

# YOUR BIONIC FUTURE

As life and technology merge, they will both become more interesting.

By Glenn Zorpette and Carol Ezzell, *issue editors*

**TELEVISION AND SLOT MACHINES** notwithstanding, the point of technology is to extend what we can do with our bodies, our senses and, most of all, our minds. In the century now closing, we have gone from gaping at electric lightbulbs and telephones to channel-surfing past images of a sunrise on Mars, to outbursts of pique if our e-mail takes more than a few minutes to get to the other side of the world.

And in the next decade or two, the revolution is finally going to get really interesting. Several of the most important but disparate scientific and engineering achievements of the 20th century—the blossoming of electronics, the discovery of DNA and the elucidation of human genetics—will be the basis for leaps in technology that will extend, enhance or augment human capabilities far more directly, personally and powerfully than ever before.

The heady assortment of biotechnologies, implants, wearables, artificial environments, synthetic sensations, and even demographic and societal shifts defies any attempt at concise categorization. But as our title boldly proclaims, we couldn't resist resurrecting the word "bionics," lately in a state of anachronistic limbo alongside the 1970s television adventures that made it a household word. Bionics often refers to the replacement of living parts with cybernetic ones, but more broadly it also means engineering better artificial systems through biological principles. That merger of the biological with the microelectronic is at the heart of most of the coming advances.

As scientists and engineers unleash fully the power of the gene and of the electron, they will transform bits and pieces of the most fundamental facets of our lives, including eating and reproducing, staying healthy, being entertained and recovering from serious illness. Big changes could even be in store for what we wear, how we

attract mates and how we stave off the debilitating effects of getting older. Within a decade, we will see:

- A cloned human being. It is possible, in fact, that experiments are already under way in secret.
- An artificial womb for women who can't become—or don't want to be—pregnant.
- Replacement hearts and livers, custom-grown from the recipient's own versatile stem cells.
- Virtual reality that becomes far more vivid and compelling by adding the senses of smell and touch to those of sight and sound.
- Custom clothing, assembled automatically from highly detailed scans of the purchaser's body and sold at a cost not much higher than off-the-rack.
- Foods that counteract various ailments, such as noninsulin-dependent diabetes, cholera, high cholesterol or hepatitis B.
- A genetic vaccine that endows the user with bigger, harder muscles, without any need to break a sweat at the gym.

With only a few exceptions, the articles collected here extrapolate conservatively into the near future. Essentially all the predicted developments will follow directly from technologies or advances that have already been achieved in the laboratory. Take that genetic muscle vaccine: as this issue goes to press, a University of Pennsylvania researcher is exercising buff laboratory mice whose unnaturally muscular hind legs were created by injection. He has little doubt about the suitability of the treatment for humans.

The three exceptions to the mostly restrained tone of this issue are the articles by neurosurgeon Robert J. White, geneticist Dean Hamer and engineer-entrepreneur Ray Kurzweil, all of whom stake

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out positions that are controversial among their peers. White raises the possibility of making the Frankenstein myth a reality as he declares that medical science is now capable of transplanting a human head onto a different body. Hamer uses today's scientific fact and his best guesses about tomorrow's technology to sketch a fictional account of a couple in the year 2250 customizing the genes that will underlie their baby's behavior and personality. Kurzweil argues not only that machines will eventually have human thoughts, emotions and consciousness but that their ability to share knowledge instantaneously will inexorably push them far past us in every category of endeavor, mental and otherwise.

Regardless of whether we ever see Frankenstein's monster, much less conscious machines, we already have enough details of the more immediate bionic future to let us raise some of the deeper questions about what it means. Depending on your viewpoint, there are plenty of uncomfortable if not alarming possible outcomes. Athletic competition, for example, could devolve into baroque spectacles that decide, basically, whose genetic enhancements (and work ethic) are best. Of course, it would be difficult to argue that such games would be intrinsically less interesting than today's contests, which pretty much decide whose natural genes (and work ethic) are best.

Since the 1970s such possibilities have tended to inspire relatively dark cultural movements. Examples include an entire sub-genre of dystopian science fiction and one mad bomber. Historians and philosophers, too, are more likely now to analyze the negative

ramifications of technology or even to attribute the endeavor to odd or unwholesome urges. Perhaps no one has written more entertainingly on the subject than the scholar William Irwin Thompson. In his 1991 book *The American Replacement of Nature*, he wrote:

In truth, America is extremely uncomfortable with nature; hence its culturally sophisticated preference for the fake and nonnatural, from Cheez Whiz sprayed out of an aerosol can onto a Styrofoam potatoed chip, to Cool Whip smoothing out the absence of taste in those attractively red, genetically engineered monster strawberries. Any peasant with a dumb cow can make whipped cream, but it takes a chemical factory to make Cool Whip. It is the technological process and not the natural product that is important, and if it tastes bad, well, that's beside the point, for what that point is aimed at, is the escape from nature.

In the next decade or two the flight from nature will soar to new heights. The bright side of this transformation is potentially dazzling enough to drown out some of the dark visions. That is always the hope, of course. But the case now is unusually strong even if we base it on nothing more than the likelihood of powerful, sophisticated treatments for a host of dread genetic diseases and the frailties of old age. Those willing to grasp the implications of the coming fusion of biology and technology, with all its potential for beneficence and havoc, will find the exercise exhilarating.



ZACH GOLD (woman); KOB StockFood (strawberry)