

CNET Interviews Dr. Canton regarding Converging Technologies and Human Performance



When brains meet computer brawn

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People linking their brains together to form a global collective intelligence. Humans living well beyond 100 years. Computers uploading aspects of our personalities to a network.

These could all happen this century with the proper investments in technology, according to a recent report from the National Science Foundation and the Department of Commerce.

Titled "Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology, and Cognitive Science," the 405-page report calls for more research into the intersection of these fields. The payoff, the authors claim, isn't just better bodies and more effective minds. Progress in these areas of technology also could play a key role in preventing a societal "catastrophe." The answer to human brutality and new forms of lethal weapons, it suggests, is a kind of tech-triggered unity: "Technological convergence could become the framework for human convergence."

Published last month, the report could one day be remembered as a seminal road map to the future. But it's not clear whether its recommendations will be followed—or should be.

Some critics question whether such sci-fi promises can ever become reality, while others doubt world salvation will come through technology. Others worry that advanced technologies such as super-smart robots or genetically modified organisms may cause us more harm than good.

The “Converging Technologies” report stems from a workshop last December involving tech leaders in government, academia and private industry. Major themes at the seminar ranged from expanding human cognition and communication to improving human health to strengthening national security.

The final report, edited by Mihail Roco, NSF's senior adviser for nanotechnology, and William Bainbridge, acting director of NSF's Division of Information and Intelligent Systems, includes papers submitted by various participants as well as an overview by Roco and Bainbridge. In the overview, the editors argue that a host of advances can be achieved in the next 20 years alone. Among these are wearable sensors that send health alerts, much more useful robots, invulnerable data networks, and direct broadband interfaces between our minds and machines.

With research in converging technologies, it's possible some disabilities will be eradicated completely and normal standards of healthiness will soar, Roco and Bainbridge wrote. “The human body will be more durable, healthy, energetic, easier to repair and resistant to many kinds of stress, biological threat and (the) aging process.”

Also at stake is the health of the nation's economy, said James Canton, a futurist who helped organize the workshop. If the United States doesn't coordinate research into these four technologies, it risks losing its global tech leadership, Canton said. Technology already lets individuals and nations “leapfrog” others, and the

combination of nanotechnology, biotechnology, information technology and cognitive science is going to create an “entirely different economy,” Canton said.

“It’s really a comprehensive change that makes the Internet seem small,” said Canton, president of the Institute for Global Futures in San Francisco.

The report thinks big when it comes to peering beyond the next two decades to the rest of the 21st century. Taking visionaries such as Ray Kurzweil seriously, it imagines robots so advanced they may deserve political rights, building surfaces that automatically change shape and color to adjust to the weather, and the prospect of personality uploads that make death itself ambiguous.

Merging human consciousness with machines is tied to another mind-boggling concept: brain-to-brain connections. The report discusses the possibility of “local groups of linked enhanced individuals” as well as “a global collective intelligence.”

Creating such a networked society could play a vital role in overcoming today’s social and political crises, Roco and Bainbridge suggest. “The 21st century could end in world peace, universal prosperity and evolution to a higher level of compassion and accomplishment,” they write. “It is hard to find the right metaphor to see a century into the future, but it may be that humanity would become like a single, transcendent nervous system, an interconnected ‘brain’ based in new core pathways of society.”

Helpful or harmful?

Not everyone is likely to sign up for this techno-utopia, however. Some people are skeptical about technology’s capabilities and cast doubt on proposals such as capturing consciousness through computers or linking neurons with nanocircuitry. Our minds may not be able to handle the flood of information resulting from a brain-machine interface, suggests Jeremy Rifkin, author of books on biotechnology and globalization. “The human physiology is just not designed for this speed-of-light world,” Rifkin said.

Although he welcomes the report's call for more interdisciplinary research, Rifkin said society ought to pick and choose carefully among emerging technologies given potential downsides. "Some of that harm can be irreversible—especially in biotechnology," he said. Rifkin calls for a ban on transgenic crops and has raised concerns about the prospect of developing fetuses in artificial wombs.

Sun Microsystems' Bill Joy also has warned that advanced technology could trigger its own catastrophe—such as in the form of self-replicating nanoscale robots that dismantle everything into a "gray goo." A cautionary tale is even suggested by the television show "Star Trek: The Next Generation": The malevolent character of the Borg suggests society may not want to share a single mind.

Other criticisms of pouring resources into technology research are that political repression and socio-economic divisions ought to be addressed first, and that thorny ethical issues have yet to be worked out completely. These include questions such as what methods—such as cloning, embryonic stem cell research and genetic engineering—are acceptable, what kinds of enhancements are appropriate and who should benefit from them. The "Converging Technologies" report concedes debate is needed on the ethics front. And efforts to promote human rights and combat poverty deserve attention along with the technology push, said Phil Kuekes, a researcher at Hewlett-Packard Laboratories who participated in the workshop. "I don't think it's an either-or issue," he said. Although new technology is always a sword with a dangerous side, the specter of self-replicating nanobots running amok is science fiction, Kuekes said. "The gray goo stuff is not credible," he said.

Kuekes acknowledged the consciousness-upload possibility is speculative, but claims the report is generally grounded in hard science. His lab, for example, is experimenting with electronic devices made up of just a few molecules. Since these are 1,000 to 10,000 times smaller than current silicon-based circuits, they could result in a storage device powerful enough to cram the entire Library of Congress into a device that fits on a person's wrist.

To push this sort of research in the right directions, Canton hopes political leaders will make converging technologies a national initiative, just as Washington did with nanotechnology research two and a half years ago. That helped transform the once-obscure field of the tiny into a big player in science, thanks partly to annual federal funding this year of \$604 million.

Kuekes would like to see the “Converging Technologies” report spark debate among policy makers, the general public and even students, who may be leading the scientific charge a few years from now. That’s partly why the tech leaders behind the report gazed as far as they did into the future, Kuekes said, risking ridicule and rebuke in the process. “It is very forward looking,” he said. “The group that issued this report kind of stuck their neck out.”