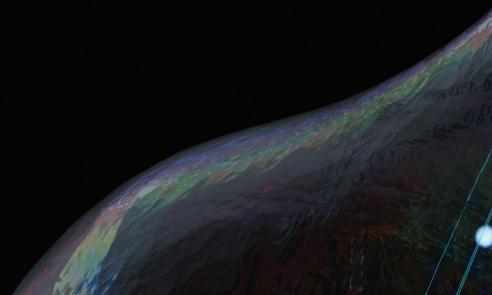


“The brain is complex enough to conjure fantasies of technotranscendence and also to foil their fulfillment”

—JOHN HORGAN





# The Singularity

A SPECIAL REPORT

TECHNOLOGICAL  
CONVERGENCE WILL  
CHANGE OUR LIVES  
BUT WON'T MAKE THEM  
INDEFINITELY LONG  
BY GLENN ZORPETTE

# WAITING FOR

ACROSS CULTURES, CLASSES, AND AEONS, PEOPLE HAVE YEARNED TO TRANSCEND DEATH. ¶ Bear that history in mind as you consider the creed of the singularitarians. Many of them fervently believe that in the next several decades we'll have computers into which you'll be able to upload your consciousness—the mysterious thing that makes you *you*. Then, with your consciousness able to go from mechanical body to mechanical body, or virtual paradise to virtual paradise, you'll never need to face death, illness, bad food, or poor cellphone reception. ¶ Now you know why the singularity has also been called the rapture of the geeks.

The singularity is supposed to begin shortly after engineers build the first computer with greater-than-human intelligence. That achievement will trigger a series of cycles in which superintelligent machines beget even smarter machine progeny, going from generation to generation in weeks or days rather than decades or years. The availability of all that cheap, mass-produced brilliance will spark explosive economic growth, an unending, hypersonic, techno-industrial rampage that by comparison will make the Industrial Revolution look like a bingo game.

At that point, we will have been sucked well beyond the event horizon of the singularity. It might be nice there, on the other side—by definition, you can't know for sure. Sci-fi writers, though, have served up lots of scenarios in which humankind becomes the prey, rather than the privileged beneficiaries, of synthetic savants.

But the singularity is much more than a sci-fi subgenre. A lot of smart people buy into it in one form or another—there are versions that dispense with the

life-everlasting stuff. There are academic gatherings and an annual conference at Stanford. There are best-selling books, audiotapes, and videos. Scheduled for release this summer is a motion picture, *The Singularity Is Near*, starring the actress Pauley Perrette and a gaggle of aging boffins who've never acted in a movie. (Without any apparent irony, the picture's producers call it “a true story about the future.”)

There's also a drumbeat of respectful and essentially credulous articles in the science press. Unlike stories about UFOs or zero-pollution energy sources, singularity stories don't exact from editors a steep payment in self-respect. That's because of the impressive attainments—albeit usually in fields unrelated to neuroscience or biology—of some of the people who chirp about mind uploading and nanomachine organ repair. The leading spokesman for the life-everlasting version of the singularity is the entrepreneur and inventor Ray Kurzweil, who's also behind the movie *The Singularity Is Near* and a recent book of the same title.

Why should a mere journalist question Kurzweil's conclusion that some of us alive today will live indefinitely? Because we all know it's wrong. We can sense it in the gaping, take-my-word-for-it extrapolations and the specious reasoning of those who subscribe to this form of the singularity argument. Then, too, there's the flawed grasp of neuroscience, human physiology, and philosophy. Most of all, we note the willingness of these

people to predict fabulous technological advances in a period so conveniently short it offers themselves hope of life everlasting.

This has all gone on too long. The emperor isn't wearing anything, for heaven's sake.

The singularity debate is too rarely a real argument. There's too much fixation on death avoidance. That's a shame, because in the coming years, as computers become stupendously powerful—really and truly ridiculously powerful—and as electronics and other technologies begin to enhance and fuse with biology, life really is going to get more interesting.

So to produce this issue we invited articles from half a dozen people who impressed us with their achievements and writings on subjects central to the singularity idea in all its loopy glory, encompassing not just hardware and wetware but also economics, consciousness, robotics, nanotechnology, and philosophy. And with a few exceptions, we found people who are not on record as either embracing singularity dogma or rejecting it.

technology-related concept resonates with such intellectual and philosophical force.

Consciousness seems mystical and inextricably linked to organisms. What happens in the cerebral cortex that turns objective information into subjective experience—that turns chemical and neuronal activity in the mouth and nose into the taste of watermelon? pressure waves into the sound of an oboe? We don't know, but we will someday. No one argues that consciousness arises from anything but biological processes in the brain.

The brain is nothing more, and nothing less, than a very powerful and *very* odd computer. Evolution has honed it over millions of years to do a fantastic job at certain things, such as pattern recognition and fine control of muscles. The brain is deterministic, meaning that its reactions and responses, including the sensations and behavior of its "owner," are determined completely by how it is stimulated and by its own internal biophysics and biochemistry. Given those

# THE RAPTURE

On consciousness, we have John Horgan, whose book *The Undiscovered Mind* describes how the mind resists explanation. We also have Christof Koch and Giulio Tononi, neuroscientists who specialize in consciousness. Rodney Brooks, of MIT's Computer Science and Artificial Intelligence Laboratory, weighs in on the future of machine intelligence. *IEEE Spectrum* journalism intern Sally Adee reports on a wildly ambitious effort, just gathering steam now, to map the human brain in enough detail to learn its secrets—and eventually re-create it. Robin Hanson, an economist, describes a future in which capitalist imperatives and technological capabilities drive each other toward a society that the word *weird* doesn't even begin to describe. Nanotechnology researcher Richard Jones, philosopher Alfred Nordmann, and semiconductor researcher Bill Arnold all consider aspects of singularitarian visions and explain where they're myopic.

For the last word in this issue, we turned to the computer scientist and science-fiction writer Vernor Vinge. It was Vinge's 1993 essay "The Coming Technological Singularity" that launched the modern singularity movement.

That movement has evolved since then into an array of competing hypotheses and scenarios [for a rundown, see "Who's Who in the Singularity," in this issue]. But central to them all is the paradoxical yet weirdly compelling idea of a conscious machine. Arguably, no other

facts, most mathematical philosophers conclude that all the brain's functions, including consciousness, can be re-created in a machine. It's a matter of time.

Ah, but let's face it—time is what really matters. If you're obsessed with your own mortality, the idea of a computer blinking into consciousness 400 years from now isn't going to rock your world. You want the magic moment to come, say, 25 years from now at most. Unfortunately, that timetable grossly overestimates the speed of technical progress. And it underestimates the brain's awesome intricacy, as Horgan argues in his article. He, Koch, Tononi, and Adee all agree that everything we know about the central issue of brain research—how it creates consciousness, and therefore the universe each one of us inhabits—adds up to almost nothing.

What we do know is that the brain's complexity dwarfs anything we've managed to fully understand, let alone build. Koch, Tononi, and Brooks are all confident that consciousness will arise in a machine, but they are less sanguine about death-defying uploading, and especially about it happening in time to allow people alive now to preserve their minds in some sort of digitally created Eden.

Still, if you encounter my uploaded consciousness in a virtual paradise 50 years from now, feel free to tell me, "I told you so."

I won't mind a bit. □