

Founding Editor's Viewpoint

Living in the "Zero Years": The Brave New World of 21st-Century Science

What an amazing time to be alive! Before and ever since we left the primordial soup, genetic mutation has fueled the enormous variety of creatures inhabiting the planet, including ourselves. But in the past century or so, we've taken the exponential leap of not relying on random changes in DNA to define life forms. We are controlling who and what we are in ways that simply boggle the mind. The process is going so quickly that we are debating issues we admittedly thought about before, but are examining now in entirely new ways. Age-old questions such as "What does it mean to be human?" begin to have very different answers than they had only 2 decades ago. Is the current science—which insists there is no reality apart from the myriad individual components of which living organisms are made—to be feared? Has this new science destroyed the concept of the soul (the "ghost in the machine," as the philosopher Gilbert Ryle put it¹), not to mention the existence of a divine, completely spiritual superpower from which all that exists has emanated? Will we use genetic manipulation to not only change the nature of who and what we are but also to synthesize new life forms, themselves capable of reproduction? (We already are.) Are we making machines so efficient and competent that they will rival and even surpass our own capacities? (We're well on our way to doing just that.) Furthermore, will we soon be designing and making ideal companions for ourselves that can be turned on and off, discarded at will, and that are free of the limitations that plague human relationships: jealousy, infidelity, contentious behavior, and deceitfulness? (Stay tuned; it's definitely on the horizon. The witty and incisive TV show, *Boston Legal*, often features characters who prefer inanimate objects or life-sized dolls as love objects, because they fear the consequences of engaging with flawed humans. The new robots we're producing are far more complex and compelling than the TV variety.)

For a world-class insomniac like myself, visiting the Edge Web site² in the early morning hours in which sleep evades me beats all other entertainment available. Many respected authors frequent the site, where their freewheeling comments make rich supplements to their books. On the Edge, maybe better than any place else in the world, you'll find the most exciting ideas of science and how they impact society: You can listen to Richard Dawkins and Steven Pinker discuss the concept of the soul,³ to George Church chat about synthetic biology,⁴ or to Pinker and Elizabeth Spelke argue about whether hardwired and important differences exist in the male and female brain.⁵

When I tire of the too-bright computer screen, I have other thought-provoking tomes at my disposal, many written by visitors to the Edge. The book I leafed through most recently after turning off my computer was edited by John Brockman, who conceived the Edge. *This Will Change Everything* is a collection of essays by some of the brightest stars in our society, detailing their predictions of what may soon be realities in the world in which we live.⁶ Some ideas are definitely counterintuitive or at least consider the possible downside of what we regard as the advantages of modern life. Alison Gopnik, for example, wonders whether the spread of education across the globe—and the longer time children are staying in school—is replacing the real-world experience obtained by an apprenticeship to a master. She worries that we'll lose the ability to make what she calls "effective decisions," and further states that "childlike brains are great for learning but not so good for effective decision-making or productive action." Gary Marcus predicts that we will eventually develop an effective working knowledge of how the brain actually manufactures thought or, as he puts it, "when we figure out how the brain manages to encode declarative knowledge" in such detail that it will be possible to upload information directly into the brain. He beautifully points out that we already have a "kind of rough geography of the brain (emotion in the amygda-

la, decision-making in the prefrontal cortex),” and he believes that we will next master precisely how all of this is achieved at the level of neuronal physiology.

Alan Alda, on the other hand, sounds a pessimistic note, opining that every time we take a quantum leap in technology, it makes us “increasingly dangerous” to ourselves.⁶ He wonders, “Will an idea or technology emerge anytime soon that will let us exit this lethal cyclotron before we meet our fate head-on and scatter into a million pieces?” (It would be nice if someone could engineer our brains to collaborate instead of destroying one another. Maybe we could upload ethical standards and plant empathy, kindness, and loyalty into our neuronal control centers so that murder would become obsolete.) Another consequence of our expanding competence might be to consider that nature, as Darwin believed, is neither supportive nor hostile; it is simply indifferent. If all forms of life continue to be confined to one planet, then death by violence, murder, and war will continue, because the competition for limited resources will make the survival of all impossible. Perhaps in the future, some of Brockman’s pundits will predict (and pursue) interplanetary travel and settlement to winnow out the excess life that by necessity will have to be accomplished if any of earth’s creatures are to survive.

Anyone reading or listening to the provocative descriptions of where we are in 2010 and where we might be headed is bound to be simultaneously astounded and terrified. The world is changing at an unprecedented pace, and we are racing toward achievements that will profoundly alter not only who and what we are, but how we live together with the other creatures on the planet. Increasingly, humans will become amalgams of machinery and protoplasm. We will make machines equal or superior to ourselves that may augment our own powers—or eventually, perhaps, threaten our own mastery of the planet. We are creating and will continue to create entirely new forms of life, themselves capable of replication and mutation. How we regulate and monitor what we bring to life may be one of the greatest challenges we face, as George Church himself not only recognizes, but consistently and thoughtfully addresses.

Darwinism explained the way we came to be ourselves. But Watson and Crick and the wizards of genomic science opened the door to exactly how that occurred and, in so doing, gave us the power to change the condition of all living things. Unfortunately for curious folks like me, most of who and what we become will evolve after our lifetimes. But I thought, putting Brockman’s book aside, what has happened and is now happening is almost enough to satisfy even the greediest of us. Certainly it gives me more than enough to think about, especially at 2 o’clock in the morning.

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