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Is Technology Moving Too Fast?

By STEWART BRAND

The newest technologies--computers, genetic engineering and the emerging field of nanotech--differ from the technologies that preceded them in a fundamental way. The telephone, the automobile, television and jet air travel accelerated for a while, transforming society along the way, but then settled into a manageable rate of change. Each was eventually rewarded more for staying the same than for radically transforming itself--a stable, predictable, reliable condition known as "lock-in."

Computers, biotechnology and nanotech don't work that way. They are self-accelerating; that is, the products of their own processes enable them to develop ever more rapidly. New computer chips are immediately put to use developing the next generation of more powerful ones; this is the inexorable acceleration expressed as Moore's law. The same dynamic drives biotech and nanotech--even more so because all these technologies tend to accelerate one another. Computers are rapidly mapping the DNA in the human genome, and now DNA is being explored as a medium for computation. When nanobots are finally perfected, you can be sure that one of the first things they will do is make new and better nanobots.

Technologies with this property of perpetual self-accelerated development--sometimes termed "autocatalysis"--create conditions that are unstable, unpredictable and unreliable. And since these particular autocatalytic technologies drive whole sectors of society, there is a risk that civilization itself may become unstable, unpredictable and unreliable.

Perhaps what civilization needs is a NOT-SO-FAST button. Proponents of technological determinism make a strong case for letting self-accelerating technologies follow their own life cycle. Rapid development in computer technology, they point out, has spun off robotics and the Internet--to the great benefit of industry and human communications. Besides, it isn't so easy for a free society to put the brakes on technology. Even if one country decided to forgo the next technological revolution, another country would gladly take it up.

There are scenarios, however, in which technology may brake itself. In the aging population of the developed world, many people are already tired of trying to keep up with the latest cool new tech. Youth-driven tech acceleration could be interpreted as simple youthful folly--shortsighted, disruptive, faddish. The market for change could dry up, and lock-in might again become the norm. Stress and fatigue make powerful decelerators.

So do religious and cultural factors. Radical new technologies are often seen as moral threats by conservative religious groups or as economic and cultural threats by political groups. Powerful single-issue

voting blocs like the antiabortionists could arise. Or terrorists like Theodore Kaczynski.

Change that is too rapid can be deeply divisive; if only an elite can keep up, the rest of us will grow increasingly mystified about how the world works. We can understand natural biology, subtle as it is, because it holds still. But how will we ever be able to understand quantum computing or nanotechnology if its subtlety keeps accelerating away from us?

Constant technological revolution makes planning difficult, and a society that stops planning for the future is likely to become a brittle society. It could experience violent economic swings. It could trip into wars fought with vicious new weapons. Its pervasive new technologies could fail in massive or horrible ways. Or persistent, nagging small failures could sap the whole enterprise.

With so many powerful forces in play, technology could hyperaccelerate to the stars with stunning rapidity, or it could stall completely. My expectation is that it will do both, with various technologies proceeding at various rates. The new technologies may be self-accelerating, but they are not self-determining. They are the result of ever renegotiated agreement with society. Because they are so potent, their paths may undergo wild oscillations, but I think the trend will be toward the dynamic middle: much slower than the optimists expect, much faster than the pessimists think humanity can bear.

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