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The Man on the Moon, Immortality, and Other Millennial Myths: The Prospects and Perils of Human Genetic Engineering

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ARTICLES

THE MAN ON THE MOON, IMMORTALITY, AND OTHER MILLENNIAL MYTHS: THE PROSPECTS AND PERILS OF HUMAN GENETIC ENGINEERING†

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The year 2000 provides an opportunity to reflect and speculate on human life in the year 3000. We cannot know what human life will be like a thousand years from now, but we can and should think seriously about what we would like it to be. What is unique about human beings and about being human? What makes humans human? What qualities of the human species must we preserve to preserve humanity itself? What would a "better human" be like? If genetic engineering techniques work, are there human qualities we should try to temper, and ones we should try to enhance? And if human rights and human dignity depend on our human nature, can we change our "humanness" without undermining our dignity and our rights? We can begin our exploration of these questions by looking back on some of the major events of the past one thousand years in Western civilization and the human proclivities they illuminate.[1]

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[1] This Article is a continuation of the one I wrote for the 1990 Thrower Symposium, at the outset of the Human Genome Project: George J. Annas, *Mapping the Human Genome and the Meaning of Monster Mythology*, 39 EMORY L.J. 629 (1990). In that Article, I outlined the major legal and ethical issues implicated in the genome mapping project. In this Article, I concentrate on the issue that may prove the most central to future of the human species: human genetic engineering.

I. HOLY WARS

The second millennium opened with holy wars: local wars, such as the Spanish *Reconquista* to retake Spain from the Moors, and the broader multi-state Crusades to take the Holy Lands from the Muslims who were menacing Christian pilgrims there. The great Crusades, which lasted almost two hundred years, were fought in the name of God with the war cry, *Deus volt* ("God wills it.").[2] The enemy was the nonbeliever, the infidel; killing the infidel became a holy act. The ability to label an enemy as "other" and subhuman, and to justify killing the "other" in the name of God or country was a defining human trait throughout the entire millennium. I will later argue that this genocidal proclivity of the past millennium could lead to genocide on an even more horrible scale if we create a new or "better" human species (or subspecies) through genetic engineering.

Like the Crusaders, Columbus sought to conquer territories inhabited by infidels, in the name of God. When Columbus reached the "new" world, which he mistakenly thought was part of India, he named the island on which he landed San Salvador. He claimed it in the name of the Catholic Church and the Catholic monarchs of Spain.[3] Naming for Europeans was emblematic of conquest. Taking possession could be symbolized with a flag or even a cross. Columbus, whose professed goal was also to convert the "savages" who inhabited the new world, wrote in his diary, "in all regions I always left a cross standing" as a mark of Christian dominance.[4] Religion was the cover story for

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[2] *See* THE OXFORD ILLUSTRATED HISTORY OF THE CRUSADES 1 (Jonathan Riley-Smith ed., 1995).

[3] SAMUEL ELLIOT MORISON, ADMIRAL OF THE OCEAN SEA: A LIFE OF CHRISTOPHER COLUMBUS 229 (1942). Columbus also explored, claimed and named Santa Maria de la Concepcion after the Virgin Mary, after whom he also named his flagship, and Fernandina and Isabela for his Spanish patrons. *See generally* CHRISTOPHER COLUMBUS: FOUR VOYAGES TO THE NEW WORLD: LETTERS AND SELECTED DOCUMENTS (R.H. Major ed. & trans. 1961).

[4] KIRKPATRICK SALE, THE CONQUEST OF PARADISE: CHRISTOPHER COLUMBUS AND THE COLUMBIAN LEGACY 93 (1991). Cortés also conquered Mexico in the name of the cross. The banner that he had made for the masthead of his flagship, for example, could be translated, "Friends, let us follow the cross and, if we have faith, let us conquer under this banner." HUGH THOMAS, CONQUEST: MONTEZUMA, CORTÉS, AND THE FALL OF OLD MEXICO 156 (1993) (translating from Latin). *See also* TZVENTAN TODOROV, THE CONQUEST OF AMERICA: THE QUESTION OF THE OTHER 107-08 (Richard Howard trans., 1984) (discussing not only the ability of the Spaniards to see the Native Americans as "others," but also noting that although the Catholic Church taught that all people were equal in the eyes of God, the Spanish conquerors made use of religion primarily only when its teachings corresponded with their own motives or self-interest). *See generally* EDWARD W. SAID, ORIENTALISM (1978) (explaining the construction of "the other").

the conquest. Nonetheless, Columbus's encounter with the Native Americans or "Indians" resulted in their merciless subjugation and genocidal destruction.[5]

The Spanish conquistadors who followed Columbus continued to use the Catholic religion and its absence in the New World as an excuse to claim the land and conquer its inhabitants. In his 1843 *The History of the Conquest of Mexico*, William Prescott recounts the European belief that paganism was "a sin to be punished with fire... in this world, and eternal suffering in the next."[6] Prescott continues, "under this code, the territory of the heathen, wherever found [was forfeit to the Holy See] and as such was freely given away by the head of the Church to any temporal potentate whom he pleased that would assume the burden of conquest."[7] Prescott seems to have had some sympathy for Montezuma (the sun god) and the other Aztecs killed by the Spaniards in their conquest, but ultimately concluded that the Aztecs did not deserve to be considered fully human: "How can a nation, where human sacrifices prevail, and especially when combined with cannibalism, further the march of civilization?"[8]

In similar fashion, Pizarro justified his conquest of Peru and the subjugation of the Incas including the kidnapping and eventual killing of Atahuallpa, by claiming it was for the "glory of God" and to bring "to our holy Catholic faith so vast a number of heathens."[9] Although God was the cover

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[5] *See, e.g.*, Leslie Roberts, *Disease and Death in the New World*, 246 SCIENCE 1245 (1989). Nor was genocide new to the Spanish. Robert Hughes describes the earlier Spanish conquest of Sardinia and Minorca:

> What happened in Sardinia and Minorca was bad as anything the Castilians inflicted on the Peruvians or Incas, and far worse than anything they later did to the Catalans themselves. It verged on cultural genocide. In 1287 the Catalan count-king Alfons II (the Liberal) invaded Minorca—Jaume I had been content to leave it as a Moorish vassal state after conquering its larger neighbor—and slaughtered most of its male population; the rest were sold as slaves, leaving the island in economic ruin for two hundred years. Sardinia fared almost as badly, though the Catalans had more difficulty imposing their rule on it. They viewed Sardinian commoners as sub-humans, fit only to be slaves—and sold they were, in the thousands. All the original inhabitants of Alghero, on the northwestern coast, were put to the sword or exiled without ceremony in 1354 by Pere III (the Ceremonious). He then repopulated the whole area with Catalan settlers....

ROBERT HUGHES, BARCELONA 109-10 (1992).

[6] WILLIAM H. PRESCOTT, THE HISTORY OF THE CONQUEST OF MEXICO 136 (C. Harvey Gardiner ed., Univ. Chi. Press 1966).

[7] *Id.* It is a strange coincidence of history that the map of the Aztec capital, Tenochtitlan, was first published in Nuremberg, Germany in 1524. THOMAS, *supra* note 4, at 267-68.

[8] *Id.* at 370.

[9] Technology played a major role in all Spanish conquests. In addition to guns, steel swords, lances and daggers, which, as described by Jared Diamond in *GUNS, GERMS, AND STEEL*, were "strong sharp weapons that slaughtered thinly armored Indians" who could not fight effectively against mounted cavalry that was more

story, they were also motivated by gold. In their later pursuit of *El Dorado*, the famed city of gold, following the conquests by Cortés and Pizarro, however, none of the other Spanish conquistadors were able to plunder the amount of gold they did.

The Crusades, the voyage of Columbus, and the slaughters of the Spanish conquistadors who followed, are powerful examples of human exploration and human encounters with the unknown. They teach us that the realm of human dominance can be radically enlarged by human imagination and courage. Equally importantly, they teach us that without a belief in human dignity and equality, the cost of such dominance is genocidal human rights violations. They also caution us to be suspicious of stated motives and cover stories; although filled with missionary zeal, most of these adventurers and explorers sought primarily fame and fortune.[10]

II. UNHOLY WARS

Of course, historical perspective makes it easier to look back five hundred years than fifty years. Nonetheless, World War II, the moon landing, and the prospect of human genetic engineering have already raised most of the important issues we face in the new millennium in defining humanness, human rights, and science's responsibilities. Postmodernism can be dated from any of these, and each holds its own lessons and cautions. We now worship science as secular society's new religion as the quest for everlasting life with God is replaced by our new crusade for immortality on earth.

A. World War II

Some scholars date the problematic descriptor "postmodernism" from Hiroshima and the Holocaust—one an instantaneous annihilation, the other a

heavily armored. JARED DIAMOND, GUNS, GERMS, AND STEEL: THE FATES OF HUMAN SOCIETIES 76-78 (1997). In fact, Diamond notes, Indians on foot were never able to defeat cavalry in the open. *Id.* As devastating as these arms were, it was ultimately disease, especially smallpox, that killed the most, and against which the natives had no defense. *Id.*

[10] "The motives of Cortés, like those of Columbus, were inextricably mixed; above all, no doubt, he wanted glory, he also wanted wealth and, where appropriate, or convenient, he also wanted to serve God." THOMAS, *supra* note 4, at 156. The contemporary historian of Columbus and Cortés, Bartolome de Las Casas, wrote at the end of his life, "I believe that because of these impious, criminal and ignominious deeds perpetuated so unjustly, tyrannically and barbarously, God will vent upon Spain his wrath and His fury, for nearly all of Spain has shared the bloody wealth usurped at the cost of so much ruin and slaughter." TODOROV, *supra* note 4, at 245.

systematic one.[11] Together, their application of industrial techniques to human slaughter represent the death of our civilization's dream of moral and scientific progress that had characterized the modern age. The nuclear age world is much more ambiguous and uncertain.

The modern human rights movement emerged from the ashes of World War II and the death of the positive law belief that only law enacted by a legitimate government, including the German Nazi government, matters.[12] The multinational trial of the Nazi war criminals at Nuremberg after World War II was held on the premise that there is a higher law of humanity (derived from rules of "natural law" that are based on an understanding of the essential nature of humans), and that those who violate it may be properly tried and punished. Universal criminal law, law that applies to all humans and protects all humans, outlaws "crimes against humanity" including state-sanctioned genocide, murder, torture, and slavery. Obeying the law of a particular country or the orders of superiors is no defense; the state cannot shield its agents from prosecution for crimes against humanity.[13]

The crusades were also echoed in World War II. General Dwight Eisenhower titled his account of World War II, *Crusade in Europe*, and his order of the day for the D-Day invasion read: "Soldiers, sailors, and airmen of the allied expeditionary forces, you are about to embark on a great crusade ... the hopes and prayers of liberty loving people everywhere march with you."[14]

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[11] *See, e.g.*, LINDA HUTCHEON, THE POLITICS OF POSTMODERNISM 24 (1989).

> Postmodernism's distinctive character lies in [a] kind of wholesale "nudging" commitment to doubleness, or duplicity ... the postmodern's initial concern is to de-naturalize some of the dominant features of our way of life; to point out that those entities that we unthinkingly experience as "natural" ... are in fact "cultural"; made by us, not given to us. Even nature, postmodernism might point out, doesn't grow on trees.

Id. at 1-2. Many scientists seem to believe that anything labeled "postmodern" is anti-science. *See, e.g.*, Richard S. Nicholson, *Postmodernism*, 261 SCIENCE 143 (1993). This view is simply wrong because postmodernism and good science both question everything.

[12] *See generally* LOUIS HENKIN ET AL., HUMAN RIGHTS 73-90 (1999); HENRY J. STEINER & PHILIP ALSTON, INTERNATIONAL HUMAN RIGHTS IN CONTEXT: LAW, POLITICS, MORALITY (2d ed. 2000).

[13] STEINER & ALSTON, *supra* note 12, at 112-26. The "Nuremberg Principles" are derived from the Judgment. They are: (1) there are crimes against humanity that individuals are responsible for committing; (2) individuals can be tried and punished for these offenses; (3) obeying orders or acting under color of domestic law is no defense; and (4) a civil court can try such international criminal acts. Robert F. Drinan, *The Nuremberg Principles in International Law*, *in* THE NAZI DOCTORS AND THE NUREMBERG CODE: HUMAN RIGHTS IN HUMAN EXPERIMENTATION 174-82 (George J. Annas & Michael A. Grodin eds., 1992) ("THE NAZI DOCTORS").

[14] Elizabeth Siberry, *Images of the Crusades in the Nineteenth and Twentieth Centuries*, *in* THE OXFORD ILLUSTRATED HISTORY OF THE CRUSADES, *supra* note 2, at 385.

And as with the Crusades and the conquest of the Americas, to justify the human slaughter of World War II, the enemy "had to [be] severely dehumanized and demeaned."[15] On the Allied side, the most dehumanizing language was meted out to the Japanese:

> Among the Allies the Japanese were also known as "jackals" or "monkey men" or "sub-humans," the term of course used by the Germans for Russians, Poles, and assorted Slavs, amply justifying their vivisection ... *Jap* ... was a brisk monosyllable handy for slogans like "Rap the Jap" or "Let's Blast the Jap Clean Off the Map," the last a virtual prophecy of Hiroshima.[16]

The United Nations was formed to prevent wars on the premise that *all* humans have dignity and deserve equal rights.[17] Science and medicine came under specific investigation in the 1946-47 "Doctors' Trial" of twenty-three Nazi physician-experimenters.[18] The Nazi experiments involved murder and torture: systematic and barbarous acts with death as the planned endpoint such as lethal freezing and high altitude experiments. The subjects of these experiments were concentration camp prisoners, mostly Jews, Gypsies, and Slavs: people the Nazis viewed as subhuman. With echoes of the conquest of the Americas, Nazi philosophy was founded on the belief that Germans were a "superior race" whose destiny was to subjugate and rule the inferior races.[19] A central part of the Nazi project was "eugenics," the attempt to improve the species by eliminating "inferior" people, so-called "useless eaters," and by

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15 PAUL FUSSELL, WARTIME: UNDERSTANDING AND BEHAVIOR IN THE SECOND WORLD WAR 117 (1989).

16 *Id.*

17 CHARTER OF THE UNITED NATIONS (1945). *See also* STEINER & ALSTON, *supra* note 12, at 137-46.

18 *See generally* Drinan, *supra* note 13.

19 *See* ROBERT PROCTOR, RACIAL HYGIENE: MEDICINE UNDER THE NAZIS 10-45 (1988). Hitler had made his own views of racial purity clear as early as 1925 in his *Mein Kampf*, which provided the rationalization for his sterilization and eugenics programs and ultimately for genocide:

> Any crossing of two beings not at exactly the same level produces a medium between the level of the two parents. This means: the offspring will probably stand higher than the racially lower parent, but not as high as the higher one. Consequently, it will later succumb in the struggle against the higher level. Such mating is contrary to the will of Nature for a higher breeding of all life .... The stronger must dominate and not blend with the weaker, thus sacrificing his own greatness. Only the born weakling can view this as cruel, but he after all is only a weak and limited man; for if this law did not prevail, any conceivable higher development of organic living beings would be unthinkable.

ADOLF HITLER, MEIN KAMPF 285 (Ralph Manheim trans., Houghton Mifflin 1999) (1938).

improving the Aryan Race.[20] In its final judgment, the court articulated what we now know as the Nuremberg Code.[21] This Code remains the most

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[20] *Id. See also* DANIEL KEVELES, IN THE NAME OF EUGENICS: GENETICS AND THE USE OF HUMAN HEREDITY (1985); Robert Proctor, *Nazi Doctors, Racial Medicine, and Human Experimentation, in* THE NAZI DOCTORS, *supra* note 13, at 17-31.

[21] The Nuremberg Code:

> 1. The voluntary consent of the human subject is absolutely essential. This means that the person should have legal capacity to give consent; should be so situated as to be able to exercise free power of choice, without the intervention of any element of force, fraud, deceit, duress, overreaching, or other ulterior form of constraint or coercion; and should have sufficient knowledge and comprehension of the elements of the subject matter involved as to enable him to make an understanding and enlightened decision. This latter element requires that before the acceptance of an affirmative decision by the experimental subject there should be made known to him the nature, duration, and the purpose of the experiment; the method and means by which it is to be conducted; all inconveniences and hazards reasonably to be expected; and the effects upon his health or person which may possibly come from his participation in the experiment.
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> The duty and responsibility for ascertaining the quality of the consent rests upon each individual who initiates, directs or engages in the experiment. It is a personal duty and responsibility which may not be delegated to another with impunity.
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> 2. The experiment should be such as to yield fruitful results for the good of society, unprocurable by other methods of means of study, and not random and unnecessary in nature.
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> 3. The experiment should be so designed and based on the results of animal experimentation and a knowledge of the natural history of the disease or other problem under study that the anticipated results will justify the performance of the experiment.
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> 4. The experiment should be so conducted as to avoid all unnecessary physical and mental suffering and injury.
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> 5. No experiment should be conducted where there is an *a priori* reason to believe that death or disabling injury will occur; except, perhaps, in those experiments where the experimental physicians also serve as subjects.
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> 6. The degree of risk to be taken should never exceed that determined by the humanitarian importance of the problem to be solved by the experiment.
>
> 7. Proper preparations should be made and adequate facilities provided to protect the experimental subject against even remote possibility of injury, disability, or death.
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> 8. The experiment should be conducted only by scientifically qualified persons. The highest degree of skill and care should be required through all stages of the experiment of those who conduct or engage in the experiment.
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> 9. During the course of the experiment, the human subject should be at liberty to bring the experiment to an end if he has reached the physical or mental state where continuation of the experiment seems to him to be impossible.
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> 10. During the course of the experiment the scientist in charge must be prepared to terminate the experiment at any stage, if he has probably cause to believe, in the exercise of the good faith, superior skill, and careful judgment required of him, that a continuation of the experiment is likely to result in injury, disability, or death to the experimental subject.

United States v. Karl Brandt, 2 Trials of War Criminals before the Nuremberg Military Tribunals Under Control Council Law No. 10, 171, 181-82 (1946-49). An edited version of the opinion is reprinted in THE NAZI DOCTORS, *supra* note 13, at 94-104.

authoritative legal and ethical document governing international research standards, and insists on the informed consent of every research subject.[22] It is one of the premier human rights documents in world history.

Trials at Nuremberg were soon followed by the articulation of the Universal Declaration of Human Rights ("UDHR") in 1948, the most important human rights document to date.[23] The UDHR has itself been followed by two treaties, the Covenant on Civil and Political Rights, and the Covenant on Economic, Social and Cultural Rights.[24] The UDHR and the two treaties (sometimes termed the "International Bill of Rights") represent a milestone for humanity: the recognition that human rights are founded on human dignity, and that human dignity is shared by *all* members of the human race without distinction based on race, religion, or national origin. This is powerful language, and the continuing challenge is to make it, and the other promises of the Covenants, a reality.

B. The Man on the Moon

The most spectacular exploration of the twentieth century is the voyage of Apollo 11 to the moon's surface and its crew's safe return. Neil Armstrong's words, upon setting foot on the moon seemed just right: "[O]ne small step for man, one giant leap for mankind."[25] Although the race to the moon had more to do with the politics of the Cold War than science, it was nonetheless an almost magical engineering accomplishment.[26] And, like Columbus, history will remember Armstrong because he was the first to set foot on the moon.

The United States was willing to go to great lengths to assure that the first man on the moon would be an American, and plant an American flag on the moon. Nonetheless, there were human rights constraints even on this

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[22] *See* George J. Annas, *The Nuremberg Code in U.S. Courts: Ethics versus Expediency*, *in* NAZI DOCTORS, *supra* note 13, at 201; ADVISORY COMMITTEE ON HUMAN RADIATION EXPERIMENTS, FINAL REPORT 101-12 (1995); *see also* Evelyne Shuster, *Fifty Years Later: The Significance of the Nuremberg Code*, 337 N. ENG. J. MED. 1436 (1997).

[23] George J. Annas, *Human Rights, and Health—The Universal Declaration of Human Rights at 50*, 339 N. ENG. J. MED. 1777, 1778-81 (1998).

[24] Both covenants, the UN Charter, and the Universal Declaration of Human Rights, as well as other related treaties, are reprinted in the Annex on Documents in STEINER & ALSTON, *supra* note 12, at 1365-401.

[25] GENE FARMER & DORA JAN HAMBLIN, FIRST ON THE MOON: A VOYAGE WITH NEIL ARMSTRONG, MICHAEL COLLINS, EDWIN E. ALDRIN, JR. 321, 509 n.1 (1970) (arguing that although Houston recorded Armstrong's first words as printed in the text above, he actually did say "a" before man).

[26] WALTER A. MCDOUGALL, THE HEAVENS AND THE EARTH: A POLITICAL HISTORY OF THE SPACE AGE 413 (1985).

experiment. President John Kennedy, for example, had set it as a national goal to get a man on the moon, "and return him safely to earth."[27] Putting human values second to winning a race with the Russians by landing a man on the moon without a clear plan for getting him back to Earth was rejected.[28]

The United States did not explicitly conquer the moon for the glory of God, but God was on the minds of the conquerors, riding in a spacecraft named for the sun god, Apollo. Some of the most explicit religious statements were made by rocket designer Werner von Braun, who had been a Nazi SS officer and the designer of the destructive V2 rockets that the Germans rained down on England near the end of World War II. Von Braun was captured by the United States and "sanitized" to work on rocket propulsion, eventually heading up NASA's effort.[29] The day before Apollo 11 blasted off he explained the reasons for putting a man on the moon: "We are expanding the mind of man. We are extending this God-given brain and these God-given hands to their outermost limits and in so doing all mankind will benefit. All mankind will reap the harvest ...."[30] The missionary zeal of the Crusaders and conquistadors was to echo on the moon.

Norman Mailer, in his chronicle on the moon landing, *Of a Fire on the Moon*, asks a central question, "[W]as the voyage of Apollo 11 the noblest expression of technological age, or the best evidence of its utter insanity? ... are we witness to grandeur or madness?"[31] Today neither extreme seems quite right. The moon rocks returned to earth poorly symbolized the trip; but the photos of Earth, taken from Space, have had a profound impact on our global consciousness, if not our global conscience, and have helped energize the worldwide environmental protection movement. It is much harder to deny our common humanity when we can all see our common home.

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[27] *Id.* at 322.

[28] One fictional account, for example, described by chronicler James Mitchner in his novel, *SPACE*, was likely not far from actual discussions at the time. It was made by an Air Force colonel who proposed landing a man on the moon with three years of food and oxygen, and then using that period to figure out how to "rescue" him. He was sure the rescue could ultimately be accomplished, noting that he himself would be willing to volunteer for such a mission: "[T]o establish discovery of the United States to a surface area bigger than Asia? To go down in the history books of the world? Gentlemen, I could get you twenty test pilots in our services who would take off tomorrow." JAMES MITCHNER, SPACE 286-87 (1982).

[29] NORMAN MAILER, OF A FIRE ON THE MOON 71 (1970).

[30] *Id.* at 72-73.

[31] *Id.* at 337. Before the flight, a reporter asked Armstrong if he would "at least recognize that his endeavor was equal in magnitude to Columbus' adventure." *Id.* at 40.

We now know that the Russians were never serious challengers in the moon race, and that the prospect of the United States following the moon landing with a serious effort at space exploration, including a manned landing on Mars by 2000, was grossly overstated.[32] We had no real plan; only a manufactured desire to do an extremely difficult engineering feat first. Our loss of enchantment, even interest, in the moon (and space exploration) was captured by Gene Cernam, the last of the twelve astronauts to land on the moon, when he said, as he blasted off its surface, "Let's get this mother out of here."[33]

The moon landing was primarily about commerce and world politics, not world peace and harmony. As historian Walter McDougall emphasizes in his book, *The Heavens and the Earth,* although the plaque we placed on the moon read "We came in peace for all mankind," peace was not what the mission was about. It did have something to do with science, but he writes, "mostly [it was] about spy satellites, and comsats, and other orbital systems for military and commercial advantage."[34] Military and commercial goals continue to dominate outer space, just as they did with the conquistadors. And even though space exploration has again been relegated to the realm of science fiction, the moon landing continues to be the scientific and engineering feat to which those aspiring to breakthrough innovation compare their efforts.

It is the realm of science fiction that contains most of the important speculation about the human predicament and the future of humanity. Borges, for example, suggested that humans could become immortal if we were willing to have all of our bodily functions performed by machines.[35] We humans could enter into the world of pure thought by having our brains inhabit a "cube-like" piece of furniture. In the nightmare envisioned by Borges, modern surgery and mechanical replacement parts could bring a type of immortality to humankind, not as immortal actors, but as immortal witnesses.

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[32] Bill Keller, *Eclipsed,* N.Y. TIMES, June 27, 1999 (Magazine), at 30.

[33] *Id.* at 63. *See also* David L. Chandler, *One Giant Leap to . . . Where?* BOSTON GLOBE, July 19, 1999, at C1.

[34] MCDOUGALL, *supra* note 26, at 413.

[35] JORGE LUIS BORGES, *The Immortals,* in THE ALEPH AND OTHER STORIES 1933-1969, 165-74 (Norman Thomas di Givoanni trans. 1978). Another Borges short story on immortality, *The Immortal,* recounts the story of a Roman soldier who discovers the "City of the Immortals" and the key to immortality, and ends up spending centuries searching for the secret of death. Among the observations he makes are, "To be immortal is commonplace; except for man, all creatures are immortal, for they are ignorant of death; what is divine, terrible, incomprehensible, is to know that one is immortal." JORGE LUIS BORGES, LABYRINTHS 105-18 (Donald A. Yates & James E. Irby eds., 1964). *See also* Kurt Vonnegut, *Fortitude, in* WAMPETERS, FOMA & GRANFALLOONS 43-64 (1989) (a play about the attachment of a human head to a series of mechanical organs).

Arthur C. Clarke, in *2001*, illustrated human evolution moving in a different direction: toward the development of a computerized mind encapsulated in a metal space-ship-like body, eternally roaming the galaxy in search of new sensations.[36] The price for the prize of human immortality in this view is the eradication of both the human body and the human mind; the former being replaced by an artificial, destruction-proof container, the latter by an infinitely copyable computer program. Of course, the indestructible robot body inhabited by a digital memory chip would not be human in the sense we understand it today, and the rights of this device would likely be more on the order of the "rights" of robots than contemporary humans.[37]

We could use our technology to explore outer space with robots, but our current fascination is with inner space. Instead of expanding our minds and our perspective as a species by pondering the mysteries of outer space with its possibilities of other intelligent life forms, we are turning inward, and contemplating ourselves on the microscopic level. The new biology, perhaps

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[36] ARTHUR CHARLES CLARKE, 2001: A SPACE ODYSSEY (1968).

[37] Isaac Asimov probably thought deeper about the implications of building humanlike robots than anyone. His vision was that robots would work with and for humans, not replace them. To this end he proposed three "laws" of robots: (1) a robot may not injure a human being, or through inaction, allow a human being to come to harm; (2) a robot must obey the orders given to it by human beings except where such orders would conflict with the first law; and (3) a robot must protect its own existence as long as such protection does not conflict with the first or second laws. These rules were first suggested by Asimov in a 1942 short story, *Runaround*. *See* ISAAC ASIMOV, *Runaround*, *in* I, ROBOT 40 (1950). *See also* his robot novels, ISAAC ASIMOV, THE CAVES OF STEEL (1953); ISAAC ASIMOV, THE NAKED SUN (1957); and ISAAC ASIMOV, THE ROBOTS OF DAWN (1983).

Artificial intelligence researcher Hans Moravec imagines a whole new species of robotic "mind children" evolving with super intelligence that simply would not be possible with the limitations of the human brain. HANS MORAVEC, MIND CHILDREN: THE FUTURE OF ROBOT AND HUMAN INTELLIGENCE (1988). On further reflection, however, he sees danger to the entire human species in permitting individuals to transcend their species:

> [W]ithout restrictions, transformed humans of arbitrary power and little accountability might routinely trample the planet, deliberately or accidentally. A good compromise, it seems to me, is to allow anyone to perfect their biology within broad biological bounds. They could make themselves healthier, more beautiful, stronger more intelligent, and longer-lived. They could not use machinery to make themselves as powerful or as smart as the robots. Those who cannot tolerate the restrictions would be offered a radical escape clause.
>
> To exceed the limits, one must renounce legal standing as a human being, including the right to corporate police protection, to subsidized income, to influence laws—and to reside on Earth. In return, one gets a severance payment sufficient to establish a comfortable space homestead and absolute freedom to make one's own way in the cosmos . . . .

HANS MORAVEC, ROBOT: MERE MACHINE TO TRANSCENDENT MIND 143 (1999). *See also* PHILIP K. DICK, DO ANDROIDS DREAM OF ELECTRIC SHEEP? (1968); RAY KURZWEIL, THE AGE OF SPIRITUAL MACHINES: WHEN COMPUTERS EXCEED HUMAN INTELLIGENCE (1999).

better described as the new genetics or the "genetics age," suggests a biology-based immortality alternative to a digital brain in a body of metal and plastic: changing and "enhancing" our human capabilities by altering our genes at the molecular level. Or, as James Watson, the co-discoverer of the structure of DNA has put it, "We used to think our future was in our stars, now we know our future is in our genes."[38]

C. Genetic Engineering

Like space exploration, work on human genetics is dominated by governmental agencies and commercial interests. And, like the moon race, there was also a race to sequence the human genome. Taking place in the shadow of Hiroshima, and under the ever-present threat of species suicide by nuclear annihilation, the entire Human Genome Project should also be seen as an attempt by science to redeem itself, to bring the "gift" of immortality (or at least a better life) to a species whose very existence it has placed at risk.[39] The scientific (and commercial) goal is unabashedly to conquer death by genetically engineering the immortal human. As William Hazeltine, CEO of Human Genome Sciences, has declared, "Death is a series of preventable diseases."[40] Two recent genetic experiments suggest basic strategies to engineer a "better human": cloning sheep and making a smarter mouse.

In early 1997, embryologist Ian Wilmut announced that he and his colleagues had cloned a sheep, creating a genetic twin of a deceased adult animal by reprogramming one of its somatic cells to act as the nucleus of an enucleated egg.[41] He called the cloned lamb Dolly. An international debate on outlawing the cloning of a human began immediately, and has continued. Dolly's "creator," Ian Wilmut, has consistently argued that his cloning technique should not be applied to humans.[42] Wilmut has not used literature to bolster his argument, but he could.

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[38] Leon Jaroff, *The Gene Hunt*, TIME, March 20, 1989, at 63, 67 (quoting James Watson); *see also* Judith P. Swazey, *Those Who Forget Their History: Lessons from the Recent Past for the Human Genome Quest*, *in* GENE MAPPING: USING LAW & ETHICS AS GUIDES 45, 47 (George J. Annas & Sherman Elias eds., 1992).

[39] *See generally* ROBERT J. LIFTON, THE FUTURE OF IMMORTALITY AND OTHER ESSAYS FOR A NUCLEAR AGE (1987); *see also* Annas, *supra* note 1, at 660.

[40] ROBERT POLLACK, THE MISSING MOMENT: HOW THE UNCONSCIOUS SHAPES MODERN SCIENCE 154-59 (1999); *see* Daniel Callahan, *Death and the Research Imperative*, 342 NEW ENG. J. MED. 654, 654-55 (2000); Lawrence Fisher, *The Race to Cash in on the Genetic Code*, N.Y. TIMES, Aug. 29, 1999, at C1.

[41] Ian Wilmut et al., *Viable Offspring Derived from Fetal and Adult Mammalian Cells*, 385 NATURE 810, 812 (1997).

[42] *See, e.g.*, IAN WILMUT ET AL., THE SECOND CREATION: DOLLY AND THE AGE OF BIOLOGICAL CONTROL 267-98 (2000).

One reporter who described Wilmut as "Dolly's laboratory father," for example, could not have conjured up images of Mary Shelley's *Frankenstein*[43] better if he had tried.[44] Frankenstein was also his creature's father/god; as the creature tells him: "I ought to be thy Adam."[45] Like Dolly, the spark of life was infused into the creature by electric current. Unlike Dolly, Frankenstein's creature was created fully grown (not a cloning possibility), and wanted more than creaturehood: he wanted a mate of his "own kind" with whom to live and reproduce. Frankenstein reluctantly agreed to manufacture such a mate if the creature agreed to leave humankind alone. But in the end, Frankenstein viciously destroyed the female creature-mate, concluding that he had no right to inflict the children of this pair, "a race of devils," upon "everlasting generations."[46] Frankenstein ultimately recognized his responsibility to humanity, and Shelley's great novel explores virtually all the noncommercial elements of today's cloning debate.[47]

The naming of the world's first cloned mammal, like the naming of San Salvador, and the spacecraft Apollo, is telling. The sole survivor of 277 cloned embryos (or "fused couplets"), the clone could have been named after its sequence in this group (e.g. 6LL3), but this would have only emphasized its character as a produced product. In stark contrast, the name Dolly suggests a unique individual. Victor Frankenstein, of course, never named his creature, thereby repudiating any parental responsibility. Naming the world's first mammal-clone Dolly, Wilmut accepted responsibility for her.[48]

Cloning is replication, and as such holds little attraction or interest for people who want to have children. Most of us want our children to have better lives than we have had, not simply to duplicate them, even genetically. That is why genetic engineering experiments that promise "better" children (and better humans) are much more important to the future of humankind. In late 1999, for example, Princeton scientist Joe Tsien announced that he had used genetic

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[43] MARY SHELLEY, FRANKENSTEIN (1996) (1818).

[44] For more on human cloning in general, and the use of the name Dolly, see George J. Annas, *Human Cloning: A Choice or an Echo?* 23 DAYTON L. REV. 247, 257 (1998). The most thoughtful response to my arguments against human cloning have been made by Professor Michael H. Shapiro, *I Want a Girl (Boy) Just Like the Girl (Boy) that Married Dear Old Dad (Mom): Cloning Lives*, 9 S. CAL. INTERDISC. L.J. 1 (1999).

[45] SHELLEY, *supra* note 43, at 66.

[46] *Id.* at 114.

[47] *Id. See also* Annas, *supra* note 44, at 457.

[48] *Id.* Although Wilmut and I both testified before a United States Senate panel on cloning legislation in March 1997, I did not get a chance to ask him about the choice of a name until 1999. Wilmut said that the Frankenstein myth had nothing to do with his choice of the name Dolly, he got the name from John Bracken. "Dolly Parten was the inspiration, stressing the mammary connection." WILMUT ET AL., *supra* note 42, at 216.

engineering techniques to create mice with better memories and these mice could therefore learn faster than other mice: they were "smarter."[49] Tsien is convinced that if his findings can be made applicable to humans, everyone will want to use genetic engineering to have smarter babies. In his words, "Everyone wants to be smart."[50]

Appropriating the moon landing achievement, Tsien said of his genetically-engineered mice (he named the strain, Doogie, after TV's fictional boy genius physician), "To the scientific community this is a small step for a man. The fundamental question is, 'Is this a giant step for mankind?'"[51] Tsien also suggested that his work is much more important than cloning; because the clone is a genetic duplicate, it adds nothing new to the world.[52] His point is well taken. The possibility of applying genetic engineering techniques to humans for the purpose of making smarter, stronger, happier, prettier, or longer-lived humans simultaneously raises all of the questions with which I began this Article: what does it mean to be human, and what changes in "humanness" would result in "better" humans, as opposed to a new species altogether?

In the world of genetic engineering, we would become in a real sense products of our own manufacture.[53] As products, we would be subject to both quality control and improvements, including destruction and replacement if we are "defective." We could, nonetheless, construct a new eugenics based not on a corrupt, Hitlerian view of our fellow humans, but on a utopian dream (or nightmare) of what an "ideal" human should be like. Do we really want what we seem to want? Is Tsien correct, for example, in claiming that everyone would want to have a better memory?

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[49] Tang Ya-Ping et al., *Genetic Enhancement of Learning and Memory in Mice*, 401 NATURE 63 (1999). Tsien, like Wilmut, also hopes to cash in on his work, and has joined with venture capitalist Charles Hsu to form Eureka Pharmaceuticals. He is also promoting his work in the popular press. *See* Joe Tsien, *Building a Brainier Mouse*, SCIENTIFIC AMERICAN, April 2000, at 62-68. In that piece he does caution, however,: "[a]lthough learning and memory are integral parts of intelligence, intelligence is a complex trait that also involves many other factors, such as reasoning, analytical skills and the ability to generalize previously learned information." *Id.* at 67. He also notes what, hopefully, is obvious: "[G]enetic engineering will never turn the mice into geniuses capable of playing the piano." *Id.*

[50] *See* Nicholas Wade, *The Hidden Traps in Fooling Mother Nature*, N.Y. TIMES, Sept. 5, 1999, at D1.

[51] *Id.* at 4. *But see* Stephen J. Gould, *Message from a Mouse*, TIME, Sept. 13, 1999, at 62 (noting that even if the gene worked in humans, it would be education, not genes, that made people "smarter").

[52] *Id.* Wilmut would agree. He and Keith Campbell developed somatic cell nuclear transfer cloning not to duplicate existing animals, but so that they could add genes directly to somatic cells (rather than embryos where it is much less efficient), and use only those cells that actually incorporated the new gene to make embryos, and (hopefully) improved animals. WILMUT ET AL., *supra* note 42, at 5-12, 153.

[53] *See, e.g.*, LEON KASS, TOWARD A MORE NATURAL SCIENCE 43-79 (1985).

D. The Human Zoo

Elie Wiesel, the most articulate witness of the Holocaust, has devoted his life's work to memory. He strives to ensure that the world understands that we must not forget the horrors of the Holocaust, so that they will not be repeated.[54] Accurate memory was also the primary aim of the prosecution and judges at the International Military Tribunal at Nuremberg. The crimes against humanity committed during World War II had to be remembered. As Chief Prosecutor Justice Robert Jackson put it to the Tribunal, "The wrongs which we seek to condemn and punish have been so calculated, so malignant, and so devastating, that civilization cannot tolerate their being ignored because it cannot survive their being repeated."[55] It is not memory alone that matters, but the information memory holds, and what humans do with that information. We have, for example, more and more information about our genes every day. We are told that scientists will soon be able to understand life at the molecular level. But we have lost all perspective, and are becoming simultaneously genetic reductionists and determinists. We do not live life on the molecular level, but as full persons. We will never be able to understand life (or how it should be lived, or what it means to be human) by exploring or understanding our lives or bodies at the molecular, atomic, or even the subatomic level.[56]

Cloned sheep live in a pen; laboratory mice are confined to a controlled environment. Science now seems to act as if humanity's goal is a world of mass contentment and containment, an earth-sized human zoo in which every man, woman, and child has all the "smart genes" we can provide, is fed the

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[54] *See, e.g.*, ELIE WIESEL, NIGHT (1960).

[55] This phrase was quoted by Telford Taylor in his opening statement at the trial of the Nazi doctors. *See* Telford Taylor, *Opening Statement of the Prosecution, December 9, 1946, in* THE NAZI DOCTORS, *supra* note 13, at 67-68.

[56] *See generally* GEORGES CONGUILHEM, THE NORMAL AND THE PATHOLOGICAL (Carolyn R. Fawcett trans. 1989) (1966). Canguilhem argues that it is a fundamental mistake to view life at the molecular or genetic level, rather than seeing humans as full persons. He also sees our fixation on genetic errors as almost inevitably leading to the "gene police" complete with sterilization of those with unfit genes. In his words:

> [W]hy not dream of hunting for heterodox genes, of a genetic inquisition? And while waiting, why not deprive suspect sires of the liberty of the liberty of sowing broadcast? . . . [I]n dreaming these dreams, we enter another world, bordering on the bravest of Aldous Huxley's from which sick individuals, their particular diseases and their doctors have been eliminated . . . . At the beginning of the dream we have the generous ambition to spare innocent and impotent living beings the atrocious burden of producing errors of life. At the end there are the gene police, clad in the geneticists' science . . . to dream of absolute remedies is often to dream of remedies which are worse than the ill.

Id. at 280-81.

most nutritious food, protected from all preventable diseases, lives in a clean, air-filtered environment, and is supplied sufficient mind-altering drugs or genes to be in a constant state of "happiness," even euphoria. And this happy life, which Borges envisioned with horror, could be made to extend for hundreds of years; at least if there is no more to life than a perfectly-engineered body, a contented mind, and virtual immortality.[57] Philosopher-physician Leon Kass has put it well in the context of genetic engineering (but could also have been speaking of Columbus): "Though well-equipped, we know not who we are or where we are going."[58] We literally do not know what to make of ourselves. Humans must inform science, science cannot inform (or define) humanity. Novelty is not progress, and technique cannot substitute for life's meaning and purpose.

III. TOWARD A "BETTER" HUMAN

As we attempt to take human evolution into our own hands, it is neither the Aztecs, nor the Nazis whom we next plan to conquer. The territory we now claim is our own body. We claim it in the name of the new eugenic "right" of every human to do with his or her body what he or she chooses; and to make of our children what we desire. Yet the brief history of our species cautions that there are limits to our knowledge and claims of dominion that we exceed at our own peril. Cortés could rationalize his subjugation of the Aztecs because, among other things, they engaged in human sacrifice and cannibalism. With human experimentation, such as the transplantation of a heart from a baboon to a newborn child known as Baby Fae, we have made human sacrifice an art, and, with organ transplantation, we have tamed cannibalism.[59] Postmodern man accepts no limits, no taboos.

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[57] On our contemporary dreams of immortality, see, for example, Stephen S. Hall, *Racing Toward Immortality (or at least your 150th birthday): The Recycled Generation*, N.Y. TIMES, Jan. 30, 2000 (Magazine), at 30; and Brian Alexander, *Don't Die, Stay Pretty*, WIRED, Jan. 2000, at 178-87.

[58] Leon Kass, *The Moral Meaning of Genetic Technology*, COMMENTARY, Sept. 1999, at 32, 38. *See generally* George J. Annas, *Questing for Grails: Duplicity, Betrayal and Self-Deception in Postmodern Medical Research*, 12 J. CONTEMP. HEALTH L. & POLICY 297 (1996).

[59] *See, e.g.*, RENÉE FOX & JUDITH SWAZEY, SPARE PARTS 43-72 (1992); Jay Katz, *Human Sacrifice and Human Experimentation: Reflections on Nuremberg*, 2 Yale Law School Occasional Papers (1997); and George J. Annas, *Baby Fae: The 'Anything Goes' School of Human Experimentation*, HASTINGS CENTER REPORT, Feb. 1985, at 15. Musing on space exploration, the transplant of a baboon heart into Baby Fae, and the slaughter and oppression of people around the world, Vaclav Havel wrote:

> How can science and reason explain it? . . . Could we be getting ready to go to Mars in the secret hope of leaving our demons behind on the earth and so disposing of them? And who, in fact, has a baboon heart: that little girl in California—or the Marxist government of Ethiopia, building its

If humanity survives another thousand years, what will the human of the year 3000 be like? With more than three-quarters of the Earth covered by water, would the addition of gills, for example, be an enhancement or a deformity?[60] Would such a child be reared for underwater exploration or for a circus sideshow?[61] How tall is too tall? Can you be too smart for your own good? If we continue to ignore the continuing pollution of our environment, perhaps the "improved human" should be able to breathe polluted air and survive on garbage. As we deplete our energy sources, perhaps the improved

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> mausoleums in a time of famine or the Polish police; or the Sikhs in the personal bodyguard of the Indian prime minister .... It seems to me that man has what we call a human heart, but that he also has something of the baboon within him. The modern age treats the heart as a pump and denies the presence of the baboon within us. And so again and again, this officially non-existent baboon goes on the rampage, either as the personal bodyguard of a politician, or wearing the uniform of the most scientific police force in the world.

VACLAV HAVEL, LIVING IN TRUTH 162-63 (1986).

[60] Olaf Stapledon imagined many possible changes in the human species. W. OLAF STAPLEDON, LAST AND FIRST MEN (1931). Although many of the changes he envisioned were the products of natural selection rather than genetic engineering, the human rights issues, especially human dignity and equality, are the same. For example, in Stapledon's work, humans are forced to migrate to Venus, and adapt to the new planet:

> After some millions of years of variation and selection there appeared a very successful species of seal-like sub-men. The whole body was moulded to stream-lines. The lung capacity was greatly developed. The spine had elongated, and increased in flexibility. The legs were shrunken, grown together, and flattened into a horizontal rudder. The arms also were diminutive and fin-like, though they still retained the manipulative forefinger and thumb. The head had sunk into the body and looked forward in the direction of swimming. Strong carnivorous teeth, emphatic gregariousness, and a new, almost human, cunning in the chase, combined to make these seal-men lords of the ocean. And so they remained for many million years, until a more human race, annoyed at their piscatorial successes, harpooned them out of existence.

Id. at 288.

[61] Katherine Dunn explores this possibility in her novel, *Geek Love,* in which Alyosius Binewski, the carnival owner, exposes his wife to a variety of terratogens to produce children suitable for carnival acts. KATHERINE DUNN, GEEK LOVE (1989). They include "Aqua Boy," who has flippers for hands and feet (but no gills), Siamese twins, and the narrator, Olympia, who is a bald, albino, hunchbacked dwarf. Many of the children spontaneously aborted, and their bodies were preserved and made into a special carnival exhibit. Among the questions Dunn explores are what is a "norm" and what is a "freak"; can beauty be a handicap; is surgical alteration different than being born that way; and how is happiness related to physical appearance? In one scene Aqua Boy (Arty) is explaining to Olympia (Oly) why he loves reading horror stories before going to bed:

> These are written by norms to scare norms. And do you know what the monsters and demons and rancid spirits are? Us, that's what. You and me. We are the things that come to the norms at night. The thing that lurks in the bell tower and bites out the throats of the choirboys—that's you. Oly. And the thing in the closet that makes the babies scream in the dark before it sucks their last breath—that's me. And the rustling in the brush and the strange piping cries that chill the spine on a deserted road at twilight—that's the twins singing scales while they look for berries.

Id. at 46.

human should have a bionic wheel to replace our legs for more efficient mobility. Or perhaps we should try to grow wings to fly.[62] Will we as a society permit individual scientists to try any or all of these experiments on humans, or can we learn from the unanticipated consequences of conquest and the horrors of war, that humans are better off when they think before they act, and act democratically when action can have a profound impact on every member of the species?[63]

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[62] STAPLEDON, *supra* note 60, at 290-301. Stapledon's "Seventh Men" were genetically engineered by the "Sixth Men" to be able to fly:

> The Seventh Men were pigmies, scarcely heavier than the largest of terrestrial flying birds. Through and through they were organized for flight. A leathery membrane spread from the foot to the tip of the immensely elongated and strengthened 'middle' finger .... The body assumed the stream-lines of a bird, and was covered with a deep quilt of feathery wool .... The breastbone was greatly developed as a keel, and as a base for the muscles of flight. The other bones were hollow, for lightness .... Compared with their makers their brain volume was of necessity small ....

Id. at 291-92. The Seventh Men prospered for "close to a hundred million terrestrial years" but had many severely handicapped infants, who were killed. Eventually they became so consumed with the passion of flying that they neglected their duties on the surface of the planet, and decided to let those infants ("deformed") who could not fly live and do the thinking and work for them on the surface. These "brilliant cripples" eventually developed large brains and took over the planet. Ultimately, they came to see wings as a deformity, "a laughing stock, and the life of natural flight was condemned as a barren luxury." *Id.* at 300. Fliers were first discriminated against by being required to spend most of their time on the ground, and later sterilized. "And finally a law was enacted by which all winged infants must be either mutilated or destroyed." *Id.* Eventually their extinction was promoted and the final survivors of the species committed suicide by throwing themselves into a volcano. The lesson from the history of the last thousand years, and from Stapledon's view of the far future, is that differences between peoples can easily be used as an excuse first to discriminate against them, then to treat them as subhuman, and finally to kill them.

[63] If the breathless discussion at a turn-of-the-century conference put on by proponents of full-speed-ahead human genetic engineering is an indication, the current impulse is toward trial and error action rather than thought, toward elite decision making rather than any species-level deliberation. *See* ENGINEERING THE HUMAN GERMLINE: AN EXPLORATION OF THE SCIENCE AND ETHICS OF ALTERING THE GENES WE PASS TO OUR CHILDREN 87 (Gregory Stock & John Campbell eds., 2000); James Watson argued at the 1999 conference chronicled in the book:

> I think it would be complete disaster to try and get an international agreement. I just can't imagine anything more stifling. You end up with the lowest possible common denominator. Agreement among all the different religious groups would be impossible. About all they'd agree upon is that they should allow us to breathe air .... I think our hope is to stay away from regulations and laws whenever possible.

Id. at 87.

Although Watson likes to take credit for the idea of making ethics an integral part of the Human Genome Project by dedicating a portion of its funding to examining the Ethical, Legal and Social Implications ("ELSI") of it, in fact he has never taken ethics or democratic oversight seriously. As he described his vision of the Project's ELSI Working Group himself, he wanted it not to set ethical standards but to help ensure that the gene scientists could do their work unimpeded. "I wanted a group that would talk and talk and never get anything done," Watson said, "and if they did do something, I wanted them to get it wrong." LORI ANDREWS, THE CLONE AGE 206 (1999) (quoting Watson). And if the ELSI group got it right, Watson wanted to be able

The United Nations was formed to prevent war, and the International Criminal Court is being formed to hold people accountable for crimes against humanity, such as murder, torture, slavery and genocide. Of course, state-sponsored crimes against humanity still take place, and not just in Rwanda and the former Yugoslavia.[64] But the world no longer ignores the rights of peoples who prior to Nuremberg would simply have been designated as "uncivilized" or considered "subhuman."[65] If we humans are to be the masters of our own destiny, and not simply products of our new technologies (a big "if"), we will need to build international institutions at least as sturdy as the United Nations and the proposed International Criminal Court to help channel and control our new-found powers and to protect basic human rights. Human dignity and equality are only likely to be safe from science that is accountable to democratic institutions, and transparent enough so that international deliberation can take place before irrevocable species threatening experiments are conducted.

Outside the realm of inventing and producing weapons of mass destruction, science is not a criminal activity, and human cloning and genetic engineering do not fit comfortably in the category of international crimes against humanity.[66] Moreover, in the face of the Holocaust and nuclear weapons, genetic engineering appears almost benign. But this is deceptive because genetic engineering has the capacity to change the very meaning of what it is

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to discredit their work nonetheless by saying that their leader was a lightweight. In his words again, "I wanted as its head Shirley Temple Black." *Id.*

[64] *See, e.g.*, JOHN CONROY, UNSPEAKABLE ACTS, ORDINARY PEOPLE: THE DYNAMICS OF TORTURE (2000); PHILIP GOUREVITCH, WE WISH TO INFORM YOU THAT TOMORROW WE WILL BE KILLED WITH OUR FAMILIES (1998); JAN WILLEM HONIG & NORBERT BOTH, SREBRENICA: RECORD OF A WAR CRIME (1996); MATTHEW JARDINE, EAST TIMOR: GENOCIDE IN PARADISE (1995).

[65] SVEN LINDQVIST, EXTERMINATE ALL THE BRUTES 122-23 (Joan Tate trans., 1992). "[D]uring nineteenth-century European expansion ... genocide began to be regarded as an inevitable by-product of progress." *See also* JOSEPH CONRAD, HEART OF DARKNESS 10 (1899): ("The conquest of the earth, which mostly means the taking it away from those who have a different complexion or slightly flatter noses than ourselves, is not a pretty thing when you look into it too much.").

[66] The development of chemical and biological weapons of mass destruction is a criminal activity. *See, e.g.*, 18 U.S.C. § 175 (1994 & Supp. 1998). It should be of much more concern to us as a species than it has been that our most significant public health triumph, the eradication of small pox, has been quickly turned against us by the prospect of genetically engineering small pox as a biological weapon of mass destruction. *See, e.g.*, KEN ALIBEK, BIOHAZARD: THE CHILLING TRUE STORY OF THE LARGEST COVERT BIOLOGICAL WEAPONS PROGRAM IN THE WORLD—TOLD FROM THE INSIDE BY THE MAN WHO RAN IT 107-22 (1999); Donald A. Henderson, *The Looming Threat of Bioterrorism*, 283 SCIENCE 1279 (1999). International Physicians for the Prevention of Nuclear War ("IPPNW") are to be applauded for their continuing efforts to eliminate nuclear weapons and to condemn scientists and physicians for using their skills to make and maintain weapons of mass destruction. *See* LEO SZILARD, THE VOICE OF THE DOLPHINS AND OTHER STORIES (1961) (a fictional account of the responsibilities of nuclear weapons scientists).

to be human. There are limits to how far we can go in changing our human nature without changing our humanity and our basic human values. Because it is the meaning of humanness (our distinctness from other animals) that has given birth to our concepts of both human dignity and human rights, altering our nature necessarily threatens to undermine both human dignity and human rights. With their loss the fundamental belief in human equality would also be lost.[67] Of course, we know that the rich are much better off than the poor and that real equality of opportunity will require both universal education and income redistribution; nonetheless, the rich and powerful may not enslave, torture, or kill even the poorest human on the planet. Likewise, it is a fundamental premise of democracy that all humans, even the poor, must have a voice in determining the future of our species and our planet.[68]

Can universal human rights and democracy, grounded in human dignity, survive human genetic engineering? Without clear goals, the market will define what it is that makes a better human. Mass marketing and advertising will encourage us to conform to some culturally-constructed ideal, rather than celebrate, or even accept, differences. This is at least one major lesson from the cosmetic surgery industry: almost all of its patient/clients want either to be reconstructed to appear "normal," or to be remodeled to appear younger.[69] It should at least give an immortality-seeking science (and society) pause to observe that the more our human life span has increased, the more human societies devalue and marginalize the aged, and worship and seek to emulate the bodies of the young.

The new "ideal" human, the genetically-engineered "superior" human, would almost certainly come to represent "the other."[70] If history is a guide,

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[67] *See supra* notes 12, 21-22.

[68] *Id. See also* AMARTYA SEN, INEQUALITY REEXAMINED (1995); AMARTYA SEN, ON ETHICS AND ECONOMICS 30-57 (1987).

[69] *See, e.g.*, ELIZABETH HAIKEN, VENUS ENVY: A HISTORY OF COSMETIC SURGERY 131-75 (1997).

[70] For example "reprogenetics" cheerleader, Lee Silver, suggests that the "Gen Rich" will develop into a separate superior species. LEE SILVER, REMAKING EDEN 240-50 (1997). Maxwell Mehlman argues persuasively that:

> The characteristics of genetic enhancement that threaten to destabilize liberal democratic government are the features that distinguish genetic enhancement from other forms of self-improvement: its high cost, which may place it beyond the reach of all but the very wealthy; the broad and fundamental nature of the traits that it could enhance; the magnitude of its effects; their multiplicity; the resulting ability to gain advantages uin multiple spheres of social activity; and the possibility—created by germ line enhancement—that these advantages would be passed on to successive generations.

either the normal humans will view the "better" humans as "the other," and seek to control or destroy them, or vice-versa. The better human will become, at least in the absence of a universal concept of human dignity, either the oppressor or the oppressed. In short, as H. G. Wells made clear in his *The Country of the Blind*, it is simply not true that every enhancement of human ability will be universally praised: in the valley of the blind the one-eyed man was not king, rather eyes were considered a deformity that had to be surgically eliminated so that the sighted person would be like everyone else.[71]

Ultimately, it almost seems inevitable that genetic engineering would move *homo sapiens* to develop into two separable species: the standard-issue human beings would become like the "savages" of the pre-Columbian Americas, and be seen by the new, genetically-enhanced neo-humans, as heathens who can properly be slaughtered and subjugated. It is this genocidal potential that makes species-altering genetic engineering a potential weapon of mass destruction and the unaccountable genetic engineer a potential bioterrorist. Science cannot save us from our inhumanity toward each other; it can just make our self-destructive tendencies more efficient and more horrible. Science and oppression can, in fact, go hand in hand. As historian Robert Proctor put it in concluding his study of public health under the Third Reich, "the routine practice of science can so easily coexist with routine exercise of cruelty."[72]

IV. NEW CRUSADES

Although we have not conquered death ourselves, we have invented a creature that has: the corporation. The corporation is a legal fiction endowed by law with eternal life (and limited liability). This creature has, like Frankenstein's monster, assumed powers neither envisioned nor controllable by its creator. In its contemporary form, the corporation has become transnational, and thus under the control of no government, democratic or otherwise. It swears no allegiance to anything and knows no limits in its pursuit of growth and profit, its battle cry is "the shareholders will it." And like the Spanish Crown, it has its own cover story. Life sciences and biotech corporations seek profits not for their own sake, but rather to conduct scientific

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Maxwell J. Mehlman, *The Law of Above Averages: Leveling the New Genetic Enhancement Playing Field*, 85 IOWA L. REV. 517, 550 (2000).

[71] H.G. WELLS, *The County of the Blind*, *in* TWENTY-EIGHT SCIENCE FICTION NOVELS OF H.G. WELLS 310-51 (1952). *See also supra* notes 57 & 59.

[72] ROBERT N. PROCTOR, THE NAZI WAR ON CANCER 278 (1999).

research "for the betterment of mankind."[73] The life sciences corporate world now seeks to make not only better plants and animals, but also better humans. George Orwell's 1946 *Animal Farm*, where "all animals are equal, but some animals are more equal than others,"[74] now seems much more likely to be brought to us by life sciences biotechnology corporations than by totalitarian dictatorships. Science fiction writer Michael Crichton has perceptively observed, "[T]he commercialization of molecular biology is the most stunning ethical event in the history of science, and it has happened with astonishing speed."[75]

Because the nation state is no longer in control of the health and safety of its citizens, other forces must be mustered to help chart the course of human "progress" and human experimentation. One approach, which my colleague Michael Grodin and I have initiated, is to combine the strengths of the two major professions, law and medicine, and encourage members of these professions, whose *raison d'être* transcends both national and corporate boundaries, to work together to enhance human rights and health.[76] The non-governmental organization ("NGO") with this specific mission is Global Lawyers and Physicians; NGOs must play a much more central role in world affairs if money and commerce is not to become the overwhelming motive for science and experimentation in the world.[77] Grassroots activists must also work together if they are to influence humanity's future. The human rights

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[73] *"Like all organisms, the living company exists primarily for its own survival and improvement: to fulfill its potential and to become as great as it can be. It does not exist solely to provide customers with goods, or to return investment to shareholders . . . ."* ARIE DE GUESS, THE LIVING COMPANY 11 (1997). Nonetheless, even though potentially immortal, the average life span of multinational corporations is only about four decades, as they succumb to takeovers, mergers, and even death through bankruptcy and dissolution. *Id. See also* RAY VERNON, SOVEREIGNTY AT BAY: THE MULTINATIONAL SPREAD OF U.S. ENTERPRISES (1971); Interdisciplinary Internet Colloquim on Corporate Being and Life on Earth (visited July 31, 2000) <http://www.nancho.net/bigmed2000/bbonline.html> (showcasing an international symposium on the corporate life form).

[74] GEORGE ORWELL, ANIMAL FARM 133 (1956).

[75] MICHAEL CRICHTON, JURASSIC PARK at x (1990); *see also* Bartha Maria Knoppers et al., *Commercialization of Genetic Research and Public Policy*, 286 SCIENCE 2277 (1999).

[76] Michael A. Grodin & George J. Annas, *Legacies of Nuremberg: Medical Ethics and Human Rights*, 276 JAMA 1682-83 (1996); *see also* HEALTH AND HUMAN RIGHTS: A READER (Jonathan M. Mann et al. eds., 1999).

[77] *See* Global Lawyers and Physicians: Working Together for Human Rights (last modified Aug. 22, 2000) <http://www.glphr.org> (highlighting information on the organization and its activities). Of course, NGOs themselves also must be much more democratic, accountable, and transparent.

community, for example, must form coalitions with the environmental, humanitarian, labor, and peace communities.[78]

Science's crusade no longer seeks eternal life with God, but eternal life on Earth ("science wills it"). In decoding the human genome, religion is again the cover story. Scientists speak of the genome as the "book of man" and the "Holy Grail" of biology, and even President Bill Clinton announced (prematurely) the completion of the genome by saying that, "[t]oday, we are learning the language in which God created life."[79] But it is still gold and glory that these modern-day, corporation-sponsored explorers seek. Because there is money to be made by doing it, the corporate redesign of humans is inevitable in the absence of what Vaclav Havel has termed "a transformation of the spirit and the human relationship to life and the world."[80] Havel has noted that the new "dictatorship of money" has replaced totalitarianism, but is equally capable of sapping life of its meaning with its "materialistic obsessions," the "flourishing of selfishness," and its need "to evade personal responsibility."[81] Without responsibility rooted in human rights our future is bleak. Like the failed quest of the Spanish conquistadors for *El Dorado*, our quest for more and more money will come up empty. Immortality without more purpose than accumulating wealth is also hollow. In Havel's words, "the only kind of politics that makes sense is a politics that grows out of the imperative, and the need, to live as everyone ought to live and therefore—to put it somewhat dramatically—to bear responsibility for the entire world."[82]

To bear responsibility for the entire world may seem excessive, but even Frankenstein would recognize it as just right. It reminds us of the environmental movement's mantra, "think globally, act locally," and makes

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[78] The demonstrations at the 1999 Seattle meeting of the World Trade Organization and the 2000 Washington D.C. meeting of the World Bank and International Monetary Fund indicate that such a diverse coalition can be effective in making its voice heard and influencing international policy. In fact, it was these demonstrations that prompted the Group of Eight, G-8, major industrial nations to take up the plight of the poor countries as the main issue at their July 2000 meeting. *See Partial Text of the Group of Eight Summit Communique*, THE DAILY YOMIURI (Tokyo), July 24, 2000, at 3.

[79] *See, e.g.*, SWAZEY, *supra* note 38; THE CODE OF CODES (Daniel J. Keveles & Leroy Hood eds., 1992); The complete text of the President's remarks was published in the June 30, 2000 M2 PRESSWIRE, *available in* NEXIS, CURNWS. Earlier in June 2000, Vice President Al Gore, in remarks at Emory University, used remarkably different language in describing the human genetic code, comparing it to the "Nazi's secret code" (in that some genetic sequences predispose to cancer) and proclaiming, "With the completion of the Human Genome, we are on the verge of cracking another enemy's secret code." FDCH POLITICAL TRANSCRIPTS, June 2, 2000, *available in* NEXIS, CURNWS.

[80] Vaclav Havel, *Paying Back the West*, N.Y. REV. BOOKS, Sept. 23, 1999, at 54.

[81] *Id.*

[82] *Id.*

each of us responsible for all of us. How can we, citizens of the world, regain some control over science and industry that threatens to alter our species and the very meaning of our lives? It will not be easy, and given the consistently brutish and genocidal nature of our species, perhaps we do not deserve to survive. Nonetheless, the worldwide revulsion to the prospect of cloning a human being provides some hope that our species is not inherently suicidal. Medical ethics is too weak a reed on which to build an international movement; human rights is both more powerful and more appropriate.[83] This is because it is not medical and scientific practice that is at stake, but the nature of humanity and the rights of humans. In the human rights arena, I conclude this Article with a few modest suggestions.

On the national level, I (and others) called for moratorium on human gene transfer experiments, what are more commonly (and incorrectly) referred to as "gene therapy" in early 2000. Many experiments were halted, but others continued, as does the debate about whether we know enough at this time to use them on humans.[84] Formal moratorium or not, we must have a national

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[83] *See, e.g.*, Grodin & Annas, *supra* note 76, at 1683. There is no Nobel Prize for ethics, which speaks loudly to how scientists view ethics. The awarding of such a prize on an annual basis could do as much as a treaty to change the perceptions of scientists about the importance of ethical considerations in their work.

[84] I first proposed a moratorium on human gene transfer experiments in early February 2000 in response to a question posed by science report Michael Lasalandra of the *Boston Herald*. Michael Lasalandra, *Medical Ethicist Says Halt Gene Therapy*, BOSTON HERALD, Feb. 8, 2000, at 18. My primary reason was that in the aftermath of the death of Jesse Gelsinger in a gene transfer experiment at the University of Pennsylvania, it had become clear that most experimenters did not know what the others were doing, that adverse results were routinely kept secret, even from the United States Food and Drug Administration, and that what had been going on in the field for almost a decade was essentially "trial and error" experiments in which the dangers were simply unknown. But human experimentation is inherently a public enterprise (involving as it does the limits of what humans should be permitted to do to other humans), and should always be conducted in the public realm. I thought it was time to pause and compare notes, and not continue until there was some reasonable probability that the research subjects will not be seriously harmed, and may be benefited. Since then, at the twenty-fifth anniversary meeting of the scientists who called for a moratorium on recombinant DNA research at Asilomar, David Baltimore, a leading advocate of genetic research, has been quoted as having said that it is "absolutely necessary" for gene therapists to slow down and reexamine the standards for when to begin trials on human subjects. "There are times when things shouldn't happen [gene vectors] . . . [treatments] that weren't working in animals are going into humans. A lot of us are saying what the hell are [doctors] doing putting these into people?" Barinaga, *Asilomar Revisted: Lessons for Today*, 287 SCIENCE 1584, 1585 (2000). Of the 372 gene transfer experiments currently in clinical trials that are registered with the National Institutes of Health (NIH), 89% are in phase I, 10% are in phase II, and only 1% (3 trials) are in phase III. Leading scientists, Leon Rosenberg and Alan Schecter put it this way:

> [D]espite repeated claims of benefit or even cure, no single unequivocal instance of clinical efficacy exists in the hundreds of gene therapy trials . . . [yet] expressions of enthusiasm continue to be heard from major figures in the field. They have, much like a virus, integrated themselves into the culture and discourse of the field . . . [Investigators should] ask themselves if they or their families in similar circumstances would volunteer for the proposed investigation . . . [,] pause to

(and international) debate on the goals of the research, and whether the lines between somatic cell and germline research, or between treatment and enhancement research are meaningful.[85] My own view is that the boundary

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assess the ratio of benefits to the risks, the care they are taking in communicating with trial participants, the timeliness and safety of their approach, the accuracy of their claims, and the responsibility they have to report untoward events, regardless of their effect on grant funding or investor confidence.

Leon E. Rosenberg & Alan N. Schecter, *Gene Therapist, Heal Thyself*, 287 SCIENCE 1751, 1751 (2000). Unfortunately, the profit-driven private financing of small biotech companies that currently sponsor most of these trials makes it extremely unlikely that a voluntary moratorium will be agreed to, and this makes much stronger federal oversight to protect the research subjects imperative. Donna Shalala, *Protecting Research Subjects—What Must be Done*, 343 N. ENG. J. MED. 808 (2000). When what was said to be the world's first unequivocal success with gene "therapy" (on a form of Severe combined immunodeficiency disease or SCID) was announced on April 28, 2000, it was done not in the United States, but in France. Marina Cavazzana-Calvo et al., *Gene Therapy of Human Severe Combined Immunodeficiency (SCID)—X1 Disease*, 288 SCIENCE 669 (2000); Gina Kolata, *Scientists Report First Success of Gene Therapy*, N.Y. TIMES, April 28, 2000, at A1.

While the RAC (NIH's Recombinant DNA Advisory Committee) should be given more oversight authority, I think we need an entirely new federal oversight commission, with both rule-making and adjudicative authority over all risky human experiments in the United States. *See* George J. Annas, *Regs. Ignored in Research*, NAT'L L.J., Nov. 5, 1999, at A20.

[85] I have never found either line particularly meaningful or useful in the regulatory setting. *See, e.g.*, Sherman Elias & George J. Annas, *Somatic and Germline Gene Therapy*, *in* GENE MAPPING: USING LAW AND ETHICS AS GUIDES 142-54 (George J. Annas & Shermon Elias eds., 1992). *See generally* ENHANCING HUMAN TRAITS: ETHICAL AND SOCIAL IMPLICATIONS (Erik Parens ed. 1998). This does not mean that I think we should proceed with germline genetic interventions at this point, only that I believe the germline boundary line may not ultimately be sustainable because it is based primarily on safety and slippery slope concerns involving future generations. Nonetheless, there is a strong argument that germline interventions will always be too dangerous to attempt in humans because their consequences may always be too unpredictable. *See, e.g.*, Paul R. Billings et al., *Human Germline Gene Modification: A Dissent*, 353 LANCET 1873 (1999). As to the argument that we should use germline interventions to "cure disease" by modifying defective genes, this seems almost nonsensical. This is because such modification will only be possible in extracorporeal embryos. It is much more reasonable to destroy the embryos considered defective than to try to modify them, since the modification itself carries an unavoidable risk of making the condition treated even worse, and also introduces new dangers to the embryo's development. It is better to simply discard the affected embryos, and use only unaffected ones for reproduction. This same logic, I believe, applies to human fetuses that have serious, lethal, genetic conditions. Abortion is a much more reasonable approach to the conditions than experimental genetic interventions, such as those proposed by French Anderson. *See* Esmail D. Zanjanl & W. French Anderson, *Prospects for in Utero Human Gene Therapy*, 285 SCIENCE 2084, 2084-88 (1999).

What this means, of course, is that the only use of germline interventions will be for what is now termed "enhancements." Although it is often argued that the first such enhancement should be something like making the embryo immune from a serious disease, such as HIV infection, this makes little sense. First, it is very unclear that this type of intervention, even if successful, would "enhance" the life of the resulting child. Scientists have already identified a number of people with such immunity, and they are working as prostitutes in Africa and Thailand. The "enhancement" may have saved their lives, but it certainly did not make them "better" humans. Secondly, and as a general rule, if we know how to "immunize" a child against disease, we should do this after the child is born, not by some novel technological intervention that could have its own unforeseen consequences to the organism. Finally, if this is true, future germline genetics will be aimed at cosmetic surgery-like enhancements, and even these are more likely to be safe and effective if done on the somatic level with the adult human than on the germline level. The same may also be true of smart-mice-type

line that really matters is set by the nature of the species itself, and that species-altering experiments should be outlawed. Likewise, human replication cloning should also be outlawed, both for its own sake (because of the deleterious effects on children and their liberty), and because it will likely be necessary to utilize somatic sell nuclear transfer cloning technology to do germline genetic engineering efficiently.

We can take many effective actions on a national level, but to tame our tendency toward genocide and to prevent species suicide we need international rules about the new science, including not only human replication cloning and genetic engineering, but also human/machine cyborgs, xenografts, artificial organs, embryo research, and brain alterations.[86] These could all fit into a new category of "crimes against humanity" in the strict sense, actions that threaten the integrity of the human species itself.[87] This is not to say that changing the nature of humanity is always criminal, only that no individual scientist (or corporation or country) has the social or moral warrant to endanger or change humanity. Performing species-altering or species-endangering human experiments in the absence of social warrant, democratically authorized, can properly be considered a terrorist act. Xenografts, for example, carry the risk of releasing a new, lethal virus upon humanity.[88] No individual scientist or

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memory enhancement, music ability, or even athletic ability. Thus ultimately we may come to the conclusion that all germline interventions should be prohibited. *See also* Jon W. Gordon, *Genetic Enchancement in Humans*, 283 SCIENCE 2023 (1999).

[86] *See* Bill Joy, *Why the Future Doesn't Need Us*, WIRED, April 2000, at 238. Joy argues that it is past time for humanity to be concerned that developments in robotics, genetic engineering and nanotechnology could create uncontrollable terrorist-type creatures that could displace or destroy humanity:

> If we could agree, as a species, what we wanted, where we were headed, and why, then we would make our future much less dangerous–then we might understand what we can and should relinquish.... This time–unlike during the Manhattan Project–we aren't at war, facing an implacable enemy that is threatening our civilization; we are driven, instead, by our habits, our desires, our economic system, and our competitive need to know. I believe we all wish our course could be determined by our collective values, ethics, and morals. If we had gained more collective wisdom over the past few thousand years, then a dialogue to this end would be more practical, and the incredible powers we are about to unleash would not be nearly so troubling.

Id. at 256.

[87] On human replication cloning as a "crime against humanity," *see* GEORGE J. ANNAS, SOME CHOICE: LAW, MEDICINE AND THE MARKET 23-24 (1998).

[88] *See, e.g.*, Declan Butler, *US Decides Close Tabs Must be Kept on Xenotransplants...*, 405 NATURE 606 (2000); Margaret Clark, *This Little Piggy Went to Market: The Xenotransplantation and Xenozoonose Debate*, 27 J. LAW MED. & ETHICS 1073 (1999); A.S. Daar et al., *Round Table: Animal-to-Human Organ Transplants: A Solution or a New Problem?* 77 BULL W.H.O. 54 (1999). Because of the dangers of creating a new viral disease in humans. Ian Wilmut announced in August 2000 that his Roslin Institute would no longer pursue this work. Declan Butler, *Roslin Backs off Pig Organ Week*, 406 NATURE 663 (2000).

corporation has the moral warrant to risk this. Altering the human species should require a worldwide discussion and debate, followed by a vote in an institution representative of the world's population, the United Nations being the only such entity today. It should also require a deep and wide-ranging discussion of our future, and what kind of people we want to be, what kind of world we want to live in, and how we can uphold universal human rights based on human dignity, and democratic principles.

An international treaty banning specific "species altering" techniques and species-endangering experiments is necessary to make such a system effective. This, of course, begs two questions that are subjects for separate articles, but each of which deserves at least some comment. First, exactly what types of human experiments should be prohibited? Second, what precisely is the international regime proposed? As to the first, the general definition would encompass any experimental intervention aimed at altering a fundamental beneficial characteristic of being human. There are at least two ways to change such characteristics. The first is to make a necessary beneficial human trait optional. Changing it in one member (who continues to be seen as a member of the species) would change the species definition for everyone. An example is asexual replication. When one human engages in replication cloning, sexual reproduction will no longer be a necessary characteristic of being human. This will matter to all humans because it is not just our brain, and what we can do with it (like develop language and anticipate our deaths) that makes us human, but also the interaction of our brain with our bodies.

A second way to change a characteristic of being human is any alteration that would make the resulting person someone we (*homo sapiens*) would no longer identify as a member of our species, or who could not sexually reproduce with a human. Examples would include the insertion of an artificial chromosome that would make sexual reproduction impossible, as well as physically altering basic brain and body structure (e.g., number of arms, legs, eyes, etc. and, of course the addition of new appendages such as wings or new functional organs such as gills). This is important because the resulting person will likely be viewed as a new species or subspecies of human, and thus not necessarily a possessor of human rights.

Genetic engineering experiments not aimed at changing the nature of the species or at placing the resultant person outside the definition of *homo sapiens* (such as those aimed at improving memory, immunity, strength, and other characteristics that some existing humans have) should also be subject to

international oversight. This is because of their inherent danger to children (and the overall danger they pose to children of treating them as manufactured products), and because there are existing alternative, less dangerous educational, exercise-based, medical and surgical ways to reach these goals. Not included would be somatic cell interventions aimed at curing or preventing disease, although I believe these should be regulated on a national basis.

To be effective, the "human species protection" treaty would have to describe and authorize an oversight and enforcement mechanism. The body to enforce the treaty should be an international administrative agency with rule-making and adjudicatory authority. Rulemaking would be to set the basic rules for high-species-risk human experiments; adjudicatory authority to determine if and when applications by researchers to perform the now outlawed species-changing and species-endangering experiments would be approved, and to determine if individuals had violated the terms of the treaty. The agency I envision would not have criminal jurisdiction, but could refer cases to the international criminal court.

Drafting and enacting such a treaty is obviously a nontrivial undertaking, and will take time.[89] In the meantime, individual governments, corporations, and professional associations can declare species-changing and species-endangering experiments off-limits. Such action could take human rights and democratic principles seriously, and recognize that a risk to the entire species—is one only the species itself can agree to take. To be effective, the treaty itself must provide that no species-altering or species-endangering techniques could be used unless and until the international body approved its use in humans. This would change the burden of proof, and put it on the would-be species-alterers and species-endangerers. It would thus apply the environmental movement's precautionary principle to the area of extreme and potentially species-altering and species-endangering experimentation.[90] That

[89] Scientists will not necessarily oppose such a treaty. Although as a group scientists are generally opposed to any laws that prohibit or inhibit their activities, many scientists see the need for much more public participation in determining how resources should be used, and in helping to set the scientific agenda. *See, e.g., Benefits of Increased Public Participation*, 405 NATURE 259 (2000). Some antilegal regime scientists have even quoted Jefferson's famous lines favorably: "I know no safe depository of the ultimate powers of the society but the people themselves, and if we think them not enlightened enough to exercise that control with a wholesome discretion, the remedy is not to take it from them, but to inform their direction." *See* Lewis Wolpert, *Is Science Dangerous?*, 398 NATURE 281, 282 (1999).

[90] PROTECTING PUBLIC HEALTH AND THE ENVIRONMENT: IMPLEMENTING THE PRECAUTIONARY PRINCIPLE (Carolyn Raffensperger & Joel A. Tickner eds., 1999):

there is no such treaty and no such mechanism in place today simply means that the world community has not yet taken responsibility for its future.[91] It's past time that we did. James Watson had it wrong. The truth is that at the beginning of the millennium we *knew* that our future was in the stars; now, at the end of the millennium, we *think* that our future is in our genes.[92]

We have a tendency simply to let science take us where it will. But science has no will, and human judgment is almost always necessary for any successful exploration or experiment in the unknown. Columbus's ships would have

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> When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically.
>
> In this context the proponent of an activity, rather than the public, should bear the burden of proof.
>
> The process of applying the Precautionary Principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action.

Id. at 353-54. *See also* Noëlle Lenoir, *UNESCO, Genetics, and Human Rights*, 7 KENNEDY INST. ETHICS J. 31 (1997), and Allyn L. Taylor, *Globalization and Biotechnology: UNESCO and an International Strategy to Advance Human Rights and Public Health*, 25 AM. J.L. & MED. 479 (1999).

[91] An earlier, narrower, proposal by Professor M. Cheriff Bassiouni, one of the prime movers behind the International Criminal Court, for a criminal Covenant on Human Experimentation, was rejected in 1981, apparently because of the opposition of the international pharmaceutical industry. *See* M. Chariff Bassiouni et al., *An Appraisal of Human Experimentation in International Law and Practice*, 72 J. CRIM. L. & CRIMONOLOGY 1597-66 (1981). His proposal, nonetheless, provides the basis for an expanded one along the lines suggested in this Article. *Id.*; *see also* George J. Annas, *The Changing Landscape of Human Experimentation: Nuremberg, Helsinki, and Beyond*, 2 HEALTH MATRIX 119, 135-37 (1992); Sharon Perley et al., *The Nuremberg Code: An International Overview*, *in* THE NAZI DOCTORS, *supra* note 13, at 149-73.

[92] James Watson is also wrong to encourage laissez-faire genetics and to discourage the Germans from thinking too deeply about their "past eugenic horrors." In his words:

> [A]nyone who proclaims that we are now perfect as humans has to be a silly crank. If we could honestly promise young couples that we knew how to give them offspring with superior character, why should we assume they would decline? Those at the top of today's societies might not see the need. But if your life is going nowhere, shouldn't you seize the chance of jump-starting your children's future?
>
> Common sense tells us that if scientists find ways to greatly improve human capabilities, there will be no stopping the public from happily seizing them.

James Watson, *Genes and Politics*, keynote address, Congress of Molecular Medicine, Berlin, Germany, May 3, 1997, at 20, reprinted *in* JAMES D. WATSON, A PASSION FOR DNA: GENES, GENOMES, AND SOCIETY 179, 208 (2000). *See also* Watson quotation, *supra* note 63. The argument, of course, is not that our species has reached its pinnacle. Rather it is that our species has developed and embraced concepts of human dignity, human rights, and democracy that preclude granting any one scientists or group of scientists dominion over the future of the species.

turned back but for his human courage and determination.[93] And the first moon landing was almost a crash because the computer overshot the planned landing site by four miles.[94] Only the expert human piloting of Neil Armstrong was able to avert disaster. The first words from humans on the moon were not Armstrong's "one small step for man," but Buzz Aldrin's "Contact light! Okay, engine stop . . . descent engine command override off . . . ."[95] It is time for us humans to take command of space ship earth and turn on science's engine override command. This should greatly increase the likelihood that our species will survive to see the next millennium.

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[93] *See* MORISON, *supra* note 3, at 202-21.

[94] ALAN SHEPARD & DEKE SLAYTON, MOON SHOT: THE INSIDE STORY OF AMERICA'S RACE TO THE MOON 23 (1994).

[95] *Id* at 27. Aldrin never really recovered from being the second, rather than the first, man on the Moon, and being first remains an American obsession. *See* SUSAN FALUDI, STIFFED: THE BETRAYAL OF THE AMERICAN MAN 451-68 (1999).