

Preface to "Genetic Enhancement of Human Abilities"

Genetic Engineering, 2006

Sally Deneen, "Designer People," *E/The Environmental Magazine*, January 2001. Copyright © 2001 by Featurewell.com. Reproduced by permission.

Sally Deneen is a freelance writer who lives in Seattle. In the following selection she describes some of the predictions that have been made about genetic enhancement of humans and some of the problems that such enhancement might cause. Opponents, she states, say that it would be risky and would require long experimentation involving many malformed babies and miscarriages. Others call for a ban on the modification of genes passed to children, even if it becomes safe, because they feel it would change people into products or would violate basic environmental and ethical principles. Another objection often raised is that those who could not afford gene enrichment might be relegated to second-class citizenship. However, Deneen reports, some opponents recognize that advocates of human enhancement include powerful and influential people who will not give up easily.

Princeton University microbiologist Lee M. Silver can see a day a few centuries from now when there are two species of humans—the standard-issue "Naturals," and the "Gene-enriched," an elite class whose parents consciously bought for them designer genes, and whose parents before them did the same, and so on for generations. Want Billy to have superior athletic ability? Plunk down the cash. Want Suzy to be exceptionally smart? Just pull out the Visa card at your local fertility clinic, where the elite likely will go to enhance their babies-to-be.

It will start innocently enough: Birth defects that are caused by a single gene, such as cystic fibrosis and Tay-Sachs disease, will be targeted first, and probably with little controversy. Then, as societal fears about messing with Mother Nature subside, Silver and other researchers predict that a genetic solution to preventing diabetes, heart disease and other big killers will be found and offered. So will genetic inoculations against HIV. Eventually, the mind will be targeted for improvement—preventing alcohol addiction and mental illness, and enhancing visual acuity or intelligence to try to produce the next Vincent Van Gogh or Albert Einstein. Even traits from other animals may be added, such as a dog's sense of smell or an eagle's eyesight.

What parents would see as a simple, if pricey, way to improve their kids would result, after many generations of gene selection, in a profound change by the year 2400—humans would be two distinct species, related as humans and chimps are today, and just as unable to interbreed. People now have 46 chromosomes; the gene-enriched would have 48 to accommodate added traits, Silver predicts in his aptly titled book, *Remaking Eden...*

An Accelerating Timetable

How soon will all this happen? Silver believes that by around 2010 parents will be able to genetically ensure their babies won't grow up to be fat or alcoholic, and by 2050 arrange to insert an extra gene into single-cell embryos within 24 hours of conception to make babies resistant to AIDS. It is already possible to insert foreign DNA into mice, pigs and sheep. The obstacles to inserting them in humans are mainly technical ones. At this point in human knowledge, it could lead to mutations. Several techniques are under development to try to avoid that, however.

"For the near and midterm future, we're looking at science fiction. You'd have to be terminally reckless to do that type of human engineering on people [with what we know now]," argues law professor Henry T. Greely, co-director of the Program in Genomics, Ethics and Society at the Stanford University Center for Biomedical Ethics.

To change a baby's eye color or hair color within a fertilized human egg "would be a very expensive and dangerous proposition for such trivial purposes," says Dr. Marvin Frazier, who fields human genome questions as director of the Life Sciences Division of the U.S. Department of Energy's Office of Biological and Environmental Research. "It is also my opinion that this would be wrong," he added, "but that will not stop some people from wanting to try."

As for manipulating intelligence or athletic ability, Frazier says it will take scientists many decades to figure out how to do it. These particular traits don't rely on one gene, but on all genes. They also rely "to a significant degree" on nurture instead of nature. Even when scientists figure it out, "It is likely that to achieve the desired goals would require a lot of experimentation, which translates into many hundred or thousands of mistakes before you get it right." That means, Frazier says, "a lot of malformed babies and miscarriages."

A Pivotal Moment

To University of Washington professor Phil Bereano, among others, now is the time for all of us to talk with friends and colleagues to hash out the ethical and societal implications of this Brave New World. Do we really want to commodify people? Could it be a Pandora's box? Unfortunately, the box may already be open: Many nations have banned genetic engineering on humans, but the United States has not.

"If scientists don't play God, who will?" said supporter James Watson, former head of the Human Genome Project, speaking before the British Parliamentary and Scientific Committee in June [2000]. "The key question is not whether human [genetic] manipulation will occur, but how and when it will," says a confident Gregory Stock, director of UCLA's Program on Science, Technology and Society in a report entitled, "The Prospects for Human Germline Engineering."

Meanwhile, a long-anticipated September [2000] report by the American Association for the Advancement of Science (AAAS) surprised some observers by failing to call for a ban on making inheritable genetic changes in humans—that is, genetic changes that would be carried on by progeny. Indeed, while the report says that such research "cannot presently be carried out safely and responsibly on human beings," it also leaves wiggle room. "Human trials of inheritable genetic changes should not be initiated until reliable techniques for gene correction or replacement are developed that meet agreed-upon standards for safety and efficacy," says report co-author Mark Frankel, director of AAAS' Scientific Freedom, Responsibility and Law Program.

Noting the public outcry after the cloning of Dolly the sheep—which raised the possibility of cloned human beings—the report stresses the importance of public discussion about genetic research before major technical innovations occur. So instead of a ban, the report suggests "rigorous analysis and public dialogue."

But there's no shortage of opposition to human engineering. The San Francisco-based Exploratory Initiative on the New Human Genetic Technologies seeks, among other things, to alert a largely unwitting public to what is going on. "It really is a nightmare vision," says Rich Hayes, who coordinates the campaign from his Public Media Center office. "Once we start genetically re-engineering human beings, where would we stop? We should have the maturity and wisdom to ban the modification of the genes we pass to our children."

Designer Genes

The futuristic notion of choosing a child's genes from a catalog can certainly capture the imagination. Just as parents today enroll their children in the best possible schools and pay for orthodontics, the parents of the

future—perhaps in a few decades—would be able to choose from an ever-increasing suite of traits: hair color, eye color, bigger muscles and so on.

Maybe they'd like to add a few inches to a child's height. Or improve a kid's chances at longevity by tweaking inherited DNA. Or ensure a resistance to viruses. Neighborhood clinics could, by appointment, insert a block of genes into a newly fertilized egg. As one cell broke into two, then four, and so on, each cell would contain the new traits. And the child would pass on those traits to all subsequent generations. Who could blame parents for going for this?

But to Stuart Newman, professor of cell biology and anatomy at New York Medical College in Valhalla, New York, the effect on human biology could be analogous to transforming wild areas into artificial areas, or wild food into artificial food.

We "might be changing people into products—genetically engineered products," says Newman, who also is chairman of the Human Genetics Committee for the Council for Responsible Genetics in Cambridge, Massachusetts. "That's something that's opened up by the Humane Genome Project."

"We believe that certain activities in the area of genetics and cloning should be prohibited because they violate basic environmental and ethical principles," Friends of the Earth President Brent Blackwelder and Physicians for Social Responsibility Executive Director Robert Musil said in a 1999 joint statement. "The idea of redesigning human beings and animals to suit the primarily commercial goals of a limited number of individuals is fundamentally at odds with the principle of respect for nature."

Proponents and critics alike envision a future in which those who can't afford gene enrichment will be relegated to second-class citizenship. "As far as I'm concerned, this thrill we have about the future will end up being one big elitist ripple," says Beth Burrows, director of the Edmonds Institute, a suburban Seattle nonprofit institute that works on issues related to environment, technology, ethics and law.

The Green Dimension

And what about the environment? Burrows says several important questions arise about genetic tampering: What are we creating? How will it affect the natural world? What will be the effect on evolution for each species involved? How will it change feeding patterns, or food for other animals? Without understanding interactions, she says, "We may do some extremely stupid things. If people are concerned that there was such a severe backlash against genetically modified foods, I think they haven't seen anything compared to the backlash when we are able to alter the human genome in significant ways—even insignificant ways," says Burrows.

UCLA's Gregory Stock agrees the impact of human genetic modification is profound, but he likes it. "This technology will force us to re-examine even the very notion of what it means to be human," he wrote in a recent report. "For as we become subject to the same process of conscious design that has so dramatically altered the world around us, we will be unable to avoid looking at what distinguishes us from other life, at how our genetics shapes us, at how much we are willing to intervene in life's flow from parent to child."

Ignacio Chapela of the University of California at Berkeley is troubled by still other implications the Human Genome Project may bring for the natural world—including plants engineered specifically to produce human proteins, and pigs produced to have antigens that are more human-like in a quest to help humans. To Chapela, a professor in the Department of Environmental Science, Policy and Management, the concept, say, of using chimpanzees as surrogate mothers for human embryos is "abhorrent—degrading for chimpanzees, and for

humans, as well. I think what we're talking about is a very deep understanding of what it means to be part of an intricate web of life, and why we have boundaries between species." To Chapela, proponents see the world as a sphere smeared with mix-and-match DNA. "Evolutionarily, it makes sense to have boundaries," he says, "and we're just willy-nilly breaking them down."...

A Brave New World

UCLA's Stock isn't concerned about the effects of human genetic engineering on nature. "Even if half the world's species were lost, enormous diversity would still remain," he argues in his 1993 book, *Metaman: The Merging of Humans and Machines into a Global Superorganism*. "We best serve ourselves, as well as future generations, by focusing on the short-term consequences of our actions rather than our vague notions about the needs of the distant future—if medical science develops an easy cure for cancer, [nuclear] wastes may not be viewed as a significant health hazard after all. If robots can be employed to safely concentrate and reprocess the radioactive materials, they might even be valuable."

Not so fast, says another architect of the modern world, Bill Joy, the father of Java software and co-founder of Sun Microsystems. Joy posits with some feeling of guilt that "our most powerful 21st-century technologies are threatening to make humans an endangered species." In a celebrated article in *Wired* magazine, Joy blamed the possible extinction of humans on a few key causes, including genetic engineering and robotics. Artificial intelligence should match that of humans within 20 or 30 years.

To combat the perceived inevitability of this Brave New World, Marcy Darnovsky, a Sonoma State University instructor who works with the Exploratory Initiative on the New Human Genetic Technologies, calls for three things: First, a global ban on inheritable genetic engineering on humans; second, a global ban on human reproductive cloning; and third, an effective and accountable regulation of other human genetic technologies.

Burrows says we need to be pondering such weighty questions as: Do we really want to merge with machines? "There are tremendous—awful—choices to be made," she says. "It's very risky to have these discussions because they're about common values. The subject is difficult, painful and easily avoided. But we have to stop focusing on the science and think of ourselves as part of an ecosystem."

Chapela is also worried about the lack of civic discourse. But the advocates are talking, particularly among themselves. At a Berkeley conference, one of them, Extropy Institute President Max More, stood before the crowd and read an open letter to Mother Nature:

Sorry to disturb you, but we humans—your offspring—come to you with some things to say:

You have raised us from simple self-replicating chemicals to trillion-celled mammals;

What you have made us is glorious, yet deeply flawed;

We will no longer tolerate the tyranny of aging and death. Through genetic alterations, cellular manipulations, synthetic organs, and any necessary means, we will endow ourselves with enduring vitality and remove our expiration date.

Other proponents are more sober, and include Nobel laureate scientists. "This is no 'marginal' movement or way of thinking," Chapela says. "The group advocating human re-engineering includes extremely powerful, influential and wealthy people. So don't expect them to roll over easily or soon."
