Technology's Creatures

Sixteen essays on humanity's uncanny ability to evolve—and the toll it takes.

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LIVING WITH THE GENIE
Edited by Alan Lightman, Daniel Sarewitz, and Christina Desser
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PICTURE YOURSELF AS a protohuman, *Homo habilis*, alive in the lower Paleolithic era. Though you don't know it, your species has recently —oh, in the last half million years—started on a new evolutionary path: your australopithecine forebears in African woodlands were herbivorous, but you eat meat. To kill small animals and scavenge larger ones' remains, you shape stones and use them as you would the claws and fangs you lack. The payoff is immense: the food you can cut from the carcasses with those tools is higher in protein and fat and lower in nonnutritive fiber and poisons than anything your herbivore ancestors enjoyed. You, and each of your children's generations, consequently gain in size and strength. You move into new ecological niches and compete with more species.

After just a few hundred thousand years other changes follow. Before you began using stone implements, your hands were apelike, the fingers curved, with pointed tips. Now your finger bones are straighter, with stronger thumbs and broader tips. Your legs are longer, your arms shorter, and with your doubled total size, your body resembles a modern human's. Still, it's the growth of your brain—twice as big within a million years, three times bigger by the middle Paleolithic era—that has been most wonderful and terrible. Metabolic needs like food processing constrain most mammals' brain size; by adding meat to your diet you have reduced your gut, freeing that metabolic energy for use by your brain, and thereby enabling symbolic communication, abstract thought, and planning.

Altogether, primitive technology has catalyzed the expansion of your cognitive capabilities and the transformation of your physiology into something that would have seemed incomprehensible to your tiny australopithecine predecessors. By 50,000 BC, you have spread from Africa through what is now Asia, Europe, and Australia, and you possess a variety of tools—knives, axes, scrapers, harpoons, awls, and needles—to supplement your biological repertoire. You are now *Homo sapiens*.

Genus *Homo* has undergone little cerebral development since that point. Where once the interplay of technology, culture, and biology created a feedback loop that drove evolution of brains and bodies, this gene-culture coevolution has plateaued, with our culture continuing to evolve while our hunter-gatherer fundamentals remain unchanged.

Many people believe that before technology cultures distorted the species, human beings had lived harmoniously with nature. For example, Native Americans are often represented as having lived in a prelapsarian state, although fossil records show that they, too, hunted species to extinction. Distrust of technology has emerged in all recorded cultures: in *Primitivism and Related Ideas in Antiquity* (1935), historians Arthur Lovejoy and George Boas proved that a belief in a superior, primitive past existed as early as the fifth century BC, embedded in foundation myths like Greek mythology's Golden Age and the Bible's Garden of Eden.

In *Living with the Genie: Essays on Technology and the Quest for Human Mastery*, 16 writers discuss humanity's unhappy relationship with its defining activity. In the introduction, editors Alan Lightman (a physicist, novelist, and adjunct professor of humanities at the Massachusetts Institute of Technology), Daniel Sarewitz (head of Columbia University's Center for Science, Policy, and

Outcomes), and Christina Desser (executive director of the Funders Working Group on Emerging Technologies) write that their purpose is not "to arrive at some grand synthesis but to shine an intense...light onto the central dilemma of our times." *Somebody* decides what technologies get developed and deployed. Why shouldn't you and I be heard from? The editors insist: "We are performing a grand experiment on ourselves in the complete absence of informed prior consent. It would be possible to proceed more deliberately, more inclusively, more consciously, but this would require trading speed for prudence, economic gain for social learning."

But why not seek informed consent? There are, after all, real examples of an entire society's consenting to a new technology. For instance (although none of the contributors discusses it) there's the Decode Genetics project, founded by Kári Stefánsson, in which Iceland's population—a quarter of a million genetically homogenous people, and an ideal population for tracking the differences that contribute to disease—decided to surrender their genetic data to researchers. Several hundred citizens were educated for 18 months about the scientific issues before voting as representatives for the rest of Iceland. It would be nice to believe that this procedure is reproducible with a population the size of the United States', and that enough Americans might agree to be representatives. But could the ideological blinders be kept off?

"No" seems the likely answer, given how many of the book's essays share one pervasive, disturbing assumption. The authors (overwhelmingly American) represent differing political doctrines, and generally call for more democratic, socially accountable uses of technology. So what's disturbing? A great deal—if those who believe the function of science is to explain why things are as they are. In his essay "Blowback in Genetic Engineering," Mark Schapiro writes that "an unwillingness to ask the right questions has been the central flaw of U.S. science policy." What, according to Mr. Schapiro, are the right questions? The notion that science's job is to discover how the universe works must be dethroned, he writes. He cites Michael Crow, president of Arizona State University: "If you say, for example, that the aim of science is to more equitably distribute a higher quality of life, that in itself would change the nature of science....It would no longer be enough to say that you have helped unravel another aspect of nature and the universe." "To more equitably distribute a higher quality of life" is an admirable goal for technology—but Mr. Schapiro doesn't distinguish between *scientia* and *techne*.

After that, it's not such a stretch for another contributor, Shiv Visvanathan, to inveigh against the "moral infantilism" of science, which, by cleaving to the idea of objective truth, is a brutal threat to "plural knowledge systems, destroying and de-skilling the gene pool of knowledge." As an alternative, Dr. Visvanathan supports "cognitive justice" with "fairness and dialogue among different knowledge systems to prevent the marginalization or museumization of any of them." That some "knowledge"—say, that the Earth is flat—is verifiably false doesn't enter into it; he writes approvingly of a tribe of people who "would not till the soil when they thought it was menstruating." If this particular essayist makes for an easy target, his views represent the logical extension of an assumption shared by most of the contributors: science, and not only technology, should serve the interests of the greatest number of people. But almost all scientists believe that science's role is to inquire impartially into the world as it is, not as human beings might wish it to be.

Philip Kitcher, a philosophy professor at Columbia University, begins his essay with much throat-clearing (noting, for instance, that theological justifications for science no longer satisfy us as they once did Isaac Newton), then delivers the truism that there is a scientific agenda, and that it is ultimately set by humans. With that, he tries defining what "well-ordered science" might look like. Well-ordered science would be democratic, unlike the privatization of research, which often neglects people's interests in favor of easy profits. Dr. Kitcher admits that he can't answer the question posed in his essay's title, "What Kinds of Science Should Be Done?" but concludes that anything is better than what we are doing now. When we're sick, he writes, "we're not much moved by someone who tells a few tales about spontaneous recovery...we

want to know just when to intervene and when to leave things alone." But we don't know what we don't know, so we can't guess when to intervene and when to leave matters alone. The agenda of scientific research may reflect human biases and emphases, but the future content of science is dictated by the universe itself. A scientific hypothesis is good because it's verifiably true, not because it serves a particular political philosophy—not even one we admire, like democracy.

This nonhumanistic aspect of science, however, is what most of the contributors dislike. Dr. Visvanathan is not extreme in calling for "science as a mode of perceiving...to be localized... within a wider metaphysics of the good, the true, and the beautiful." This sentiment (if not its language) is probably typical of U.S. culture at large: the idea that science can be exactly what we wish is a popular one. In such a context, referenda in America, like the one that preceded the Decode project in Iceland, seem exceedingly unlikely.

Do the scientists in this book—a minority among the anthropologists, lawyers, journalists, and "democratic decision theorists"—enlarge the debate? Only slightly. In "Science and Happiness," Dr. Sarewitz points out that advances in science, technology, and affluence don't make us happier. Still, while most cultures may find the same level of "mopiness" (the rain forest dweller is not unhappier than the U.S. suburbanite), Dr. Sarewitz has forgotten that human beings now live, and mope, 50% longer than they did two centuries ago.

The most subversive piece here may be "The Origin of the Genie," by Kathy Schick and Nicholas Toth. By simply delineating our evolution since the lower Paleolithic era, they clarify how technology, far from suddenly threatening our humanity, redefined us from the very start. The anthropological evidence suggests we have always been technology's creatures, and the book's contributors could have addressed that record. They might have asked some interesting questions. What, for instance, is the likely prognosis—to borrow Dr. Kitcher's medical metaphor—for a society that attempts to restrict or direct technological innovation?

History instructs us that such attempts often fail, and in failing, create more misery than they avoid. Fifteenth-century China was the world's preëminent civilization until its ruling classes became frightened of new technologies and halted an incipient industrial revolution. By the 19th century, Europeans possessed such military superiority that they were able to dominate the Middle Kingdom. Today, the U.S. government is hoping to obstruct new technologies—specifically, genetic ones—even though other nations are investing in them. This attempt to freeze development will probably end badly for the United States.

Because scientific and technological progress renders accustomed ways of living obsolete, human apprehension is natural. But since science and technology are unlikely to be constrained, *Living with the Genie*'s essayists might have asked a deeper question. Humanity rates its cognitive powers highly, but we are a young species. Is our continuing accumulation of knowledge a good evolutionary strategy?

It's worthwhile to realize how freakish our intelligence is, compared to that of other animals. It's probably a side effect of another selected trait; William Calvin, a neurophysiologist at the University of Washington at Seattle, has proposed that rock throwing demanded advanced motor skills and also increased the number of neurons. Evolved for rehearsing and storing rock-throwing sequences, those brain cells were then assigned to other sequences. Where other species adapted by means of natural selection—proceeding only at the pace of biological evolution—humans could mentally simulate and solve problems. So is human intelligence just a passing aberration on the far end of life's bell curve—or at the forefront of an evolutionary trend? The answers would say a great deal about the long-term benefits of technology-using, knowledge-accumulating intelligence.

From individual experience we know that the accumulation of knowledge inevitably alters a person. New memories and pathways are created, sometimes in permanently destabilizing ways, eventually creating a different individual. For the species, too, knowledge transforms, and we may blow ourselves up—or apply our intelligence to evolve into something unrecognizable. But intelligence is the hand we were dealt, and it is the hand we must play out.