

# Enhancing humanity? Manipulating the genetic code: manipulating the genetic code

by [Donald W. Shriver](#) in the [March 7, 2001](#) issue

When two groups of scientists announced in mid-February that they had finished mapping the human genome, scientists, politicians and journalists paid rapt attention. The human genetic code has been deciphered! We are on our way at last to obeying scientifically the old Delphic oracle: Know thyself!

Debate over the significance of the discovery and how it will be used in therapeutic or reproductive medicine is well under way. What does it mean that we now know the genetic building blocks of human life? Two leaders of the genome project, J. Craig Venter and Francis Collins, both warned against the notion that human choices are “hard wired into DNA and [that] free will goes out of the window.” Among the human choices, of course, has been the decision of scientists, politicians and corporations to invest in the genome project. Nothing “hard-wired” there.

Theologians have always believed that, whatever its scope, human freedom is bounded. (The most interesting theological question has always been whether the freedom of our Creator is bounded or boundless.) And I have to confess that geneticists’ views of freedom have worried me less than the fate of another human capacity that is sometimes present, and sometimes lacking, in scientific pronouncements: wonder.

I am most likely to trust scientists who retain their capacity for wonder, especially in the realm of current genetic research. One such scientist is Herbert Boyer, founder of Genentech, Inc., a company that specializes in the micro-universe of DNA. In a commencement address at the University of Pittsburgh, Boyer told graduates that “wonder is what sets us apart from all other life forms. . . . No other species wonders about the meaning of existence or the complexity of the universe or themselves. . . . It is difficult to imagine a world in which there is nothing left to wonder about.”

In genetic research the facts themselves are wonderful—even incredible. The human individual, we are told, consists of some 100 trillion cells. The 46 chromosomes in those cells, placed end to end, would stretch six feet. The chromosomes of 100 trillion cells would stretch 113 billion miles, or 610 round trips between earth and sun. If reduced to print, our personal genetic code would run the length of 800 Bibles.

Last year, 40 Chinese scientists, philosophers and theologians met with a half dozen Americans to ponder this new, portentous science. Ironically, we gathered in Zhoukoudian, the village near Beijing where the remains of 500,000-year-old “Peking Man” were uncovered in 1927. As Peking Man’s descendants, we debated whether we should invade and manipulate the genetic code that we have inherited from our ancient ancestors.

The meeting resonated with hopes and cautions. How can we not hope for a genetic cure of such dread diseases as cystic fibrosis, Alzheimer’s and Huntington’s? And if we can engineer those cures, why not seek other enhancements in our species—intelligence, longevity, special skills, more beautiful bodies? The technology for achieving these feats may not exist yet, but excitement over genetic “improvements” among biological and medical researchers is not just speculative. We could be on the edge of deciding to speed up our own species’ evolution. If so, in what direction should we want to evolve?

This meeting was sponsored by the Global Academy Forum and the Link Foundation at the initiative of John Naisbitt (*Megatrends*, 1982, and *High Tech/High Touch*, 1999). It was premised on the assumption that genetic science concerns the relations of a remote human past to a remote human future, and thus requires a long public dialogue. Chinese scholars agreed on three points. First, no one country, institution or ideology can be trusted to guide the use of genetic knowledge for “enhancing” the human future. Second, compassion for gross suffering compels us to continue investigating genetic therapy for dread diseases. Finally, “germ-line” manipulation for “improving” humanity is a risky business that we are not close to knowing how to undertake wisely.

The Chinese themselves have initiated certain official controls over human reproduction that make most Americans uncomfortable. Health authorities ask couples who harbor major genetic defects to remain childless. A pregnant woman whose fetus is discovered to have Down’s syndrome is pressured to abort. By

contrast, amniocentesis (prenatal investigation of the baby) is forbidden by law in light of the danger that in China, with its one-child-per-family policy and a male-child cultural preference, the balance between men and women could be radically skewed.

In general, however, Chinese participants agreed with Western policymakers that intervention in human stem cells (the undifferentiated earliest cells of the human conceptus) presents more risk than promise. This conservatism matches European policies that prohibit experimentation in stem-cell manipulation for the purpose of permanently changing the physique of our lineal descendants. Who has the wisdom to correct a million years of human evolution? As He Guang-hu of the Institute of World Religions of the Chinese Academy of Social Sciences said, let's stop and think before we start imposing our priorities on our descendants.

Unfortunately, the prospect that we will collectively "stop and think" is discouraged by scientific, economic and political pressures. Leaders in these realms are not accustomed to waiting. In addition to pure scientific curiosity, there is the eagerness of parents and corporations to explore the promise of genetic engineering. Their hopes are already shaping the directions of research.

Among the warnings voiced at the conference was one by Xu Zhi-Wei, a professor of molecular biology, medicine and bioethics. Xu raised the following concerns:

- Contrary to some images of the human genome, our genetic inheritance functions *dynamically* and not deterministically. From conception to maturity, prenatally and postnatally, genes interact with environments of other genes, cells, organisms, ecosystems and societies. From start to finish, we are creatures of both nature and nurture. No scientist is close to understanding all the interactions of our trillions of constituent parts. If a single gene has 20 or more functions in an organism, how can we be sure that when we change its relation to a dread disease, we will not also be changing its relation to what keeps us healthy?
- Genetic science is a contingent, uncertain affair. It deals with factors hidden from our most intelligent inquiry. Among the contingencies are the unpredictable environment challenges that our descendants may have to cope with. We might alter the germ line of the present generation, only to cripple the human capacity to adapt to those challenges in the future.

- As in all research, medical knowledge precedes medical therapy, and the gap between the two may negatively impact individuals in society. Justly enough, many countries are proposing legislation that would protect individuals from discrimination in employment, educational opportunity, marriage and the right to bear children on the basis of knowledge about their genetic vulnerability. Police and the courts have found a new tool for criminal investigation in the analysis of DNA. But what if the knowledge that someone is likely to develop cystic fibrosis within ten years becomes a reason to deny him or her health insurance, a job or loan?
- Finally, the likelihood of caution and controls in genetic research is severely endangered by the autonomy of science and its profit-seeking corporate partners. Economically and medically, “availability creates demand,” noted Xu. Corporations assume this when they invest millions in genetic science. Their potential customers include not only persons in danger of inheriting various diseases but also parents ambitious for their progeny. Given the power of the free market and these potential customers—parents—can we really prohibit experiments on improving the human germ line?

Both Western and Eastern participants were conservative about improving the unborn future members of our species but cautiously hopeful about healing the ills of the living. If we can *safely* deliver ourselves and our descendants from certain dread diseases, we should probably do so.

Many Chinese, however, fear that powerful Western corporations and governments will monopolize the discussion. What is the line between a healthy human being and an “improved” one? As the science now stands, successful somatic genetic therapy for living individuals is probably more difficult than manipulation of stem cells. Therein lies temptation. The rule “we can do it, therefore we must do it” is appealing logic in scientifically oriented societies. From the atomic bomb of 1945 to auto traffic congestion in Chinese and American cities, we know what happens when this rule gets followed with little concern for negative side effects.

Moreover, even if we agree globally that certain diseases should be high on the list of desirable cures, they could become hugely expensive. Then the gap between an elite of medical privilege and a mass of earth’s medically deprived would be bound to grow. Already in HMO-beset and underinsured America, it is money, not medical knowledge, that often determines who and what get treated. Do we want to live in a world where 35,000 children die each day from nutrition-related diseases while rich

people pay millions to improve the IQ of their offspring?

The century that gave us atomic weapons was not able to teach us how to control their use. The same caution applies a fortiori to genetic science and engineering. Disposing of nuclear power plant waste is hard enough, but reversing alterations in stem cells could be harder.

I left Beijing with new knowledge of the current state of genetic arts and sciences. More profoundly, I left with new respect for the long history of human evolution, for the multitude of anonymous contributors to our modern being and well-being. Most of all, I left with a new feeling of astonishment.

The Hebrew prophet in Psalm 139 describes us earth creatures as “fearfully and wonderfully made.” He had no knowledge of DNA, nor did he think “genome” when he imagined himself emerging from “the depths of the earth.” But he knew enough to marvel that from that next-to-nothing beginning of himself there came forth an intricately wrought being. He knew little of science but much of reverence. So should we, before we dare to control our own evolution.