



Our Biopolitical Future

FOUR SCENARIOS

BY RICHARD HAYES

Center for Genetics and Society

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Our Biopolitical Future: Four Scenarios

By Richard Hayes

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Our Biopolitical Future

FOUR SCENARIOS

BY RICHARD HAYES

Emerging genetic technologies could radically reshape the world, for good or ill.

MOST OF US WOULD ENJOY BEING HEALTHIER, smarter, more attractive, and longer-lived. But we also know there can be too much of a good thing. If we're overweight it makes sense to reduce, but anorexia can be lethal. A nice haircut can make us feel good, but repeated, expensive cosmetic surgery can bring more complications than compliments. Most of us understand this, and learn to lead full and productive lives within the natural range of diversity that comes with being human.

But what if that natural range of diversity no longer applied? What if it were possible to radically enhance our looks, brains, athletic abilities, and life-span with, say, injections of customized genes? What if we could design our children with chromosomes purchased from a catalogue?

Scientists have long speculated that genetic technology would someday allow us to manipulate our own genes. In the past such musings were dismissed as fanciful, or as so far in the future that they didn't need to be taken seriously.

Now, hardly a day passes without news that researchers have discovered another gene that appears to influence the development of a particular human trait. Genetically modified animals are a staple of laboratory research. Fertility clinics offer an increasing array of procedures to manipulate human embryos. Noted scientists announce, with barely disguised anticipation, that we are about to enter the post-human epoch, like it or not.

A hallmark of the human species is the ability to intentionally manipulate objects of nature. But not until now have humans been able to intentionally manipulate the biological foundations of *human* nature. Our common biological nature evolved over many millennia but has been essentially stable

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over the few thousand years during which modern human values, behaviors, and institutions have developed. The ability to manipulate human nature—in effect, to make the agent of change an object of change—destabilizes both the biological and the social foundations of the human world.

How do we even begin to think about what this might mean? In recent years developments concerning the new human genetic technologies have been interpreted in many countries largely through the familiar frameworks of abortion politics and the culture wars. Religious conservatives were among the most vocal early opponents of human cloning, stem cell research, and related procedures, and many liberals and progressives reflexively assumed that the enlightened position was therefore to embrace these technologies.

While understandable, this is nonetheless simplistic and misleading. The same genetic technologies that might be used to prevent or cure many widespread diseases and debilitating conditions will allow forms of genetic manipulation that could endanger equality, social justice, human rights, and other core progressive values.

There’s no reason we can’t draw lines that protect abortion rights and medical research while prohibiting applications of genetic science that open the door to profoundly undesirable outcomes. But to do so we need new interpretive frameworks to help us understand what’s at stake and what our options are.

FOUR BIOPOLITICAL SCENARIOS

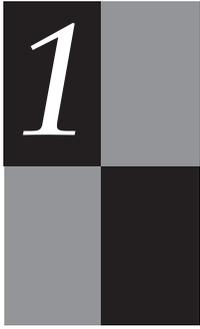
The four scenarios of the human biopolitical future presented below may help us think through these issues. They take place over the 15-year period from 2007 through 2021.

A central theme is the tension between libertarian and communitarian values. Humans evolved with tendencies both to compete and to cooperate, and societies have varied in the emphasis they give to one tendency or the other. Environmentalists are familiar with the libertarian/communitarian tension as *the tragedy of the commons*: an individual may benefit by polluting a river or the atmosphere, but if everyone seeks to benefit in this manner everyone suffers.

An appreciation of this tension affords us a richer understanding of today's political landscape. The conflict between Left and Right has historically centered on different levels of concern regarding *equality*. The conflict between libertarians and communitarians centers on different levels of concern regarding *solidarity*, that is, the willingness to forego individual desires in the interest of the community as a whole. In the United States the political landscape thus includes the *libertarian right* (e.g., Milton Friedman and the Cato Institute), the *libertarian left* (much of the 1960s counterculture and Hollywood), the *communitarian right* (religious and social conservatives, and some neoconservatives) and the *communitarian left* (labor unions, the religious left, social justice advocates, and many environmentalists).

Our four scenarios suggest ways that different combinations of these values might give rise to alternative human biopolitical futures. In "Libertarian Transhumanism Triumphs," both left- and right-libertarian values prevail. In "One Family, One Future," communitarian values grounded in quasi-religious solidarity and patriarchy prevail. In "A Techno-Eugenic Arms Race," a lethal mix of communitarian nationalism and libertarian techno-capitalism spins out of control. The scenario "For the Common Good" is grounded in communitarian values of the sort historically associated with social democracy and liberal internationalism.

It's unlikely that the future will play out precisely as sketched in any one of these scenarios. But there *will* be a future. The more we are clear about those futures we wish to avoid and those we would welcome, the easier it will be to figure out what we are called to do now.



Libertarian Transhumanism Triumphs

Individualist social values and free-market economic values combine with powerful new genetic technologies to launch humanity along a new post-human trajectory.

THE OPENING YEARS OF THE 21ST CENTURY were marked by controversy over cloning, stem cells, and human genetic modification (see sidebar, p. 6, for definitions). Despite concern about fraudulent cloning claims and unethical gene therapy experiments, genetic technology was increasingly seen as part of a progressive vision that rejected outworn, traditionalist values and embraced a bright future of technological innovation and economic growth.

During this same period libertarian sentiment grew rapidly among many Americans, encouraged by a well-funded network of think tanks, bloggers and entrepreneurial scientists. By 2009 their ideology of “free markets, free choice, free bodies,” was spreading at the expense of both religious conservatism and social democratic liberalism. Democrats and Republicans alike argued in favor of free trade, school vouchers, deregulation, privatization, personal retirement accounts, pharmacological freedom, and repro-genetic autonomy.

With visions of trillion-dollar markets waiting to be served, global biotech conglomerates raced to develop technologies allowing parents to screen embryos for behavioral and cosmetic traits. For the other end of the life-cycle, these same firms established high-tech life-extension and cryonics facilities throughout the world, most lucratively in small countries proudly advertising their lack of regulatory oversight.

Among the earliest adopters of genetic modification were athletes, and the public turned out in droves to see gene-doped competitors break one record after another. Despite hand-wringing from an older generation of sports professionals and a short-lived protest movement by concerned parents, by 2011 athletics was fast becoming a contest of competing genetic interventions rather than innate ability, coaching and practice.

“With visions of trillion-dollar markets waiting to be served, global biotech conglomerates raced to develop technologies allowing parents to screen embryos for behavioral and cosmetic traits.”

A major threshold was crossed in 2013, when Swedish scientists announced the birth of the first true “designer baby,” that is, a child able to pass its modified genes to its own children. Although ostensibly developed to prevent congenital disease, within four years the procedure was being offered commercially for a wide range of aesthetic, cognitive, and performance enhancements. The cost of a designer baby was high (about US\$235,000), but affluent couples flocked to the new “better baby” clinics to ensure that their children had the best genes money could buy.

Meanwhile the transhumanist movement, which had started as a fringe group of sci-fi cultists in Los Angeles in the early 1990s, was growing into a major social force. The transhumanists were obsessed with the prospect of reconfiguring the human species and the rest of the natural world through genetic modification, nanotechnology, and synthetic biology. The combination of libertarian politics and transhumanism resonated strongly with ambitious young technophiles throughout the world, and an increasing number of up-and-coming figures in the sciences, commerce, the arts, and politics openly identified themselves as libertarian transhumanists.

In 2015 *Forbes* magazine estimated that flamboyant bioindustrialist and committed transhumanist Dmitri Rastovich had become the world’s first person with net assets in excess of US\$1 trillion. When asked by reporters to comment on growing fears that biotechnology was giving rise to human genetic castes, Rastovich replied, “There is no alternative. Relax and enjoy it.”

One of the earliest casualties of the spread of libertarian transhumanism was the environmental movement. Attempts to channel biotechnology along environmentally friendly paths had succeeded in a handful of instances, such as the time in 2014 when genetically engineered microbes successfully biodegraded a major oil spill off the Southern California coast. But at the core of the transhumanist philosophy was a belief that nature, whether in the form of plants, animals, humans, or ecosystems, was an inferior product whose due-date had long since expired. After 2018 the Sierra Club, Greenpeace, and other longstanding environmental groups rapidly began losing membership.

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The Language of the New Biopolitics

Twenty years ago those committed to a just, sustainable world needed to learn a host of new scientific terms, such as “chlorofluorocarbon” and “ozone layer.” Now we need to learn some more new terms.

Cloning | The process of creating a living organism, embryo, or cell that has the same genetic composition as an existing or previously existing individual.

Cryonics | The practice of freezing a body, or just the head, in the hope that biotechnology will allow a dead person to be reanimated sometime in the future.

Eugenics | The attempt to improve the human species by controlled selective breeding; historically, by encouraging the “fittest” to have more children and sterilizing or killing those considered genetically “unfit.” New genetic technologies could have eugenic applications.

Gene doping | The proposed use of genetic techniques to improve athletic performance.

Gene therapy | In theory, the treatment of a disease by introducing a corrective gene.

Germline modification | An alteration to genes in eggs, sperm or early embryos that is passed on to succeeding generations.; also called inheritable genetic modification.

Nanotechnology | The manipulation of extremely small objects, usually at the atomic or molecular level.

Ovarian hyperstimulation syndrome | An occasionally fatal side-effect of hormones women take as part of fertility treatments, or when supplying eggs for research, so that they produce multiple eggs simultaneously.

Sex selection | The deliberate choice of male or female offspring, sometimes performed by the genetic screening of embryos or sperm.

Stem cells | Cells capable of developing into a variety of specialized cells and tissues. Stem cells may have therapeutic value, but could also be used for non-medical “enhancement” procedures.

Synthetic biology | The construction of novel biological parts or organisms; at its extreme, building from scratch rather than by modifying existing organisms.

Now, in 2021, it’s clear that there’s no going back. “Techno” has fully replaced “natural” as a hallmark of excellence. The genetically enhanced elites relax in their gated communities, dine on transgenic squash and cloned beef, dote on their cloned pets, and look forward to receiving the latest GenePak® uploads for their kids. Libertarian transhumanism has become the hegemonic vision of the human future. Few people can any longer imagine a credible alternative.



One Family, One Future

Reaction against the new human genetic technologies is part of a far-reaching neo-traditionalist backlash against modernity and post-modernity.

THE OPENING YEARS OF THE 21ST CENTURY were marked by controversy over cloning, stem cells, and human genetic modification. In 2008 the U.S. biotech industry organized a political action committee to promote an industry-friendly agenda of “Cures for All.” Initial success was tarnished, however, when covert human cloning labs were discovered the following year in Thailand. Embryos used for these illicit experiments were traced to fertility clinics associated with the World Stem Cell Consortium, established by scientists in Australia, Belize and Cyprus, to help themselves and others evade national regulations.

In 2010 a German human rights group documented the deaths of over 300 women worldwide from ovarian hyperstimulation syndrome, the result of aggressive efforts to obtain eggs for cloning research. Meanwhile wealthy individuals were increasingly outsourcing the entire process of reproduction. Women rated “Grade A” were routinely being offered sums in excess of US\$150,000 for their eggs, genetically “superior” sperm could be purchased over the Internet, and young women from Ukraine and Romania were paid little better than minimum wage for the use of their wombs. In 2012 a Scottish gene therapy experiment gone awry left two dozen infants with an incurable form of bone cancer and life expectancies of less than 12 years.

Religious conservatives saw an opening, and began speaking out against the eugenic juggernaut and in support of equality, social justice, human rights, women’s and children’s health, the sanctity of the natural world, and the precautionary principle. The political tide began to shift. After winning filibuster-proof congressional majorities in the United States in 2014, conservatives quickly succeeded in banning reproductive and research cloning, sex-selection, research using human/animal chimeras, physician-assisted suicide, child-accessible Internet pornography, and gas-guzzling SUVs. Protests were heard from the biotech industry, civil libertarians and the automakers, but the great majority of people in the United States were relieved to find that someone was finally willing to draw some lines.

“Growing repugnance over the dehumanizing impacts of the new genetic technologies and the pervasive tawdriness and superficiality of the post-modern world helped fuel neo-traditionalist movements in Europe, Asia, Africa, and the Americas. ”

During these same years, growing repugnance over the dehumanizing impacts of the new genetic technologies, techno-capitalist globalization, and the pervasive tawdriness and superficiality of the post-modern world helped fuel neo-traditionalist movements in Europe, Asia, Africa, and the Americas. The gifted German-Turkish writer Fredericka Musfika, author of the influential book *Humanity or Transhumanity?*, drew on conservative Islamic, Christian, Jewish, Hindu, and Confucian social values to offer a universalist vision of a human future embracing peace, love, and harmony with nature. Her impassioned speaking and writing gave rise to the mass social movement known as “One Family, One Future” (OFOF). It was a secular movement open to people of any (or no) religious faith, but it adopted codes of conduct similar to those found in many traditional religions. In the period after 2016 the practice of wearing a full-length woolen scarf displaying OFOF iconography spread throughout the world as a symbol of the rejection of post-modernity.

Although OFOF endorsed the use of the Supernet, the iWeb, and other new information technologies, it viewed high-tech medical practice with suspicion. By 2018 many countries had abandoned research on genetic modification. The use of naturopathy, aroma therapy, herbal preparatories, and a form of massage therapy accompanied by poetry and song had all but replaced conventional medical treatment among significant sectors of the world’s population.

As early as 2017 the established religious denominations began losing members to OFOF. In some North American and European cities as much as 30 percent of the population would gather for OFOF’s Saturday affirmation services. This proportion is certain to increase, because OFOF families shun birth control and now average seven children per couple.

In 2019 OFOF-USA announced the formation of a political party, and in last year’s (2020) elections OFOF candidates—all men, and all wearing the full, luxuriant beards that now designate OFOF clan leaders—won two dozen seats in the House and four in the Senate, taking votes from both Republicans and Democrats. Similar parliamentary gains have been made in about 20 other countries. Earlier this year, OFOF leaders told the tens of thousands gathered at their 2021 annual World Convocation that the human future never looked as promising as it does today.



A Techno-Eugenic Arms Race

Powerful genetic technologies are used by individuals, corporations, and countries in an escalating struggle for superiority and dominance.

THE OPENING YEARS OF THE 21ST CENTURY were marked by controversy over cloning, stem cells, and human genetic modification. In 2008 biotech enthusiasts in the United States organized a national campaign to “liberate” stem cell research by loosening even the minimal existing state and federal oversight guidelines. Although many scientists worried that this would allow ethically questionable activities to be swept under the carpet, they were reluctant to break ranks and speak out for fear of giving aid and comfort to demands by the religious right that stem cell research be banned entirely.

In 2010 North Korean scientists announced the birth of a child genetically modified to allow an increased respiratory capacity of 18 percent above the human norm. The scientists involved made no pretense that this was done to address a medical need. Rather, they said, it was the first step towards creating “The New Man” for the 21st century.

Just eight months later, China—with an exploding GDP, growing nationalist fervor, and 60,000 freshly trained biotech engineers entering the workforce each year—announced a national initiative to improve the genetic quality of its people. All couples at risk of transmitting genes identified as deleterious were required to take steps to avoid doing so, with the government covering all costs. In addition, couples could volunteer to have their children “enhanced,” again with all costs covered. Leading Chinese rock stars and taikonauts were featured in a massive media campaign promoting the program.

Alarms were raised by international human rights and social justice organizations, but to little effect. Other countries knew they had to follow China’s lead or risk having their children left behind. A new techno-eugenic arms race rapidly escalated out of control.

“The genetic scientists and their political and military commanders have lost any sense of identification with the larger human community. In their minds the wellbeing of any existing human cannot be allowed to stand in the way of the post-human future.”

In 2014 the CIA reported that Venezuelan scientists had created a virus that turned skin cells containing specified concentrations of melanin carcinogenic. Other countries enacted laws requiring the medical termination of “lives not worth living.” Still others approved forms of human experimentation, using prisoners, the disabled, terminally ill patients, orphans and others, that had been anathema barely a decade earlier.

“A doomsday cult is about to release the “Elysium Virus,” a genetically engineered hyper-viroid that inactivates neural calcium ion channels and would rapidly destroy all life on Earth above the level of a sponge.”

Some early promoters of human genetic modification argued that its widespread use would result in such a diverse array of genetic types that the concept of “race” would finally be consigned to the dustbin of history. In fact just the opposite has occurred. With ethnocentrism and nationalism on the rise, right-wing governments have issued genetic profiles of “ideal” racial and ethnic types, and individuals are implicitly or explicitly urged to modify themselves and their children to conform with these profiles.

By 2018 most genetic research was being conducted by secret government and corporate labs. In that year it was reported that scientists in Mumbai had developed a procedure to slow the rate of human cellular aging by as much as 60 percent. Leading Indian government officials and biotech executives, realizing the havoc this technology could cause if made widely available, moved quickly to limit its use to priority national security resources: themselves.

Today, in 2021, the genetic scientists and their political and military commanders have lost any sense of identification with the larger human community. In their minds the wellbeing of any existing human cannot be allowed to stand in the way of the historical transition to a post-human future. But they differ about who will supply the foundational human stock.

And if it seems that things could not get any worse, just last week a doomsday cult announced that it has perfected and is about to release the “Elysium Virus,” a genetically engineered hyper-viroid that inactivates neural calcium ion channels. Its release would rapidly destroy all life on Earth above the level of a sponge. The cult has issued no demands; its members say they are driven by an altruistic desire to relieve “all sentient beings” of the burden of existence. The world is holding its breath, teetering on the verge of panic.



For the Common Good

Liberal democratic and popular institutions, informed by values of equality, social justice, and community, establish cultural norms and legal institutions that support scientific research while precluding its use in ways that endanger human wellbeing.

THE OPENING YEARS OF THE 21ST CENTURY were marked by controversy over cloning, stem cells, and human genetic modification. Opinion surveys showed strong support for the development of genetic technology for medical purposes, but controversies involving blackmail attempts using stolen sperm donor records, the deaths of clonal primates at a lab in Oregon, and shady financial practices by leading bioethicists began to raise doubts. Although the new genetic technologies attracted many sincere, socially responsible researchers, by 2009 the field was increasingly dominated by dismissively arrogant scientists, unscrupulous fertility clinic operators, traffickers in clonal embryos, and out-and-out racist eugenicists.

Reaction from the general public and affected constituencies had been building for some time, and by 2010 reached a tipping point. Advocates for women's health, consumer rights, and economic justice raised concerns about risky technologies that put corporate profits above safe, affordable health care. Civil rights leaders warned of a new free-market eugenics that could stoke the fires of racial and ethnic hatred. Disability rights leaders charged that a society obsessed with genetic perfection could come to regard the disabled as mistakes that should have been prevented. Civil libertarians were appalled to learn of plans by global biotech consortia to establish a universal DNA registry. Lesbians and gays were disturbed by reports that prenatal tests for sexual orientation were about to be made commercially available. Environmentalists argued that genetic modification of living organisms, including humans, was a powerfully disruptive technology being deployed before long-range consequences had been considered.

In 2011 liberal and conservative religious denominations put aside their doctrinal differences and convened an international summit that declared the genetic modification of the human species to be a threat to human dignity and the human community. Later that year the Citizens Health Assembly, representing hundreds of international health, development, and indigenous rights organizations, began a major campaign opposing the global biotechnology industry's drive to have human genomics declared the lead technology for addressing public health problems in poor countries.

The first credible reports of covert attempts to create clonal and genetically modified children appeared in early 2012. The efforts were taking place on a fleet of converted naval hospital ships sailing the South Pacific and guarded by gunboats. The identities of the scientists involved were unclear. Responsible political and scientific leaders realized that a strong response was in order. In late 2012 a group of internationally recognized scientists and health policy experts declared that the new human biotechnologies “carry with them both great promise and great risk,” and that scientists must be willing to work within socially determined limits. The declaration received extensive press coverage and commentary.

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In 2013 a bipartisan group of U.S. senators began meeting to broker a broadly acceptable, comprehensive package of human biotech regulations. All involved agreed to take the issues of abortion and the moral status of human embryos off the table, and to focus on policies on which it appeared that consensus might be reached. As it turned out, this was easier than had been anticipated. Embryonic stem cell research was allowed but “designer baby” applications and human cloning were banned, and a new federal commission was established to oversee human biotech research. In 2015 the final bill was signed into law.

The following year, international civil society leaders prevailed upon the United Nations to convene the Extraordinary Summit on Bioscience and the Human Future. Delegates included noted scientists, political leaders, and scholars, and representatives of the full spectrum of social and religious constituencies. Negotiations were contentious and frequently threatened to break down. But the delegates realized that this might be the last chance humanity would have to agree upon a common framework for regulating these powerful technologies, and by 2018 success was in sight. In 2019 the UN General Assembly approved the Universal Convention on Biomedicine and Human Rights by a nearly unanimous vote. In 2020 the Convention went into force after having been approved by the parliaments of 110 countries. All involved recognized that they had participated in an undertaking of world-historical import. Just last month, the 2021 Nobel Prizes for Medicine and Peace were jointly awarded to the lead institutions that had made this all possible: The United Nations, the World Assembly of Science, the Global Council of Religions, and the NGO Network for a Human Future.

REFLECTION

It's useful to consider ways in which these scenarios might vary. "Libertarian Transhumanism" could prevail without ever being recognized as an explicit ideology. For many people, science, technology, and individual rights are nonideological, self-evident goods, and a *de facto* libertarian transhumanism could come to pass as the simple extension and deepening of these.

Some transhumanists claim to be motivated by social democratic rather than libertarian values, and suggest that we use genetic modification to bring everyone up to at least the current mean in health, intelligence, and life expectancy, after which all humanity would begin its posthuman journey in unison. But even if such a scenario made sense scientifically, it is imaginable only under the most absurdly authoritarian conditions.

"One Family, One Future" blends elements of the environmental and New Age movements of the 1970s, the multicultural sensibilities of the 1980s, and the social conservatism of the 1990s. It adds a jarring note of patriarchy as well. This scenario is premised on the idea that libertarianism simply doesn't cut it as a mass political philosophy. Much of our experience of purpose and self-worth comes from making and honoring enduring social commitments. If the pendulum swings too far towards libertarianism, people will welcome a communitarian adjustment. The challenge then becomes one of preventing this adjustment from going too far.

"A Techno-Eugenic Arms Race" is one version of a nightmare scenario. The 1995 Aum Shinrikyo nerve gas attacks in Japan and the 2001 anthrax attacks in the United States show the attraction that biological agents hold for fanatics. In 2000, concern about massively lethal applications motivated computer scientist Bill Joy to call for a permanent halt to particular avenues of genetic research. In 2003 the Sunshine Project documented nearly a dozen possible uses of genetic science for biowarfare purposes, including the creation of ethnicity-specific pathogens. Last November, in one of his final addresses as UN Secretary General, Kofi Annan urgently called for new international treaties

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to guard against biological terrorism, and specifically mentioned the dangers posed by new technologies of genetic manipulation.

After the horrific experience of the 20th century with eugenics and genocide, could any country call for creation of a genetically “superior” population without immediate and massive international censure? One would hope not. But for the past decade reputable scientists, bioethicists, and others have been actively promoting a revival of eugenic sensibilities and practices, and have received plaudits rather than protests from their peers and the press. In a world that is far from overcoming its propensity for racism, xenophobia, and warfare, this is more than worrisome.

“For the Common Good” incorporates many of my own values and hopes, and is presented as a more-or-less straightforward success story. But the road to any agreements of the sort sketched here will surely be filled with bumps and detours. Conflicts over the new human biotechnologies, like most other conflicts, involve the eternal tension between competition and cooperation among individuals, families, communities, and nations. New technologies developed over the past century have enabled individuals and groups to compete in ways that could endanger humanity as a whole. It’s widely acknowledged that humanity needs to develop shared values and institutions that will allow such universal threats to be avoided. Attempts to do this, from the United Nations to bans on nuclear weapons to the Kyoto Accords, have had mixed success.

The noted writer Bill McKibben once said, correctly, that the greatest macroscale environmental challenge is global warming and the greatest microscale environmental challenge is genetic engineering. Technologies that enable humanity to manipulate individual atoms, molecules, genes, and cells are being used to radically transform the fundamental processes of the natural world, including many of those that define what it means to be human.

It is imperative that individuals and organizations committed to a sustainable, just, and truly human future take steps to bring these technologies under effective national and international oversight and control. To do this we need to think of the issues before us and the frameworks through which we interpret them in new ways. There is no greater challenge, and time is short.

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RESOURCES

Text or bibliographic information for the resources listed below are easily located using conventional internet search engines.

I. SCENARIO RESOURCES

Aldous Huxley's 1932 *Brave New World* is the archetypal and still instructive 20th century biopolitical scenario.

The preparation of alternative scenarios as a tool for helping decide courses of action was developed by the Rand Corporation during the Second World War. It has become ubiquitous among corporate, governmental, and NGO strategic planners and others. See the Wikipedia.org entry for **Scenario Planning**.

In *The Biotech Century* (1998) Jeremy Rifkin contrasted a "Hard Path" and a "Soft Path" for the new biotechnologies. Rifkin's forecasts of the ways in which biotechnology might develop over the succeeding decade were prescient.

Joel Garreau's *Radical Evolution* (2005) presents three scenarios - "Heaven," "Hell" and "Prevail" - in all three of which human genetic modification is more-or-less allowed to proceed.

Many biotechnology firms and industry-wide organizations have prepared studies of the biopolitical future. Examples include *Biotechnology Scenarios 2000-2050*, by the World Business Council for Sustainable Development, and *BioVisions 2015*, prepared for the Siemens Corporation.

II. OTHER RESOURCES

The July/August 2002 *World Watch* is a special issue on the risks of human genetic modifications, with essays by Brian Halweil, Vandana Shiva, Richard Hayes, Marcy Darnovsky, Tom Athanasiou, Rosario Isasi, Pat Mooney, Paul Billings, Michael Dorsey, Judith Levine and others.

One of the best single introductions to the challenges raised by the new human biotechnologies is *Human Genetic Engineering* (2005) by Pete Shanks.

For perspectives of civil society leaders in Europe, Asia, Africa, the Americas and other regions see the webpage of **Within and Beyond the Limits of Human Nature**, a major international conference held in Berlin, Germany in 2003.

For the perspectives of feminists, women of color, women's health leaders and others, see the website of the 2004 conference **Gender and Justice in the Gene Age**.

In *Our Posthuman Future* (2001), Francis Fukuyama argues that genetic technologies should be used to address legitimate medical needs, but not used in ways that undermine our common humanity.

Bill McKibben addresses some of the deepest issues raised by the new human genetic technologies in *Enough: Staying Human in an Engineered Age* (2003).

Research and policy organizations with large compendia of resources on their websites include the **Center for Genetics and Society**, the **Hastings Center**, and the **Genetics and Public Policy Center**. See also the journal *The New Atlantis*.

An increasing number of blogs track developments concerning the new human genetic technologies. See the blogrolls displayed at *Biopolitical Times* and *The Bioethics Blog*.

A compelling account of the influence of market forces on bioscience is *Science in the Private Interest: Has the Lure of Profits Corrupted Biomedical Research?* (2003) by Sheldon Krimsky.

The 2003 anthology *Living with the Genie* contains sixteen thoughtful essays on science, technology and society by presenters at the four-day Columbia University conference of the same name. Edited by Alan Lightman, Daniel Sarewitz and Chris Desser.

Two excellent analyses of the risks of biotech "enhancements" are *Better than Well* (2003) by bioethicist Carl Elliott, and the April 2004 *Atlantic* cover story "**The Case Against Perfection**" by Michael Sandel.

A concise introduction to the controversy over stem cell research and its implications for the future is *Stem Cells and Public Policy*, published by the Century Foundation (2006).

Canada has established the most comprehensive set of national laws and guidelines regarding the new human genetic technologies, as described on the Health Canada webpage "**Assisted Human Reproduction Agency of Canada.**" For a detailed analysis of how an analogous set of policies might be crafted for the United States, see *Beyond Bioethics* (2006) by Francis Fukuyama and Franco Furger.

Two overview articles on the prospects for global governance concerning the new human biotechnologies are "**Governing Biotechnology,**" by George Annas, in *Global Agenda* (2006), and "**Protecting the Endangered Human: Towards an International Treaty Prohibiting Cloning and Inherited Alterations,**" by George Annas, Lori Andrews and Rosario Isasi, in the *American Journal of Law and Medicine* (2002).

The history and potential future of eugenics is explored in Edwin Black's *War Against the Weak: Eugenics and America's Campaign to Create a Master Race* (2003), and Alexandra Minna Stern's *Eugenic Nation: Faults and Frontiers of Better Breeding in Modern America* (2005).

The **Institute for Biotechnology and the Human Future** is working to identify common ground between pro-choice liberals and pro-life religious conservatives regarding socially unacceptable forms of human genetic modification.

The perspectives of the "transhumanists" can be seen on the websites of the **World Transhumanist Association** and the **Institute for Ethics and Emerging Technologies**.

ABOUT CGS

THE CENTER FOR GENETICS AND SOCIETY is a nonprofit public affairs organization working to encourage responsible uses and effective societal governance of the new human genetic and reproductive technologies. We support benign and beneficent medical applications of these technologies and oppose those applications that objectify and commodify human life and threaten to divide human society. We work in a context of support for the equitable provision of health technologies domestically and internationally; for women's health and reproductive rights; for the protection of our children; for the rights of the disabled; and for precaution in the use of powerful new technologies.

Please contact us for information on resources, events, and programs.

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