social discipline and family structures. A few years back, Tom Wolfe wrote a brilliant article on Bob Noyce, the inventor of the integrated circuit and the son of a Presbyterian minister. It highlighted the analogies between religious communities and entrepreneurial technological companies.

**PP:** That talks about who creates the technology. What about the world view itself?

**GG:** People say that this technology is a sort of triumph of materialism, but its key theme is the *overthrow* of matter. Quantum physics reveals a world not of Newtonian solidity but rather one that resembles the play of thoughts as much as of things. The quantum realm violates all principles of material solidity. If materialist causality doesn't apply to matter itself, doesn't apply even in physics, how on earth can you imagine it applying to society? Some intellectuals think that we are still in a Newtonian age which is hostile to a religious view of the world, but quantum theory overthrew the laws of matter.

Overthrowing matter in physics made possible the creation of the silicon chip where you can put scores of functioning electronic devices not on the head of a pin, but on the point of a pin, and switch them in trillionths of seconds. And the

computer industry transcended the material resource constraints that have conventionally afflicted industrial advance, because the silicon chip is based on sand, the most common substance on the face of the earth—made up of silicon, oxygen, and aluminum. Fiber-optics is again based on sand. We are building our current industrial empires mostly on foundations of sand—which I admit may seem biblically unsound.

**PP:** You have sketched out an almost poetic link between physics and metaphysics. Don't many people perceive a kind of dehumanization, parallel to genetic engineering, cloning, and so on?

**GG:** Most people embrace computer-based technologies with great enthusiasm, and this enthusiasm is increasing today among younger generations. There is a much more powerful argument with bio-engineering that I really don't see related to computer technology in itself. Of course, computer technology makes bio-engineering possible, but it's always possible to use technologies in destructive ways; it's possible to use the old bacterial sciences to promote plagues.

**PP:** What about nuclear power?

**GG:** Nuclear power can be used obviously to destroy as well as to produce power. The most successful feat of today's Luddites has been to stop nuclear power. They will have a harder time stopping the computer revolution. The thing about nuclear energy is that it's capital intensive. It's an industrial technology; it's centralized and requires a lot of approvals. It's far easier to stop than technology based on the "microcosm".

**PP:** What about genetic engineering?

**GG:** This idea that somehow we are going to be categorizing everybody in some genetic totalitarianism seems to me to be contrary to the whole dominant posture of the culture. It is "politically incorrect" to acknowledge the most rudimentary and obvious biological differences, although everybody acknowledges them in their own lives and behavior. So

the idea that suddenly we are going to start categorizing everybody from birth on the basis of genetics exaggerates the potential of reading these codes and prospects for translating genetic potentials into actual behavioral patterns.

**PP:** Isn't there likely to be a problem as we move from description to manipulation or treatment?

**GG:** The most socially disruptive use would be to manipulate sex choices. This probably should not be allowed, but it will occur sometime. It could be disruptive of the whole social order. Attacking the biological constitution of humanity itself poses a much greater threat than does creating computer brains.

**PP:** A lot of individuals would at any given time have a strong preference for a boy or girl, but people by and large would agree that it would not be good for society if suddenly you had 70% of one sex being born. What's good for everybody may be a very different question than what's good for me right now.

**GG:** That's a good point and such issues are the most contentious and truly menacing in the emergence of the new technologies. Privacy invasion, or dehumanization through computers, or the fragmentation of the culture are all fantasies, not significant threats. Access of terrorists to nuclear explosives and biological poisons is a real threat. An attack on the genetic constitution of humanity through bio-engineering, which C.S. Lewis defined decades ago in the *Abolition of Man*, is a real threat. The religious dimension of human life cannot be eclipsed. It is necessary for human survival. The people who believe that it's possible to reinvent a rational philosophy for each generation without any religious foundation will be confounded.

---

*George Gilder is fellow at the Discovery Institute in Seattle, WA, and author of Life After Television [New York: W.W. Norton, 1992]*