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Selective Science

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In the late 1950s, soon after Watson and Crick had discovered DNA's structure, scientists began predicting that someday we'd be able to genetically engineer our children. We'd design them to be healthy, smart and attractive, with life spans of 200 years, photographic memories, enhanced lung capacity for athletic endurance, and more. Our children would pass these modifications to their own children and add new ones as well. Humanity would take control of its own evolution and kick it into overdrive.

Few people took these speculations very seriously. Could this sort of genetic engineering really be done? Even if it could, would anyone really want to do it? If they did, wouldn't society step in and set limits? In any event, wouldn't it be decades before we'd have to worry about this?

Now it's 2004, and those decades have passed. The era of genetically modified humans is close upon us. Almost every day we read of new breakthroughs: cloning, artificial chromosomes and now high-tech sex selection. Scientists create genetically modified animals on an assembly-line basis. Biotech entrepreneurs discuss the potential market for genetically modified children at investors' conferences. For the most part, society has not stepped in and set limits.

Last year Science magazine reported that a variant of the human 5-HTT gene reduces the risk of depression following stressful experiences. Depression can be a devastating condition. Would it be wrong if a couple planning to start a family used in vitro fertilization procedures to have the 5-HTT gene variant inserted into the embryos of their prospective children? Taken as an iso-

lated instance, many people would be hard-pressed to say that it was.

In 1993, University of California at San Francisco biochemist Dr. Cynthia Kenyon discovered a variant of the DAF-2 gene that doubles the two-week life span of nematode worms. The university filed for patents based on knowledge of the metabolic pathway regulated by the human version of the DAF-2 gene. In 1999, Kenyon and others founded Elixir Pharmaceuticals, a biotech firm. In early 2003, Elixir licensed the university's patent rights to Kenyon's discoveries and secured \$17 million in private financing. In an earlier interview with ABC News, Kenyon said she saw no reason humans might not be able to achieve 200-year life spans.

Last June at Yale University, the World Transhumanist Association held its first national conference. The Transhumanists have chapters in more than 20 countries and advocate the breeding of "genetically enriched" forms of "post-human" beings. Other advocates of the new techno-eugenics, such as Princeton University professor Lee Silver, predict that by the end of this century, "All aspects of the economy, the media, the entertainment industry, and the knowledge industry [will be] controlled by members of the GenRich class... Naturals [will] work as low-paid service providers or as laborers..."

What happens then? Here's Dr. Richard Lynn, emeritus professor at the University of Ulster, who, like Silver, supports human genetic modification: "What is called for here is not genocide, the killing off of the population of incompetent cultures. But we do need to think realistically in terms of the 'phasing out' of such peoples....Evolutionary progress means the extinction of the less competent."

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Notice that I've gone, in just four steps, from reducing susceptibility to depression, to extending the human life span, to the creation of a genetic elite, to proposals that genetically inferior people be "phased out."

When first presented with this scenario, people typically respond in one of two ways. Some say, "It's impossible." Others say, "It's inevitable." Notice what these otherwise diametrically different responses have in common: both counsel passivity. If the "post-human future" is impossible, there's no need to try to prevent it. If it's inevitable, such efforts would be in vain.

Will it actually be possible to genetically engineer our children? Most scientists who have studied this question conclude that although the techniques need to be refined, there's no reason to believe it can't be done. Meanwhile, research on stem cells, cloning, artificial chromosomes and more continues to refine those techniques.

Many people believe that to suggest that manipulating genes can affect behavioral and cognitive traits in humans is to indulge discredited ideologies of "genetic determinism." It's true that the crude sociobiology of the 1970's has been discredited, as have simplistic notions that there exist "I.Q. genes" or "gay genes" that determine one's intelligence or sexual orientation. But to say that genes have no influence over traits is equally simplistic. Some genes have minimal influence, others have greater influence. Some have influence in the presence of certain environmental factors but no influence otherwise. Few genes determine anything; most confer propensities.

Suppose scientists found a gene giving male children a 15 percent greater chance of growing one inch taller than they would have grown without that gene, all else equal. If fertility clinics offered to engineer embryos to include this gene, would there be customers?

Yes. Couples would say, "In this competitive world, I want to do anything I can that might give my child an edge."

Once we allow children to be designed through embryo modification, where would we stop? If it's acceptable to modify one gene, why not two? If two, why not 20? Or 200? There are some 30,000 genes in the human genome. Each contributes, in smaller or larger proportions, to some propensity. Where would we stop? On what grounds?

Some suggest we allow embryo modification for certified medical conditions and prohibit it for cosmetic or enhancement purposes. It's unlikely that this would succeed. Prozac, Viagra and Botox were all developed for medical purposes but in the blink of an eye became hugely profitable cosmetic and enhancement consumer products.

Will the use of genetic engineering to redesign our children exacerbate inequality? Amazingly, the neo-eugenic advocates don't deny that it will. As good libertarians, they celebrate free markets and social Darwinism, and counsel us to accept a rising tide of genetically enhanced inequality as the inevitable result of human ingenuity and desire.

But couldn't this be prevented? Wouldn't society step in? Several years ago, a team of health policy academics examined a range of proposals, including systems of national health insurance making eugenic engineering available to all, or preferentially to the poor, or by lottery. Despite their best efforts, they couldn't identify any realistic set of policies that would prevent the new eugenic technologies, once allowed at all, from generating unprecedented inequality.

And consider the international implications. What happens when some country announces an aggressive program of eugenic engineering explicitly intended to create a new, superior, omni-competent breed of human? What does the rest

of the world do then?

We need to take a deep breath and realize what is going on here. The birth of the first genetically modified child would be a watershed moment in human history. It would set off a chain of events that would feed back upon themselves in ways impossible to control.

Everything we experience, everything we know, everything we do is experienced, known and done by a species—homo sapiens—which evolved through natural selection over hundreds of thousands of years. We differ as individuals, but we are a single human species with a shared biology so fundamental to what we are that we are not even conscious of it, or of the manifold ways it unites us. What happens if we begin changing that fundamental shared biology?

Three hundred years ago the scientific and political leaders of that era took as a self-evident fact the division of humanity into "superior" and "inferior" types, designed by Providence respectively as masters and slaves. Human beings were bred, bought and sold, like cattle or dogs. After three hundred years of struggle and bloodshed we are on the verge—barely—of putting this awful legacy behind us.

Or maybe not. If left uncontrolled, the new human genetic technologies could set us on a trajectory leading to a new Dark Age in which people are once again regarded as little better than cattle or dogs. Here is "bioethicist" Gregory Pence, who has testified in support of human cloning before the U.S. Congress and elsewhere:

"[M]any people love their retrievers and their sunny dispositions around children and adults. Could people be chosen in the same way? Would it be so terrible to allow parents to at least aim for a certain type, in the same way that great breeders... try to match a breed of dog to the needs of a family?"

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The common initial responses to the prospect of the new techno-eugenics—“It’s impossible,” and “It’s inevitable”—are incorrect and unhelpful. The response we need to affirm is at once more realistic and more challenging: the techno-eugenic future certainly is possible, and is certainly not inevitable.

In 1997, the Council of Europe negotiated an important international agreement, the Convention on Biomedicine and Human Rights. Thus far, it has been signed by more than two-thirds of the Council’s 45 member countries. The Convention draws the lines on human genetic modification in just the right ways. It allows medical research, including stem cell research, to continue, and does not restrict abortion rights, but it bans genetic modifications that would open the door to high-tech eugenic engineering. Many countries in Asia, Africa and Latin America have like-

wise begun to address these issues through legislation.

These efforts are encouraging, but we have a long way to go before such policies are implemented, as they must be, worldwide. In some countries, notably the United States, the politics of the new genetic technologies have become polarized to the point of gridlock. The religious right insists on total bans on nearly all human embryo research, while bio-research interests and the biotech industry insist on nearly total freedom from any meaningful social oversight and accountability.

In other countries, and at the international level, the challenge of a new high-tech, free market eugenics, while worrisome, can seem remote in comparison with the real existing challenges of warfare, hunger and disease.

What is to be done? More than anything, we need to realize the unprecedented nature of the challenges that the new human genetic technologies present. We need to distinguish benign applications of these technologies from pernicious ones, and support the former while opposing the latter. Concerned organizations and individuals need to engage these challenges and make their voices heard worldwide. National and international leaders in politics, the sciences and the arts need to declare that humanity is not going to let itself be split asunder by human genetic technology. The United Nations and other international bodies need to give these issues the highest attention. The hour is late. There is no greater challenge before us.

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