Biotechnology, Ethics, and the Politics of Cloning[1]

Steven Best and Douglas Kellner
(sbest1@elp.rr.com and kellner@ucla.edu)

"O, wonder!
How many goodly creatures are there here!
How beauteous mankind is!
O brave new world
That has such people in't."
William Shakespeare, The Tempest

"We're ready to go because we think that the genie's out of her bottle."
Dr. Panos Zavos

"Anyone who thinks that things will move slowly is being very naive."
Lee Silver, Molecular Biologist

As we move into a new millennium fraught with terror and danger, a global postmodern cosmopolis is unfolding in the midst of rapid evolutionary and social changes co-constructed by science, technology, and the restructuring of global capital. We are quickly morphing into a new biological and social existence that is ever-more mediated and shaped by computers, mass media, and biotechnology, all driven by the logic of capital and a powerful emergent technoscience. In this global context, science is no longer merely an interpretation of the natural and social worlds, rather it has become an active force in changing them and the very nature of life. In an era where life can be created and redesigned in a petri dish, and genetic codes can be edited like a digital text, the distinction between "natural" and "artificial" has become greatly complexified. The new techniques of manipulation call into question existing definitions of life and death, demand a rethinking of fundamental notions of ethics and moral value, and pose unique challenges for democracy.

As technoscience develops by leaps and bounds, and as genetics rapidly advances, the science-industrial complex has come to a point where it is creating new transgenic species and is rushing toward a posthuman culture that unfolds in the increasingly intimate merging of technology and biology. The posthuman involves both new conceptions of the "human" in an age of information and communication, and new modes of existence as flesh merges with steel, circuitry, and genes from other species. Exploiting more animals than ever before, technoscience intensifies research and experimentation into human cloning.

---

[1] This article draws on work from Steven Best and Douglas Kellner The Postmodern Adventure (New York and London: Guilford Press and Routledge, 2001) and is part of a larger project we are developing on cloning and stem cell research. Thanks to the editors of this journal for helpful remarks in revising the paper and Richard Kahn for help in formatting.

This process is accelerated because genetic engineering and cloning are developed for commercial purposes, anticipating enormous profits on the horizon for the biotech industry. Consequently, all natural reality -- from microorganisms and plants to animals and human beings -- is subject to genetic reconstruction in a commodified "Second Genesis."

At present, the issues of cloning and biotechnology are being heatedly debated in the halls of science, in political circles, among religious communities, throughout academia, and more broadly in the media and public spheres. Not surprisingly, the discourses on biotechnology are polarized. Defenders of biotechnology extol its potential to increase food production and quality; to cure diseases and prolong human life; and to better understand human beings and nature in order to advance the goals of science. Its critics claim that genetic engineering of food will produce Frankenfoods that pollute the food supply with potentially harmful products; that biotechnology-out-of-control could devastate the environment, biodiversity, and human life itself; that animal and human cloning will breed monstrosities; that a dangerous new eugenics is on the horizon; and that the manipulation of embryonic stem cells violates the principle of respect for life and destroys a bona fide "human being."

Interestingly, the same dichotomies that have polarized information-technology discourses into one-sided technophobic and technophilic positions are reproduced in debates over biotechnology. Just as we have argued that critical theories of technology are needed to produce more dialectical perspectives that distinguish between positive and negative aspects and effects of information technology (Best and Kellner, 2001), so too would we claim that similar approaches are required to articulate the potentially beneficial and perhaps destructive aspects of biotechnology. Indeed, current debates over cloning and stem cell research suggest powerful contradictions and ambiguities in these phenomena that render one-sided positions superficial and dangerous. Parallels and similar complexities in communication and biotechnology are not surprising given that information technology provides the infrastructure to biotechnology that has been constituted by computer-mediated technologies involved in the Human Genome Project, and, conversely, genetic science is being used to push the power and speed of computers through phenomena such as "gene chips."

As the debates over cloning and stem cell research indicate, issues raised by biotechnology combine research into the genetic sciences, perspectives and contexts articulated by the social sciences, and the ethical and anthropological concerns of philosophy. Consequently, we argue that intervening in the debates over biotechnology require supradisciplinary critical philosophy and social theory to illuminate the problems and their stakes. In addition, debates over cloning and stem cell research raise exceptionally important challenges to bioethics and a democratic politics of communication. Biotechnology is thus a critical flashpoint for ethics and democratic theory and practice. For contemporary biotechnology underscores the need for more widespread knowledge of important scientific issues; participatory debate over science, technology, values, and our very concept of human life; and regulation concerning new developments in the biosciences, which have such high economic, political, and social consequences.

More specifically, we will demonstrate problems with the cloning of animals that for now render the cloning of humans unacceptable. In our view, human cloning constitutes a momentous route to the posthuman, a leap into a new stage of history, with significant and potentially disturbing consequences. We will also take on arguments for and against stem cell research and contend that it contains positive potential for medical advances that should not be blocked by problematic conservative positions. Nonetheless, we believe that the entire realm of biotechnology is fraught with dangers and problems that require careful study and democratic debate. The emerging genomic sciences should thus be undertaken by scientists with a keen sense of responsibility and accountability, and be subject to intense public scrutiny and open discussion. Finally, in the light of the dangers and potentially deadly consequences of biotechnology, we maintain that embracing its positive potential can be realized only in a new context of cultivating new sensibilities toward nature, engaging in ethical and political debate, and participating in political struggles over biotechnology and its effects.

Brave New Barnyard: The Advent of Animal Cloning

> "The idea is to arrive at the ideal animal and repeatedly copy it exactly as it is."
> Dr. Mark Hardy

From its entrenched standpoint of unqualified human superiority, science typically first targets objects of nature and animals with its analytic gaze and instruments. The current momentous turn toward cloning is largely undertaken by way of animals, although some scientists have already directly focused on cloning human beings (see below). While genetic engineering creates new “transgenic” species by inserting the gene from one species into another, cloning replicates cells to produce identical copies of a host organism by inserting its DNA into an enucleated egg. In a potent combination, genetic engineering and cloning technologies are used together in order, first, to custom design a transgenic animal to suit the needs of science and industry (the distinction is irrevocably blurred) and, second, to mass reproduce the hybrid creation endlessly for profitable peddling in medical and agricultural markets.

Cloning is a return to asexual reproduction and bypasses the caprice of the genetic lottery and random shuffling of genes. It dispenses with the need to inject a gene into thousands of newly fertilized eggs to get a successful result. Rather, much as the printing press replaced the scribe, cloning allows mass reproduction of a devised type, and thus opens genetic engineering to vast commercial possibilities. Life science companies are poised to make billions of dollars in profits, as numerous organizations, universities, and corporations move toward cloning animals and human stem cells, and patenting the methods and results of their research.

To date, science has engineered thousands of varieties of transgenic animals and has cloned sheep, calves, goats, bulls, pigs, mice, and a cat. Though still far from precise, cloning nevertheless has become routine. What's radically new and startling is not cloning itself, since from 1952 scientists have replicated organisms from embryonic cells. Rather,

the new techniques of cloning, or "nuclear somatic transfer," from adult mammal body cells constitutes a new form of human reproduction. These methods accomplish what scientists long considered impossible -- reverting adult (specialized) cells to their original (non-specialized) embryonic state where they can be reprogrammed to form a new organism. In effect, this startling process creates the identical twin of the adult that provided the original donor cell. This technique was used first to create Dolly, and subsequently all of her varied offspring.

Dolly and Her Progeny

Traditionally, scientists considered cloning beyond the reach of human ingenuity. But when Ian Wilmut and his associates from the Roslin Institute near Edinburgh, Scotland, announced their earth-shattering discovery in March 1997, the "impossible" appeared in the form of a sheep named Dolly, and a "natural law" had been broken. Dolly's donor cells came from a six-year-old Finn Dorset Ewe. Wilmut starved mammary cells in a low-nutrient tissue culture where they became quiescent and subject to reprogramming. He then removed the nucleus containing genetic material from an unfertilized egg cell of a second sheep, a Scottish Blackface, and, in a nice Frankenstein touch, fused the two cells with a spark of electricity. After 277 failed attempts, the resulting embryo was then implanted into a third sheep, a surrogate mother who gave birth to Dolly in July 1996.

Many critics said Dolly was either not a real clone or was just a fluke. Yet, less than two years after Dolly's emergence, scientists had cloned numerous species, including mice, pigs, cows, and goats, and had even made clones of clones of clones, producing genetic simulacra in mass batches as Huxley envisioned happening to human beings in Brave New World.[2] The commercial possibilities of cloning animals were dramatic and obvious for all to behold. The race was on to patent novel cloning technologies and the transgenic offspring they would engender.

Animals are being designed and bred as living drug and organ factories, as their bodies are disrupted, refashioned, and mutilated to benefit meat and dairy industries. Genetic engineering is employed in biomedical research by infecting animals with diseases that become a part of their genetic make-up and are transmitted to their offspring, as in the case of researchers trying to replicate the effects of cystic fibrosis in sheep. Most infamously, Harvard University, with funding from Du Pont, has patented a mouse -- OncoMouse -- that has human cancer genes built into its genetic makeup and are expressed in its offspring.[3]

In the booming industry of "pharming" (pharmaceutical farming), animals are genetically modified to secrete therapeutic proteins and medicines in their milk. The first major breakthrough came in January 1998, when Genzyme Transgenics created transgenic

---

[2] Aldous Huxley, Brave New World. (New York: Perennial Library, 1932 [1958a]).

[3] See Donna Haraway, Modest Witness@Second Millennium. Female Meets Oncomouse. (New York: Routledge, 1997).

cattle named George and Charlie. The result of splicing human genes and bovine cells, they were cloned to make milk that contains human proteins such as the blood-clotting factor needed by hemophiliacs. Co-creator James Robl said, "I look at this as being a major step toward the commercialization of this [cloning] technology."[4]

In early January 2002, the biotech company PPL announced that they had just cloned a litter of pigs which could aid in human organ transplants -– on the eve of the publication of an article by another company Immerge Bio Therapeutics that claimed they had achieved a similar breakthrough.[5] The new process involved creation of the first "knockout" pigs, in which a single gene in pig DNA is deleted to eliminate a protein that is present in pigs which is usually violently rejected by the human immune system. This meant that a big step could be made in the merging of humans and animals, and creating animals as harvest-machines for human organs.

Strolling through the Brave New Barnyard, one can find incredible beings that appear normal, but are genetic satyrs and chimera. Cows generate lactoferrin, a human protein useful for treating infections. Goats manufacture antithrombin III, a human protein that can prevent blood clotting, and serum albumin, which regulates the transfer of fluids in the body. Sheep produce alpha antitrypsin, a drug used to treat cystic fibrosis. Pigs secrete phytase, a bacterial protein that enables them to emit less of the pollutant phosphorous in their manure, and chickens make lysozyme, an antibiotic, in their eggs to keep their own infections down.

"BioSteel" presents an example of the bizarre wonders of genetic technology that points to the erasure of boundaries between animate and inanimate matter, as well as between different species. In producing this substance, scientists have implanted a spider gene into goats, so that their milk produces a super-strong material -- BioSteel -- that can be used for bulletproof vests, medical supplies, and aerospace and engineering projects. In order to produce vast quantities of BioSteel, Nexia Biotechnologies intend to house thousands of goats in 15 weapons-storage buildings, confining them in small holding pens.[6]

Animals are genetically engineered and cloned for yet another reason, to produce a stock of organs for human transplants. Given the severe shortage of human organs, thousands of patients every year languish and die before they can receive a healthy kidney,

---

[4] Cited in Carey Goldberg, and Gina Kolata, "Scientists Announce Births of Cows Cloned in New Way," The New York Times. January 21, 1998: A 14. Companies are now preparing to sell milk from cloned cows; see Jennifer Mitol, "Got cloned milk?" abcnews.com, July 16, 2001. For the story of Dolly and animal cloning, see Gina Kolata, Clone. The Road to Dolly and the Path Ahead. (New York: William Morrow, 1998).

[5] See Sheryl Gay Stolberg, "Breakthrough in Pig Cloning Could Aide Organ Transplants" (New York Times, Jan. 4, 2001). In July 2002, the Australian government announced draft guidelines that would regulate transplanting animal organs into humans and anticipated research with pig organs translated into humans within two years; see Benjamin Haslem, "Animal-to-human transplants get nod," The Australian, July 8, 2002: A1

[6] See http://abcnews.go.com/sections/DailyNews/biotechgoats. 000618.html.

liver, or heart. Rather than encouraging preventative medicine and finding ways to encourage more organ donations, medical science has turned to xenotransplantation, and has begun breeding herds of animals (with pigs as a favored medium) to be used as organ sources for human transplantation.

Clearly, this is a very hazardous enterprise due to the possibility of animal viruses causing new plagues and diseases in the human population (a danger which exists also in pharmaceutical milk). For many scientists, however, the main concern is that the human body rejects animal organs as foreign and destroys them within minutes. Researchers seek to overcome this problem by genetically modifying the donor organ so that they knock out markers in pig cells and add genes that make their protein surfaces identical to those in humans. Geneticists envision cloning entire herds of altered pigs and other transgenic animals so that an inexhaustible warehouse of organs and tissues would be available for human use. In the process of conducting experiments such as transplanting pig hearts modified with a human gene into the bodies of monkeys, companies such as Imutran have caused horrific suffering, with no evident value to be gained given the crucial differences among species and introducing the danger of new diseases into human populations.[7]

As if billions of animals were not already exploited enough in laboratories, factory farms, and slaughterhouses, genetic engineering and cloning exacerbate the killing and pain with new institutions of confinement and bodily invasion that demand millions and millions more captive bodies. Whereas genetic and cloning technologies in the cases described at least have the potential to benefit human beings, they have also been appropriated by the meat and dairy industries for purposes of increased profit through the exploitation of animals and biotechnology. It's the nightmarish materialization of the H.G. Wells scenario where, in his prophetic 1904 novel The Food of the Gods, scientists invent a substance that prompts every living being that consumes it to grow to gargantuan proportions.[8] Having located the genes responsible for regulating growth and metabolism, university and corporate researchers immediately exploited this knowledge for profit. Thus, for the glories of carnivorous consumption, corporations such as MetaMorphix and Cape Aquaculture Technologies have created giant pigs, sheep, cattle, lobsters, and fish that grow faster and larger than the limits set by evolution.

Amidst the surreality of Wellsian gigantism, cattle and dairy industries are engineering and cloning designer animals that are larger, leaner, faster-growing value producers. With synthetic chemicals and DNA alteration, pharmers can produce pigs that mature twice as fast and provide at least twice the normal amount of sows per litter as they

---

[7] See Heather Moore, "The Modern-Day Island of Dr, Moreau," http://www.alternet.org/story.html?StoryID=11703, October 12, 2001. For a vivid description of the horrors of animal experimentation, see Singer (1975); for an acute diagnosis of the unscientific nature of vivisection, see Ray Greek and Jeanne Swingle Greek, Sacred Cows and Golden Geese: The Human Cost of Experiments on Animals. (2000).

[8] See H.G. See also our discussion of Wells in Best and Kellner, The Postmodern Adventure.

eat 25% less feed, and cows that produce at least 40% more milk. Since 1997, at least one country, Japan, has sold cloned beef to its citizens.[9] But there is strong reason to believe that U.S. consumers – already a nation of guinea pigs in their consumption of genetically modified foods -- have eaten cloned meat and dairy products. For years, corporations have cloned farmed animals with the express purpose of someday introducing them to the market, and insiders claim many already have been consumed.[10] The National Institute of Science and Technology has provided two companies, Origen Therapeutics of California, and Embrex of North Carolina, with almost $5 million to fund research into factory farming billions of cloned chickens for consumption.[11] With the Food and Drug Administration pondering whether to regulate cloned meat and dairy products, it's a good bet they are many steps behind an industry determined to increase their profits through biotechnology. The future to come seems to be one of cloned humans eating cloned animals.

While anomalies such as self-shearing sheep and broiler chickens with fewer feathers have already been assembled, some macabre visionaries foresee engineering pigs and chickens with flesh that is tender or can be easily microwaved, and chickens that are wingless so they won't need bigger cages. The next step would be to just create and replicate animal's torsos -- sheer organ sacks -- and dispense with superfluous heads and limbs. In fact, scientists have already created headless embryos of mice and frogs in grotesque manifestations of the kinds of life they can now construct at will.

Clearly, there is nothing genetic engineers will not do to alter or clone an animal. Transgenic "artist" Eduardo Kac, for instance, commissioned scientists at the National Institute of Agronomic Research in France to create Alba, a rabbit that carries a fluorescent protein from a jellyfish and thus glows in the dark. This experiment enabled Mr. Kac to demonstrate his supremely erudite postmodern thesis that "genetic engineering [is] in a social context in which the relationship between the private and public spheres are negotiated"![12] Although millions of healthy animals are euthanized every year in U.S. animal "shelters," corporations are working to clone animals, either to bring them back from the dead, or prevent them from "dying" (such as in the Missyplicity Project, initiated by the

---

[9] See "In Test, Japanese Have No Beef With Cloned Beef," http://www.washingtonpost.com/wpsrv/inatl/daily/sept99/japan10.htm. According to one report, it is more accurate to refer to this beef as being produced by "embryo twinning," and not the kind of cloning process that produced Dolly; see "`Cloned' Beef Scare Lacks Meat," http://www.wired.com/news/technology/0,1282,19146,00.html. As just one indicator of the corporate will to clone animals for mass consumption, the National Institute of Science and Technology has donated $4.7 million to two industries to fund research into cloning chickens for food. See "Cloned chickens on the menu," New Scientist.com, August 15, 2001.

[10] See Heather Moore, "The Modern-Day Island of Dr, Moreau," op. cit., and Sharon Schmickle, "It's what's for dinner: milk and meat from clones," www.startribune.com/stories/462 /868271.html, December 2, 2001.

[11] "Clonefarm: Billions of identical chickens could soon be rolling off production lines," www.newscientist.com/ hottopics/cloning/cloning.jsp?id=23040300, August 18, 2001.

[12] Cited in Heather Moore, "The Modern Day Island of Dr. Moreau," op. cit.

wealthy "owners" of a dog who want to keep her alive indefinitely).[13] Despite alternatives to coping with allergies problems and the dangers with cloning animals, Transgenic Pets LLC. is working to create transgenic cats that are allergen-free.[14] It is time to examine concretely what cloning means for animal existence.

Transgenic Travesties

The agricultural use of genetics and cloning has produced horrible monstrosities. Transgenic animals often are born deformed and suffer from fatal bleeding disorders, arthritis, tumors, stomach ailments, kidney disease, diabetes, inability to nurse and reproduce, behavioral and metabolic disturbances, high mortality rates, and Large Offspring Syndrome. In order to genetically engineer animals for maximal weight and profit, a Maryland team of scientists created the infamous "Beltway pig" afflicted with arthritis, deformities, and respiratory disease. Cows engineered with bovine growth hormone (rBGH) have mastitis, hoof and leg maladies, reproductive problems, numerous abnormalities, and die prematurely. Giant supermice endure tumors, damage to internal organs, and shorter life spans. Numerous animals born from cloning are missing internal organs such as hearts and kidneys. A Maine lab specialized in breeding sick and abnormal mice who go by names such as Fathead, Fidget, Hairless, Dumpy, and Greasy. Similarly, experiments in the genetic engineering of salmon have led to rapid growth and various aberrations and deformities, with some growing up to ten times their normal body weight.[15] Cloned cows are ten times more likely to be unhealthy as their natural counterparts. After three years of efforts to clone monkeys, Dr. Tanja Dominko fled in horror from her well-funded Oregon laboratory. Telling cautionary tales of the "gallery of horrors" she experienced, Dominko said that 300 attempts at cloning monkeys produced nothing but freakishly abnormal embryos that contained cells either without chromosomes or with up to nine nuclei.[16]

For Dominko, a "successful" clone Like Dolly is the exception, not the rule. But even Dolly is inexplicably overweight and there was evidence in May 1999 that she may be suspectible to premature aging. On January 4, 2002, there were reports that Dolly has arthritis and her creator Ian Wilmut said on a BBC broadcast: "There is no way of knowing if this is down to cloning or whether it is a coincidence." Moreover, cloned mice have also become extremely obese, and cloned cows have been born with abnormally large hearts and lungs.

A report from newscientists.com argues that genes are disrupted when cultured in a lab, and this explains why so many cloned animals die or are grossly abnormal. On this account, it is not the cloning or IVF process that is at cause, but the culturing of the stem

---

[13] The Missyplicity Project boasts a strong code of bioethics; see http://www.missyplicity.com/.

[14] See http://www.transgenicpets.com/.

[15] See Michael W. Fox, Beyond Evolution: The Genetically Altered Future of Plants, Animals, the Earth, and Humans. (New York: The Lyons Press, 1999).

[16] "In Cloning, Failure Far Exceeds Success," Gina Kolata, www.nytimes.com/2001/12/11/science/11CLON.html.

cells in the lab, creating major difficulties in cloning since so far there is no way around cloning through cultured cells in laboratory conditions.[17]

A team of U.S. scientists at the M.I.T. Whitehead Institute examined 38 cloned mice and learned that even clones which look healthy suffer genetic maladies and scientists found the mice cloned from embryonic stem cells had abnormalities in the placenta, kidneys, heart, and liver. They feared that the defective gene functioning in clones could, wreak havoc with organs and trigger foul-ups in the brain later in life and that embryonic stem cells are highly unstable.[18] "There are almost no normal clones," study author and MIT biology professor Rudolf Jaenisch, explained. Jaenisch claims that only 1-5% of all cloned animals survive, and even those that survive to birth often have severe abnormalities and die prematurely.[19]

As we argue below, these risks make human cloning a deeply problematic undertaking. Pro-cloning researchers claim that the "glitches" in animal cloning eventually can be worked out. In January 2001, for example, researchers at Texas A&M University and the Roslin Institute claimed to have discovered a gene that causes abnormally large cloned fetuses, a discovery they believe will allow them to predict and prevent this type of mutation. It is conceivable science someday will work out the kinks, but for many critics this assumes that science can master what arguably are inherent uncertainties and unpredictable variables in the expression of genes in a developing organism. A recent study showed that some mouse clones seem to develop normally until an age the equivalent of 30 years for a human being; then there is a spurt of growth and they suddenly become obese.[20] Mark Westhusin, a cloning expert at Texas A&M, points out that the problem is not that of genetic mutation, but of "genetic expression," that genes are inherently unstable and unpredictable in their functioning. Another report indicates that a few misplaced carbon atoms can lead to cloning failures.[21] Thus, any small errors in the cloning process could lead to huge disasters, and the prevention of all such "small errors" seems to presume something

---

[17]See "Clones contain hidden DNA damage," www.newscientist.com/news/news.jsp?id=ns9999982; see also the study published in Science (July 6, 2001) which discusses why so many clone pregnancies fail and why some cloned animals suffer strange maladies in their hearts, joints, and immune system.

[18] "Clone Study Casts Doubt in Stem Cells: Variations in Mice Raise Human Research Issues,"www.washingtonpost.com/ac2/wp-dyn/A23967-2001Jul5?language=printer, July 6, 2001.

[19] See "Scientists Warn of Dangers of Human Cloning," www.abcnews.com. See also the commentaries in Gareth Cook, "Scientists say cloning may lead to long-term ills," The Boston Globe, July 6, 2001; Steve Connor, "Human cloning 'will never be safe," Independent, July 6, 2001; Carolyn Abraham, "Clone creatures carry genetic glitches," July 6, 2001; Connor cites Dolly-cloner Ian Wilmut who noted: "It surely adds yet more evidence that there should be a moratorium against copying people How can anybody take the risk of cloning a baby when its outcome is so unpredictable?"

[20]See "Report Says Scientists See Cloning Problems, http://abcnews.go.com/wire.US/reuters200103525_573.html.

[21]The Westhusin quote is at abcnews.go.com/cloningflaw010705. htm; the "misplaced carbons" quote is in Philip Cohen, "Clone Killer," www.newscientist.com/news.

close to omniscience.

Yet, while most scientists are opposed to cloning human beings (rather than stem cells), and decry it as "unacceptable," few condemn the suffering caused to animals or position animal cloning research itself as morally problematic, and many scientists aggressively defend animal cloning. Quite callously and arbitrarily, for example, Jaenisch proclaims, "You can dispose of these animals, but tell me –- what do you do with abnormal humans?"[22] The attitude that animals are disposable is a good indication of the problems inherent in the mechanistic science that still prevails and a symptom of callousness toward human life that worries conservatives.

Despite the claims of its champions, the genetic engineering of animals is a radical departure from natural evolution and traditional forms of animal breeding. Further, human cloning takes biotechnology into a new and, to many, frightening posthuman realm that begins to redesign the human body and genome. Cloning involves manipulation of genes rather than whole organisms. Moreover, scientists engineer change at unprecedented rates, and can create novel beings across species boundaries that previously were unbridgeable. Ours is a world where cloned calves and sheep carry human genes, human embryo cells are merged with enucleated cows' eggs, monkeys and rabbits are bred with jellyfish DNA, a surrogate horse gives birth to a zebra, a dairy cow spawns an endangered gaur, and tiger cubs emerge from the womb of an ordinary housecat.

The ability to clone a desired genetic type brings the animal kingdom into entirely new avenues of exploitation and commercialization. From the new scientific perspective, animals are framed as genetic information that can be edited, transposed, and copied endlessly. Pharming and xenotransplantation build on the system of factory farming that dates from the postwar period and is based on the confinement and intensive management of animals within enclosed buildings that are prison-houses of suffering.

The proclivity of the science-industrial complex to instrumentalize animals as nothing but resources for human use and profit intensifies in an era in which genetic engineering and cloning are perceived as a source of immense profit and power. Still confined for maximal control, animals are no longer seen as whole species, but rather as fragments of genetic information to be manipulated for any purpose.

Weighty ethical and ecological concerns in the new modes of animal appropriation are largely ignored, as animals are still framed in the 17th century Cartesian worldview that views them as nonsentient machines. As Jeremy Rifkin (1997: 35) puts it, "Reducing the animal kingdom to customized, mass-produced replications of specific genotypes is the final articulation of the mechanistic, industrial frame of mind. A world where all life is transformed into engineering standards and made to conform to market values is a dystopian nightmare, and needs to be opposed by every caring and compassionate human being who believes in the intrinsic value of life."[23]

---

[22] "Human Clone Moves Sparks Global Outrage," www.smh.com.au, March 11, 2001.

[23] Given this attitude, it is no surprise that in September, 2001, Texas A&M University, the

Patenting of genetically modified animals has become a huge industry for multinational corporations and chemical companies. PPL Therapeutics, Genzyme Transgenics, Advanced Cell Technology, and other enterprises are issuing broad patents claims on methods of cloning nonhuman animals. PPL Therapeutics, the company that "invented" Dolly, has applied for the patents and agricultural rights to the production of all genetically altered mammals that could secrete therapeutic proteins in their milk. Nexia Biotechnologies obtained exclusive rights to all results from spider silk research. Patent number 4,736,866 was granted to Du Pont for Oncomouse, which the Patent Office described as a new "composition of matter." Infigen holds a U.S. patent for activating human egg division through any means (mechanical, chemical, or otherwise) in the cloning process.

Certainly, genetics does not augur solely negative developments for animals. Given the reality of dramatic species extinction and loss of biodiversity, scientists are collecting the sperm and eggs of endangered species like the giant panda in order to preserve them in a "frozen zoo." It is indeed exciting to ponder the possibilities of a Jurassic Park scenario of reconstructing extinct species (as, for example, scientists recently have uncovered the well-preserved remains of a Tasmanian tiger and a woolly mammoth). In 2001, European scientists cloned a seemingly healthy mouflon lamb, a member of an endangered species of sheep, and ACT produced the first successful interspecies clone when a dairy cow gave birth to a gaur, an endangered wild ox native to Southeast Asia (although it died of an infection only two days later). Currently, working with preserved tissue samples, ACT is working to bring back from extinction the last bucardo mountain goat which was killed by a falling tree in January 2000.[24]

But critics dismiss this as a misguided search for a technofix that distracts focus from the real problem of preserving habitat and biodiversity. Even if animals could be cloned, there is no way to replicate habitats lost forever to chainsaws and bulldozers. Moreover, the behaviors of cloned animals would unavoidably be altered and they would end up in zoos or exploitative entertainment settings where they exist as spectacle and simulacra. Animals raised through interspecies cloning such as the gaur produced by ACT will not have the same disposition as if raised by their own species and so for other reasons will not be less than "real." Additionally, there is the likelihood that genetic engineering and cloning would aggravate biodiversity loss to the extent it creates monolithic superbreeds that could crowd out other species or be easily wiped out by disease. There is also great potential for ecological disaster when new beings enter an environment, and genetically modified organisms are especially unpredictable in their behavior and effects.

---

same institution working on cloning cats and dogs, showed off newly cloned pigs, who joined the bulls and goat already cloned by the school, as part of the "world's first cloned animal fair."

[24] See "Back from the Brink: Cloning Endangered Species," Pamela Weintraub, http://news.bmn.com/hmsbeagle/109/notes/_feature2, August 31, 2001. "Gene Find No Small Fetus," www.wired.com/news/print/0,1294,41513,00.html

Still, cloning may prove a valuable tool in preserving what can be salvaged from the current extinction crisis. Moreover, advances in genetics also may bypass and obviate pharming and xenotransplantation through use of stem cell technologies that clone human cells, tissues, or perhaps even entire organs and limbs from human embryos or an individual's own cells. Successful stem cell technologies could eliminate at once the problem of immune rejection and the need for animals. There is also the intriguing possibility of developing medicines and vaccines in plants, rather than animals, thus producing a safer source of pharmaceuticals and neutraceuticals and sparing animals suffering. None of these promises, however, brighten the dark cloud cloning casts over the animal kingdom, or dispel the dangers of the dramatic alteration of human life.

Clones R' Us: The Portent of Human Replication

> "Human cloning could be done tomorrow."
> Alan Trounson, In Vitro Fertilization clinician. Monash University

Thus, the postmodern adventure of the reconstruction of nature begins with the genetic engineering of transgenic animals and the cloning of numerous animal species for agricultural, medical, and "scientific" purposes, while in fact biotechnology is being positioned as a field for prodigious profits. The fate of the human is inseparable from the future of our fellow animal species, as they are the launch pad for the redesign of human nature. With the birth of Dolly, a new wave of animal exploitation arrived, and anxiety grew about a world of cloned humans that scientists said was technically feasible and perhaps inevitable. Ian Wilmut, head of the Roslin Institute team that cloned Dolly, is an example of an animal and stem cell cloning advocate who repudiates human replication. Like Jaenisch and numerous others, Wilmut believes human cloning is unethical, unnecessary, and dangerous, and that the inevitable deformities would be cruel to both the parents and children involved (see Wilmut et al 2000).

Wilmut feels human cloning should not be attempted until there is a quantum leap in cloning technologies, an advance he feels is at least 50 years away. Most of all, Wilmut fears that the drive toward human cloning could cause a backlash against all cloning, and thereby thwart the far more important research into cloning stem cells for therapeutic purposes. For Wilmut, the authentic purpose for biotechnology is to cure disease and improve agriculture. Whatever his intention, however, many scientists and entrepreneurs inspired by the Roslin Institute's work have aggressively pursued the goal of human cloning as the true telos of genomic science. Driven by market demands for clones of infertile people, of those who have lost loved ones, of gays and lesbians who want their own children, of people who want to clone themselves or family members to provide needed organs, and of numerous other client categories, doctors and firms are actively pursuing human cloning.

The Race to Clone Humans

> "Even if we had to transfer the laboratory on a boat located in international waters, the human cloning project will continue."

Rael, ex-race car driver and founder of Clonaid company

Pro-human cloning forces include Richard Seed who shocked the world in 1997 by declaring that he was prepared to clone himself, later appending the project to his wife. The Raelins, a wealthy Quebec-based religious cult, believe that all humans were cloned in laboratories by alien scientists and claim that their "Cloinaid" project is about to produce the first human clone (which they initially projected to be ready by November 2001). Infertility specialists Severino Antinori and Panayiotis Zanos openly announce their intent to clone humans, in defiance of any national law if necessary. The Council for Secular Humanism is a broad coalition of scientists, philosophers, authors, and politicians who decry the influence of religion in the cloning debates and champion the cause of human cloning, as they assure us that cloning will not create any "moral predicaments beyond the capacity of human reason to resolve."[25] And the Human Cloning Foundation is an Internet umbrella group for diverse clonistas who see cloning as the best hope for curing infertility and diseases and promoting longevity.[26]

One bioethicist estimates that there are currently at least a half dozen laboratories around the world doing human cloning experiments.[27] While cloning human beings is illegal in the U.S., Britain, German, Japan, and elsewhere, in many countries in Asia, Russia, and Brazil, it is perfectly legal and human cloning is being pursued both openly and clandestinely. In fact, there are at least two known cases where human embryos have been cloned, but the experiment was terminated. According to Wired (9.02, February 2001: 128):

> In 1988, a scientist working at Advanced Cell Technology in Worcester, Massachusetts took a human somatic cell, inserted it into an enucleated cow egg, and started the cell dividing to prove that oocytes from other species could be used to create human stem cells. He voluntarily stopped the experiment after several cell divisions. A team at Kyung Hee University in

---

[25] For the case in favor of human cloning, see Gregory Stock, Redesigning Humans. Our Inevitable Genetic Future. (Boston and New York: Houghton Hifflin Company, 2002). Stock argues that "germline engineering" is even more radical than cloning in that it involves redesigning the human genetic structure and may lead to a posthuman condition. For pro-cloning manifestoes, see also www.secularhumanism.org/library/fi/cloning_declaration_17_3.html; www.humancloning.org and www.reason.com/biclone.html. For the case against cloning, see Francis Fukuyama, Our Posthuman Future, (New York: Farrar Straus & Giroux, 2002) and articles in the special World Watch issue "Beyond Cloning" (July/August 2002).

[26] See http://www.humancloning.org/.

[27] Investigative reporter Joe Lauria found a secret cloning lab supposedly carrying out Raelian human cloning experiments, but it appeared abandoned and there are suspicions that the whole effort was a fraud to exploit a desperate family that wanted its child cloned; see London Times, August 12, 2001. On predictions that human cloning experiments are already underway, see www.wired.com/wired/archive/9.02/projectxpr.html).

> South Korea said it created an embryonic adult human clone in 1999 before halting the experiment, though some doubt that any of this really happened. Had either of these embryos been placed in a surrogate mother, we might have seen the first human clone.

In November 2001, ACT created a global sensation with (misleading) reports they had cloned human embryos (see below). While many scientists think human cloning is possible and inevitable, some think it is likely human clones already exist, perhaps in hideous form where they are studied on an island, such as was portrayed in H.G. Wells' The Island of Dr. Moreau (see Best and Kellner 2001). The breeding of monstrosities in animal cloning, the pain and suffering produced, and the possibility of assembly-production of animals and humans should give pause to those who want to plunge ahead with human cloning. Animal cloning experiments produced scores of abnormalities and it is highly likely that human cloning would do the same – a possibility more likely given the increased complexity of human beings.

The possibilities of producing serious human defects raises ethical dilemmas as well as the question of the social responsibility involved in the care of deformed beings produced by human cloning experiments. Fervant pro-cloners like Antinori and Zavos deny there are any risks to cloning humans and claim that there is "enough information" to proceed with confidence. If pressed to admit there might be "mistakes," they simply write them off as necessary means to the end of reproductive freedom and medical progress. Ignoring the availability of frozen embryos and existing children for adoption, they claim the "right to reproduce" as crucial for human beings, and argue that this "right" -– which in fact does not exist in any social constitution -- outweighs any risks to the baby or to society as a whole, once the doorway is opened to the world of human cloning.

But, at present, what sane person would want to produce a possibly freakish replication of him or herself or a dead loved one? What are the potential health risks to women who would be called upon to give birth to human clones, at least before artificial wombs make women, like men, superfluous to the reproductive process? Who will be responsible for caring for deformed human clones that parents renounce? Is this really an experiment that the human species wants to undertake so that self-centered infertile couples can have their own children (apparently some can only love a child with *their own* DNA), or misinformed narcissists can spawn what they think will be their carbon-copy twins? What happens if human clones breed? What mutations could follow? What might result from long-range tampering with the human genome as a consequence from genetic engineering and cloning?

Furthermore, until scientists figure out how to clone minds, cloning inevitably involves reproduction of bodily DNA, raising questions of what sorts of minds cloning might produce. What if cloned humans appear to be mentally defective or aberrant as a result of the technology? What might be the long-term costs of the perceived short-term benefits that cloning may produce? Already, scientists are raising the issue of "cognitive deficiencies" in cloned animals and certainly this problem is relevant to the project of human cloning.

In addition, as the TV-series "Dark Angel" illustrates, there is the possibility of a military appropriation of cloning to develop herds of Ubermenschen (although no two would be exactly alike). Indeed, will commodification of the humane genome, eugenics, designer babies, and genetic discrimination all follow as unavoidable consequences of helping infertile couples and other groups reproduce, or will human cloning become as safe and accepted as in vitro fertilization (IVF), once also a risky and demonized technology? Will developing countries be used as breeding farms for animals and people, constituting another form of global exploitation of the have-nots by the haves? What are the consequences of the commodification of the human genome, and the patenting of stem cells and their research methods?

With so many questions and uncertainties that arise, it is clear that the project of human cloning is being approached in a purely instrumental and mechanistic framework that doesn't consider long-term consequences to the human genome, social relations, or ecology. Or, if social relations and consequences are considered, likely this is from the perspective of improving the Nordic stock and creating an even deeper cleavage between rich and poor since, without question, only the rich will be able to afford genetically designed and/or cloned babies with superior characteristics. This situation could change if the state sponsors cloning welfare programs or the prices of a "Gen-Rich" (Silver 1998) baby drop like computers, but the wealthy will already have gained a decisive advantage and "democratic cloning" agendas beg the question of the soundness of human cloning in the first place.

Problems with Human Cloning

Thus, we have serious worries about biotechnology not only due to the colonialist history of science and capitalism, the commodification of the life sciences, and how genetic technologies have already been abused for profit and power by corporations like Monsanto and Du Pont, but also because of the reductionistic paradigm informing molecular engineering.[28] Ironically, while biology helped to shape what theorists conceive as a postmodern physics through evolutionary and holistic emphases, the most advanced modes of biological science -- genetic engineering and cloning research -- have not advanced to the path of holism and complexity (see Best and Kellner, 2001). Rather, biotechnology seems to have regressed to the antiquated errors of atomism, mechanism, determinism, and reductionism. The new technosciences and the outmoded paradigms (Cartesian) and domineering mentalities (Baconian) that informs them generates a volatile mix, and the situation is gravely exacerbated by the commercial imperatives driving research and development, the frenzied "gene rush" toward DNA patenting.

Yet if human cloning technologies follow the path of IVF technologies, they eventually will become widely accepted, even though currently large percentages of U.S.

[28] For a discussion of how modern science and capitalism co-evolved in the context of colonialism, whereby they underpinned each other in the bid to control other peoples and exploit their knowledges, see Sandra Harding. Is Science Multicultural? Postcolonialism, Feminism, and Epistemologies. Bloomington: University of Indiana Press, 1998.

citizens oppose it (90% according to some polls in summer 2001). Alarmingly, scientists and infertility clinics have taken up human cloning technologies all-too-quickly. After the announcement of the birth of Dolly, many were tripping over themselves to announce emphatically that they would never pursue human cloning. Nonetheless, only months later, these same voices began to embrace the project.[29] The demand from people desperate to have babies, or "resurrect" their loved ones in conjunction with the massive profits waiting to be made, is too great an allure for corporations to resist -– a demand begging for supply. The opportunistic attitude of cloning advocate Panayiotis Zavos is all-too-typical: "Ethics is a wonderful word, but we need to look beyond the ethical issues here. It's not an ethical issue [!]. It's a medical issue. We have a duty here. Some people need this to complete the life cycle, to reproduce."[30]

In his attempt to dispel the ineliminable moral quandaries surrounding cloning, Zavos has confused "need" with desire, and reduced humans to crude reproduction machines. Yet, as his statement shows, defenders of cloning and biotechnology argue for the primacy of individual reproductive rights over potential risks to society as a whole. They believe that science is valuable to the extent that it increases freedom, individuality, and choice, as if embryos were a soft drink and what an "individual" chooses in this case is not of enormous consequence for future humanity, to say nothing of the deformed children who surely will be the guinea pigs of science. Of them, Zavos can only say, "We're ready to face those mishaps … It's part of any price that we pay when we develop new technology."[31]

There are indeed legitimate grounds for anxiety and loathing of cloning, but most fears of human cloning are irrationally rooted in what Leon Kass claims is an intuitive human repulsion -- the "yuk" factor -- toward something that is seemingly "unnatural" (see

---

[29] See Gina Kolata, "Human Cloning: Yesterday's Never is Today's Why Not?" The New York Times, December 2, 1997).

[30] Cited in Nancy Gibbs, "Baby, "It's You! And You, and You …" Time, February, February 19, 2001: 50. In March 2001, to great media fanfare, Zavos, Israeli biotechnologist Avi Bin Abraham, and Italian fertility specialist Severino Antinori announced that the group had signed up more than 600 infertile couples and were undertaking human cloning experiments to provide them with children; see "Forum on Human Cloning Turns Raucous," Los Angeles Times (March 10, 2001). When Zavos and his partner went to Israel to seek permission to do human cloning there, ABC News (March 25, 2001) reported that they received the blessing of an old rabbi, but the Israeli justice minister said that he was against cloning "on moral and ideological grounds." A University of Pennsylvania ethicist said that Zavos had no medical training, had published no articles in the field, had no qualifications, and that one of the dangers of cloning was that frauds were operating in the dangerous minefield of human cloning and exploiting people with false promises. There were also numerous discussions of the failures of animal cloning that were suggesting that human cloning would be highly dangerous and disturbing; see Aaron Zitner, "Perpetual Pets, Via Cloning," Los Angeles Times (March 16, 2001), Gina Kolata, "Researchers Find Big Risk of Defect in Cloning Animals," New York Times (March 25, 2001), and the examples that we provide below.

[31] "Brave New World?" http://msnbc.com/news/525661.asp

Kass 1998 and the critique by Pence 1998b). Many such clonophobic arguments are weak. The standard psychological objections, in particular, are poorly grounded. We need not fear Hitler armies assembling because the presumption of this dystopia -– genetic determinism -- is false (although certain desirable traits could be cloned which might prove useful for military powers). Nor need we fear individuals unable to cope with lack of their own identity since identical twins are able to differentiate themselves from one another relatively well and they are even more genetically similar than clones would be. Nor would society always see cloned humans as freaks, as people no longer consider test-tube babies alien oddities, and there are anywhere from 20,000 to 200,000 such humans existing today (figures vary widely). The physiological and psychological dangers are real, but in time cloning techniques could be perfected so that cloning might be as safe, if not safer than babies born through a genetic throw-of-the-dice, or IVF.

A strong objection against human cloning and genetic engineering technologies is that they could be combined to design and mass reproduce desirable traits, bringing about a society organized around rigid social hierarchies and genetic discrimination -– as vividly portrayed in the film *Gattaca* (1997). This was, of course, the nightmare of Aldous Huxley, who continued H.G. Wells' speculations on a genetically engineered society and creation of new species. Indeed, with only trivial qualifications, Huxley's Brave New World (1932) of genetic engineering, cloning, addictive pleasure drugs (soma), entertainment and media spectacles, and intense social engineering has arrived.[32] Huxley thought cloning and genetic engineering were centuries away from realization, but in fact they began to unfold a mere two decades since his writing of Brave New World in the early 1930s. Technocapitalism cannot yet, for instance, biologically clone human beings, but it can clone them in a far more effective way -- socially. Whereas biological clones would have a mind of their own, since the social world and experiences that conditioned the "original" could not be reproduced, social cloning according to a given ideological and functional model is far more controlling. That is why Huxley's sequel work, Brave New World Revisited (1958) focused on various modes of social conditioning and mind control.[33]

Defenders of cloning and biotechnology argue that current science is geared toward increasing individuality and choice, enabling people to design their own children and within limits to mold their own body. Already parents can genetically choose the sex of the their child. Soon, they might be able to isolate and remove genes that cause obesity, addictions, and a host of fatal illness, as well as to engineer genes that would enhance intelligence, strength, athleticism, physical attractiveness, and other desirable traits.

Of course, as Baudrillard argues, cloning is connected as well to the fantasy of immortality, to defeating the life-death cycle.[34] Techno-utopians fantasize about the possibility of cloning one's body, or downloading one's memories into another body or a machine, thereby achieving immortality and alleged continuity of selfhood. The Raelians promote cloning as a chance for "eternal life." In the current social setting, it's no surprise

---

[32] Huxley, Brave New World.

[33] Aldous Huxley, Brave New World Revisited. (New York: Perennial Library, 1989b).

[34] Jean Baudrillard, The Vital Illusion. (New York: Columbia University Press, 2000).

that cryogenics -– the freezing of dead human beings in the hope they might be regenerated in the future through medical advances -- is a booming global industry.

Currently, the human race stands at a crossroads and must make crucial choices concerning the future of the human, including the issue of cloning. Whatever one's philosophical and ethical conceptions of cloning, it is clear that at present human cloning is unacceptable. Proponents of human cloning argue that it took hundreds of attempts to develop a test-tube baby and that trial-and-error is simply the scientific method. We need to ask, however, if such costs are legitimate when the benefits are not yet clear. While one might sympathize with couples that fervently desire a child and utilize IVF, legions of unwanted children await adoption, and it is difficult to justify the great leap forward to cloning through these kinds of rationale.

Therapeutic vs. Reproductive Cloning: The Debate Over Stem-Cell Research

> "It is not unrealistic to say that stem cell research has the potential to revolutionize the practice of medicine."
> Dr. Harold Varmus, former NIH director

> "The 20th century was the drug therapy era. The 21st century will be the cell therapy era."
> George Daleuy, biologist with the Whitehead Institute for Biomedical Research, Cambridge, Massachusetts

Full-blown human reproductive cloning is problematic for numerous reasons, and we reject it on the grounds that it lacks justification and portends a world of eugenics and genetic discrimination rooted in the creation and replication of desired human types. Yet scientists are also developing a more benign and promising technology of stem cell research, or "therapeutic cloning." The controversy around *embryonic* stem cell research – because it involves using and destroying cells from frozen human embryos -- remains one of the key debates of our time, important enough to provoke a major policy crisis for the Bush Administration and to warrant an address to the nation on prime-time TV in August 2001. Rarely do scientific debates erupt into the public forum, and although the technical aspects are difficult and complex, the ethical and medical stakes are clear enough to command a national debate.

In 1998, Dr. James A. Thomson, a developmental biologist at the University of Wisconsin, announced to the scientific world that he had isolated embryonic stem cells, thus portending a new era of "regenerative medicine" based on the renewal and recreation of the body's cells. Stem cells are the primitive master cells of the body that differentiate into functions like skin, bone, nerve, and brain cells (the body produces over 200 cell types). The goal of stem cell research is to program the development of stem cells toward specific functions in order to replace lost or damaged cells, tissues, and organs. Using similar technological breakthroughs such as led to Dolly, stem cell research involves cloning cells from a wide range of human tissue, or very young human embryos (around 5 days of age) and aborted fetal tissues.

In the debates over stem cell research, an important distinction emerged between adult stem cells, that are derived from blood, bone marrow, fat and other tissues, and embryonic stem cells from discarded IVF cultures, aborted fetuses, or embryos created in a lab. While scientists are experimenting with adult stem cells, the current consensus is that embryonic cells are the most pliable and hence have the most regenerative potential. In July 2001, the National Institute of Health issued a report that "Stem cells from adults and embryos both show enormous promise for treating an array of diseases but at this early stage, cells from days-old embryos appear to offer certain key advantages." As Ceci Connolly summarized it: "Embryonic stem cells are more plentiful and therefore easier to extract, can be grown and made to multiply in the laboratory more easily and appear to have the uncanny ability to develop into a much wider array of tissues."[35] In fact, embryonic and adult stem cell research may each contribute to significant medical and health advancement. According to Senator Bill Frist (R-Tenn), the only medical doctor in Congress, an opponent of abortion, and key science advisor to the Bush administration: "because both embryonic and adult stem cell research may contribute to significant medical and health advancement, research on both should be federally funded within a carefully regulated, fully transparent framework that ensures respect for the moral significance of the human embryo."[36]

Scientists argue that therapeutic cloning has tremendous medical potential. Early in life, for example, each individual could have their stem cells frozen to create their own "body repair kit" if they developed a disease or even lost a limb. There would be no organ shortages, no rejection problem, and no need for animal exploitation as the cells would be their own. Although there has of yet been no significant advances in human research, and the results so far confined to animals are not necessarily applicable to human beings, stem cell research nonetheless shows remarkable potential for revolutionary breakthroughs in medicine. Among their achievements with mice, rats, pigs, and fetal monkeys, scientists have directed stem cells to produce insulin, to induce growth of brain cells, and to form new blood vessels in hearts, thereby suggesting immense contributions to curing diabetes, Alzheimer's or Parkinson's, and heart disease.[37] Still, while industries and media often hype the research as producing immanent medical revolutions, many scientists believe breakthroughs in gene therapy and therapeutic cloning are likely decades away and that

---

[35] Ceci Connolly, "Embryo Cells' Promise Cited in NIH Study" (Washington Post, July 18, 2001: A01. The NIH notes the preliminary status of the report, the many uncertainties around stem cells, and the need for more research.

[36] See www.time.com , July 19, 2001.

[37] See "Stem Cells Coaxed To Produce Insulin," http://www.msnbc.com/news/607294.asp, "Fetal Stem Cells Boost Brainpower," http://www.msnbc.com/news/566735.asp, and "Rebuilding Hearts," http://abcnews.go.com/sections/GMA/DrJohnson/GMA010402Stemcells_dr.Tim.html, and "Early Success Seen with 2nd Type of Stem Cell," www.nytimes.com/2001/07/26/health/genetics/26MOUS.html. The experiment with brain cells involved injecting human stem cells from the brains of aborted fetuses into mice, rats, and pigs, thereby imploding species boundaries and demonstrating the versatility of human stem cells.

expectations have been unduly raised.[38]

Another crucial distinction involves using embryonic stem cells from IVF discards and cloning embryos for the explicit sake of research. Whereas Britain allows both kinds of stem cell research, and thus condones embryo cloning for therapeutic purposes, the Bush administration highly restricts the use of IVF stem cell lines and condemns embryonic cloning. Yet many scientists argue that the ideal source of stem cells for regenerative medicine would not only be those derived from IVF embryos, but from embryos cloned from a patient's own cells, as the derived stem cells would be one's own and in theory far less susceptible to rejection. Thus, there is a medical justification for cloning human embryos and embryo cloning will be crucial to regenerative medicine.

On January 22, 2001, Britain became the first country to legalize human embryo cloning, with the proviso, perhaps impossible to enforce, that all clones would have to be destroyed after 14 days of development, and never implanted in a human womb. Britain thus endorsed therapeutic cloning, while banning reproductive cloning.[39] On the whole, Britain seems to have more scientifically advanced and democratic political guidelines and policies on cloning than the U.S. While a ban on human reproductive cloning is pending, therapeutic cloning is allowed under rigorous guidelines. Britain was ahead in the process of IVF since the birth of Louise Brown in England in 1978. Moral philosophers have been debating bioethical issues and there has been much public discussion. Parliament set up an agency on Human Fertilization and Embryology Authority that license fertility clinics and research institutions that study human embryos. The agency has kept detailed statistics of the number of human embryos created, planted and destroyed in fertility clinics.[40] The U.K. is establishing a stem cell bank that would be run as a public resource, in a way similar to the

---

[38] One key problem is that scientists as of yet have been unable to get stem cells to grow into the specialized types they seek, rather than clumps of different cells. For an important article that punctures much of the hype surrounding stem cell research, see "A Thick Line Between Theory and Therapy, as Shown With Mice," Gina Kolata, www.nytimes.com/2001/12/18/science/life/18MICE.html.

[39] See "Britain Oks Human Embryo Cloning," www.msnbc.com/news520058.asp and Kristen Philipkoski, "U.S. to Clone Brit Policy?," Wired News, Jan. 24, 2001. In April, 2001, however, Britain prepared to pass laws criminalizing human cloning, and to make sure that genetic treatment was available to everyone through their national health service. See Marjorie Miller, "Britain Proposes Law Against Cloning of Humans," Los Angeles Times (April 20, 2001: A10). After the November 2001 ACT announcement that they had cloned human embryos, however, a loophole was discovered in the law that would allow reproductive cloning despite the fact that the Human Fertilization and Embryology Act sought to ban human cloning. After a High Court judge ruled it was in fact legal to clone embryos, the British House of Lords proposed emergency legislation in late November 2001 to explicitly ban human cloning and have now explicitly banned human reproductive cloning.

[40]See Nicholas Wade, "Clearer Guidelines Help Britain to Advance Stem Cell Work," New York Times, August 14, 2001, and Judith Klotzho, "Embryonic victory," The Guardian, August 20, 2001.

Human Genome Project. Hence, existing stem cell lines and techniques are available to any qualified researcher, and Britain has passed progressive laws banning genetic discrimination and mandating that therapies and medical advances that come out of genetic research will be available to and benefit everyone through its National Health Service.

In the U.S. and elsewhere, many religious groups and hard-core technology critics vituperate against stem cell research as "violating" the "inherent sanctity of life." To be sure, there is an ethical issue at stake in creating embryos for research purposes, or even using IVF cells, as living matter is being used as a means to some end other than its own existence. Clearly, using IVF cells that are going to be destroyed regardless is less objectionable than cloning an embryo for the sake of "harvesting" its cells then terminating it, but many religious groups and conservatives nonetheless vehemently oppose all forms of stem cell research and any manipulation of life, no matter what profound medical consequences may result. "Anyone truly serious about preventing reproductive human cloning must seek to stop the process from the beginning," Leon Kass, later to be Bush's cloning czar, proclaimed before a House judiciary subcommittee in June 2001.[41]

To challenge stem cell research, many conservatives (and some liberals) are recycling philosophical arguments from earlier debates over abortion. The Pope and critics of stem cell research argue that once a sperm and egg are mixed into an embryo, no matter what the medium, there is a human life with all of its rights and sacredness. Others claim that a human life exists only when the embryo is implanted in a mother and has undergone the beginnings of the maturation process. Some medical experts assert that 14 days is the crucial dividing line when a backbone and organs begin to develop, while many pro-choice proponents argue that a fetus itself is not yet fully a human being. These earlier philosophical arguments have been revived in the stem-cell debate to legitimize conflicting scientific and political positions. In the context of stem cell research, religious conservatives repeat the same question-begging argument: (1) a human embryo is a human being; (2) it is wrong to take a human life; (3) therefore, it is wrong to "destroy" an embryo. The most controversial claim of the argument, in premise (1), is either just assumed, or defended through dogmatic claims that "life begins at conception," when, arguably, there is no real conception in a petri dish holding a 5-day-old cell mass.[42]

Ultimately, the debate comes down to the philosophical issue of what constitutes a human being. Opponents of therapeutic human cloning and embryonic stem cell research claim that "conception" takes place when an embryo is produced, even in a petri dish. Critics of this notion of human life argue that an embryo is a merger of sperm and egg that takes place in five or six days and is called a blastocyst, which scientists distinguish from a fetus. Scientists further claim that an embryo only attains fetus-status at around 14 days when it develops a "primitive streak," the beginnings of a backbone. Up until that point, a single embryo can divide into identical twins, and two embryos can merge into one, leading Ronald Green, a Dartmouth bioethicist to conclude: "It is very clear that you cannot speak of

---

[41] "Cloning Capsized?" The Scientist 15[16]:1, August 20, 2001.

[42] For a thorough problematization of attempts to define the "beginning point" of life, see Silver (1998).

a human individual in the first 14 days of development. How can one speak of the presence of an individual soul if the embryo can be split into two or three?"[43]

Clearly, it is difficult to say when human life begins, and claims that it emerges "at conception" are simplistic. So far human life has only been produced from fetuses that mature in the womb of a woman's body, and thus we have trouble conceiving that 5 day-old embryos in a petri dish are human. It also might be pointed out that only about one in eight embryos implanted through IVF achieves fetal status, and few conservative critics worry over the doomed embryos or question the ethics of IVF as a whole, a technology that produces surplus cells for medical research. The fact that embryos typically used for stem cell research are leftover from couples using in vitro fertilization, and are marked for destruction regardless, strongly undercuts the force of the argument against embryonic stem cells.[44]

Indeed, the slippery slope argument beloved by conservatives (the direct and unavoidable path from stem cell research to fetus farms and a society peopled by clones) is easily turned against them. In the age of cloning where possibly any cell can be replicated and turned into an embryo, one might argue that it is unethical even to scrape any skin cells as they too are potential human beings.[45] Silly, perhaps, but this is also an indicator of the surreality of the postmodern adventure. In an amazing alchemy, scientists can directly transform cells of one kind into another. PPL Therapeutics succeeded in transforming a cow's skin cell into a basic stem cell, and then refashioned it as a heart cell. Further, researchers are working on cultivating spermless embryos, studying how to prod unfertilized eggs to grow to produce stem cells.[46] Geron has created heart cells that beat in a petri dish. Clearly, the implications of stem cell research are staggering.

One should not see the use or creation of human embryos for medical resources as a trivial issue, but the debate over therapeutic cloning involves competing values and

---

[43] Cited in Aaron Zitner, "Uncertainty is Thwarting Stem Cell Researchers," Los Angeles Times, July 21, 2001: A01.

[44] In Britain, "the Human Fertilization and Embryology Authority has reported that some 50,000 babies have been born through in vitro fertilization since 1991, and 294,584 surplus human embryos have been destroyed." While no official records have been kept in the United States, "According to the American Society for Reproductive Medicine, about 100,000 children have been born in the United States by in vitro fertilization, or twice the number in Britain, implying that some 600,000 embryos would have been destroyed if American clinics followed the same five- year storage limit used in Britain. Only a small fraction of the discarded embryos would provide as many stem cells as researchers could use." See Nicholas Wade, "Stem Cell Issue Causes Debate Over the Exact Moment Life Begins," New York Times, August 15, 2001.

[45] "Adult stem cells found in skin," www.newscientist.com/hottopics/cloning/cloning.jsp?id=ns99991147, August 13, 2001.

[46] See "Another Advance for Dolly Cloners," www.wirednews.com/news/print/0.1294.41989.00.html, and Aaron Zitner, "Working On Sperm-less embryos," Los Angeles Times, August 12, 2001.

conceptions of the nature of a human being. This is a conflict between a small clump of cells no bigger than the period at the end of this sentence, and full-fledged human beings in dire medical need. In a conflict between a tiny ball of non-sentient cells or fetuses that would be disposed of regardless, and full-fledged human beings suffering from diseases that lack a cure, most people would reasonably choose the latter category of human persons.

In June 2002, however, an attempt to ban all embryonic cloning, supported by President Bush, was defeated in the U.S. Senate. This resulted in part because advocates of embryonic research rejected the category of "therapeutic cloning" and even "embryo". The argument was that it is not a question of "cloning," but of "somatic cell nuclear transfer" or "regenerative medicine," working on eggs in a test tube that have not been fertilized by sperm and is thus not a human embryo. This change in terminology won over some conservatives who were being pressured to support potentially significant medical research, although critics decried the effort as use of "linguistic cloaking devices" and continued their polemic against all cloning.[47] Thus, while many conservatives defend the "sanctity" of embryonic cells, and so far are successfully thwarting stem cell research, thousands of people continue to suffer and die from Alzheimer's, Parkinson's disease, diabetes, paralysis, and other afflictions. This is a strange position for "pro-life" and "compassionate" conservatives to defend. The entire moral quandary may be blunted, however, as scientists are now discovering ways to use stem cells derived from umbilical cords, bone marrow, and even fat and brain cells, and have cloned and implanted kidneys in a cow.[48]

Deferring the Brave New World: Challenges For Ethics and Democracy

> "Cloning is inefficient in all species. Expect the same outcome in humans as in other species: late abortions, dead children and surviving but abnormal children,"
> Ian Wilmut

> "Is there any risk too great or any reason too trivial for you not to attempt human cloning?"
> Alta Charo, University of Wisconsin bioethicist, speaking to Antinori and Zavos

---

[47] See Aaron Zitner, "Cloning Receives a Makeover," Los Angeles Times, June 17, 2002: A1 and A13.

[48] See "Adult Approach to Stem Cells," http://www.wirednews.com/news/print/0,1294,38892,00.htm; "Need Stem Cells? Its in the Fat," http://www.wired.com/news/print/0,1294,42957,00.html; "Human Fat May Provide Useful Cells," http://www.msnbc.com/news/557256.asp; and Nicholas Wade, "Scientists Make Two Stem Cell Advances," New York Times (June 21, 2002). The latter article describes new advances in converting embryonic stem cells into the kind of brain cell that is lost in Parkinson's disease and extracting cells from bone marrow. On the successful cloning and implant of kidneys in a cow, see "Therapeutic Cloning Gets Boost in Implant Study," Los Angeles Times, June 3, 2002: A11.

Thus by summer of 2001, a technical and esoteric debate over stem cells, confined within the scientific community during the past years, had moved to the headlines to become the forefront of the ongoing science wars -– battles over the cultural, ethical, and political implications of science. The scientific debate over stem cell research in large part is a disguised culture war, and conservatives, liberals, and radicals have all jumped into the fray. In our own case, coming from a perspective of critical theory and radical democratic politics, we reject conservative theologies and argue against conflations of religion and the state. Likewise, we question neo-liberal acceptance of corporate capitalism and underscore the implications of the privatization of research and the monopolization of knowledge and patents by huge biotech corporations. In addition, we urge a deeper level of public participation in science debates than do conservatives or liberals and believe that the public can be adequately educated to have meaningful and intelligent input into technical issues such as cloning and stem cell research which have tremendous human and ethical implications.

As we have shown, numerous issues are at stake in the debate over cloning, having to do not only with science, but also with religion, politics, economics, democracy, ethics, and the meaning and nature of human beings and all life forms as they undergo a process of genetic reconstruction. Thus, our goal throughout this paper has been to question the validity of the cloning project, particularly within the context of a global capitalist economy and its profit imperative, a modernist paradigm of reductionism, and a Western sensibility organized around the concept of the domination of nature. Until science is recontextualized within a new holistic paradigm informed by a respect for living processes, by democratic decision making, and by a new ethic toward nature, the genetic sciences on the whole are in the hands of those governed by the imperatives of profit. Moreover, they are regulated by politicians who do not have a good grasp of the momentous issues involved, requiring those interested in democratic politics and progressive social change to educate and involve themselves in the politics of biotechnology.

We have already entered a new stage of the postmodern adventure in which animal cloning is highly advanced and human cloning is on the horizon, if not now underway. Perhaps little human clones are already emerging, with failures being discarded, as were the reportedly hundreds of botched attempts to create Louise Brown, the first test-tube baby, in 1978. At this stage, human cloning is indefensible in light of the possibility of monstrosities, dangers to the mother, burdens to society, failure to reach a consensus on the viability and desirability of cloning humans, and the lack of compelling reasons to warrant this fateful move. The case is much different, however, for therapeutic cloning, which is incredibly promising and offers new hope for curing numerous debilitating diseases. But even stem cell research, and the cloning of human embryos, as we have seen, is problematic, in part because it is the logical first step toward reproductive cloning and mass production of desired types, which unavoidably brings about new (genetic) hierarchies and modes of discrimination.

We thus need to discuss the numerous issues involved in the shift to a posthuman, postbiological mode of existence where the boundaries between our bodies and technologies

begins to erode as we morph toward a cyborg state. Our technologies are no longer extensions of our bodies, as Marshall McLuhan stated, but rather are intimately merging with our bodies, as we implode with other species through the genetic crossings of transgenic species. In an era of rapid flux, our genotypes, phenotypes, and identities are all mutating. Under the pressure of new philosophies and technological change, the humanist mode of understanding the self as a centered, rational Subject has transformed into new paradigms of communication and intersubjectivity,[49] and information and cybernetics.[50]

Despite these shifts, it is imperative that elements of the modern Enlightenment tradition be retained, as it is simultaneously radicalized. Now more than ever, as science embarks on the incredible project of manipulating atoms and genes through nanotechnology, genetic engineering, and cloning, its awesome powers must be measured and tempered through ethical, ecological, and democratic norms in a process of public debate and participation. The walls between "experts" and "laypeople" must be broken down along with the elitist norms that form their foundation. Scientists need to enter dialogical relations with the public to discuss the complexities of cloning and stem cell research, to make their positions clear and accessible, as well as accountable and responsible, while public intellectuals and activists need to become educated in biotechnology in order to engage in debate in the media or public forums on the topics.

Scientists should recognize that their endeavors embody specific biases and value choices, subject them to critical scrutiny, and seek more humane, life-enhancing, and democratic values to guide their work. Respect for nature and life, preserving the natural environment, humane treatment of animals, and serving human needs should be primary values embedded in science. And when these values might conflict, as in the tension between the inherent value of animals and human “needs,” the problem must be addressed as sensitively as possible.

This approach is quite unlike how science so far has conducted itself in many areas. Most blatantly, perhaps, scientists, hand in hand with corporations, have prematurely rushed the genetic manipulation of agriculture, animals, and the world's food supply while ignoring important environmental, health, and ethical concerns. Immense power brings enormous responsibility, and it is time for scientists to awaken to this fact and make public accountability integral to their ethos and research. A schizoid modern science that rigidly splits facts from values must give way to a postmodern metascience that grounds the production of knowledge in a social context of dialogue and communication with citizens. The shift from a cold and detached "neutrality" to a participatory understanding of life that deconstructs the modern subject/object dichotomy derails realist claims to unmediated access to the world and opens the door to an empathetic and ecological understanding of

---

[49] See Jurgen Habermas, Communication and the Evolution of Society. (Boston: Beacon Press, 1979); Theory of Communicative Action, Vol. 1. (Boston: Beacon Press, 1984), and Theory of Communicative Action, Vol. 2. Boston: Beacon Press, 1987.

[50] See N. Katherine Hayles, How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics. (Chicago: University of Chicago Press, 1999).

nature.[51]

In addition, scientists need to take up the issue of democratic accountability and ethical responsibility in their work. As Bill Joy argued in a much-discussed Wired article in July 2000, uncontrolled genetic technology, artificial intelligence, and nanotechnology could create catastrophic disasters, as well as utopian benefits. Joy's article set off a firestorm of controversy, especially his call for government regulation of new technology and "relinquishment" of development of potentially dangerous new technologies, as he claimed biologists called for in the early days of genetic engineering, when the consequences of the technology were not yet clear.[52] Arguing that scientists must assume responsibility for their productions, Joy warned that humans should be very careful about the technologies they develop, as they may have unforeseen consequences. Joy noted that robotics was producing increasingly intelligent machines that might generate creative robots that could be superior to humans, produce copies of themselves, and assume control of the design and future of humans. Likewise, genetic engineering could create new species, some perhaps dangerous to humans and nature, while nanotechnology might build horrific "engines of destruction" as well as of the “engines of creation” envisioned by Eric Drexler.

Science and technology, however, not only require responsibility and accountability on the part of scientists, but also regulation by government and democratic debate and participation by the public. Publics need to agree on rules and regulations for cloning and stem cell research, and there need to be laws, guidelines, and regulatory agencies open to public input and scrutiny. To be rational and informed, citizens need to be educated about the complexities of genetic engineering and cloning, a process that can unfold through vehicles such as public forums, teach-ins, and creative use of the broadcast media and internet.

An intellectual revolution is needed to remedy the deficiencies in the education of both scientists and citizens, such that each can have, in Habermas' framework, "communicative competency" informed by sound value thinking, skills in reasoning, and democratic sensibilities. Critical and self-reflexive scrutiny of scientific means, ends, and procedures should be a crucial part of the enterprise. "Critical," in Haraway's analysis, signifies "evaluative, public, multiactor, multiagenda, oriented to equality and

---

[51] See Evelyn Fox, A Feeling for the Organism: The Life and Work of Barbara McClintock. (New York: W.H. Freeman and Co., 1983) and Linda Birke and Ruth Hubbard, Reinventing Biology: Respect for Life and the Creation of Knowledge. (Bloomington: Indiana University Press, 1983).

[52.] See the collection of responses to Joy's article in Wired 8.07 (July 2000). Agreeing with Joy that there need to be firm guidelines regulating nanotechnology, the Foresight Institute has written a set of guidelines for its development that take into account problems such as commercialization, unjust distribution of benefits, and potential dangers to the environment. See www.foresight.org/guidelines/current.html. We encourage such critical dialogue on both the benefits and dangers of new technologies and hope to contribute to these debates with our studies.

heterogeneous well-being".[53] Indeed, there should be debates concerning precisely what values are incorporated into specific scientific projects and whether these serve legitimate ends and goals. In the case of mapping the human genome, for instance, enormous amounts of money and energy are being spent, but almost no resources are going to educating the public about the ethical implications of having a genome map. The Human Genome Project spent only 3 to 5 percent of its $3 billion budget on legal, ethical, and social issues, and Celera spent even less.[54]

A democratic biopolitics and reconstruction of education would involve the emergence of new perspectives, understandings, sensibilities, values, and paradigms that put in question the assumptions, methods, values, and interpretations of modern sciences, calling for a reconstruction of science (on "new science" and "new sensibilities".[55] At the same time, as science and technology co-construct each other, and both coevolve in conjunction with capitalist growth, profit, and power imperatives, science is reconstructing -- not always for the better -- the natural and social worlds as well as our very identities and bodies. There is considerable ambiguity and tension in how science will play out given the different trajectories it can take. Unlike the salvationist promises of the techoscientific ideology and the apocalyptic dystopias of some of its critics, we see the future of science and technology to be entirely ambiguous, contested, and open. For now, the only certainty is that the juggernaut of the genetic revolution is rapidly advancing and that in the name of medical progress animals are being victimized and exploited in new ways, while the replication of human beings is looming.

The human species is thus at a terribly difficult and complex crossroads. Whatever steps we take, it is imperative we do not leave the decisions to the scientists, anymore than we would to the theologians (or corporate-hired bioethicists for that matter), for their judgment and objectivity is less than perfect, especially for the majority who are employed by biotechnology corporations and have a vested interest in the hastening and patenting of the brave new world of biotechnology.[56] The issues involving genetics are so important that scientific, political, and moral debate must take place squarely within the public sphere. The fate of human beings, animals, and nature hangs in the balance, thus it is imperative that the public become informed on the latest developments and biotechnology and that lively and substantive democratic debate take place concerning the crucial issues raised by the new technosciences.

References

Baudrillard, Jean (2000) The Vital Illusion. New York: Columbia University Press.

---

[53] See Haraway, Modest Witness@Second Millennium, p. 95.

[54] See www.wired.com/news/0,1294,36886,00.html.

[55] See Herbert Marcuse, One-Dimensional Man. (Boston: Beacon Press, 1964) and An Essay on Liberation. (Boston: Beacon Press, 1969).

[56] For a sharp critique of how bioethicists are bought off and co-opted by corporations in their bid for legitimacy, see "Bioethicists Fall Under Familiar Scrutiny," http://www.nytimes.com/2001/08/02/health/genetics/02BIOE.html.

Birke, Linda and Ruth Hubbard (1995) Reinventing Biology: Respect for Life and the Creation of Knowledge. Bloomington: Indiana University Press.

Fox, Michael W. (1999) Beyond Evolution: The Genetically Altered Future of Plants, Animals, the Earth, and Humans. New York: The Lyons Press.

Fukuyama, Francis (2002)Our Posthuman Future: Consequences of the Biotechnology Revolution. New York: Farrar Straus & Giroux.

Greek, Ray and Greek, Jeanne Swingle (2000). Sacred Cows and Golden Geese: The Human Cost of Experiments on Animals. New York: Continuum.

Habermas, Jurgen (1979) Communication and the Evolution of Society. Boston: Beacon Press.

_____ (1984) Theory of Communicative Action, Vol. 1. Boston: Beacon Press.

_____ (1987) Theory of Communicative Action, Vol. 2. Boston: Beacon Press.

Haraway, Donna (1997) Modest Witness@Second Millennium. Female Meets Oncomouse. New York: Routledge.

Harding, Sandra (1998) Is Science Multicultural? Postcolonialism, Feminism, and Epistemologies. Bloomington: University of Indiana Press.

Hayles, N. Katherine (1999) How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics. Chicago: University of Chicago Press.

Huxley, Aldous (1989a) Brave New World. New York: Perennial Library.

Huxley, Aldous (1989b) Brave New World Revisited. New York: Perennial Library.

Kass, Leon (1998) "The Wisdom of Repugnance," pp. 13-37, in Gregory Pence (ed.) Flesh of My Flesh: The Ethics of Human Cloning. Lanham, Maryland: Rowman and Littlefield Publishers, Inc.

Keller, Evelyn Fox (1983) A Feeling for the Organism: The Life and Work of Barbara McClintock. New York: W.H. Freeman and Co.

Kolata, Gina (1998) Clone. The Road to Dolly and the Path Ahead. New York: William Morrow.

Marcuse, Herbert (1964) One-Dimensional Man. Boston: Beacon Press.

Marcuse, Herbert (1969) An Essay on Liberation. Boston: Beacon Press.

Pence, Gregory (1998) Who's Afraid of Human Cloning? Lanham, Maryland: Rowman and Littlefield.

Rifkin, Jeremy (1998) The Biotech Century: Harnessing the Gene and Remaking the World. New York: Tarcher/Putnam.

Silver, Lee (1998) Remaking Eden: How Genetic Engineering and Cloning Will Transform the American Family. Bard: New York.

Singer, Peter (1975) Animal Liberation. New York: Avon Books.

Stock, Gregory (2002) Redesigning Humans. Our Inevitable Genetic Future. Boston and New York: Houghton Hifflin Company.

Wilmut, Ian, Keith Campbell, and Colin Tudge (2000) The Second Creation: Dolly and the Age of Biological Control. New York: Farrar, Straus, and Giroux.