UNTHINKABLE BIOTECHNOLOGY: THE STANDING-RESERVES AND SACRIFICIAL STRUCTURES OF LIFE ITSELF

by

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Abstract

The emergence of biotechnology has resulted in intense debates about its promises and dangers. Advocates hail its promises, ranging from alleviating starvation through genetically engineered food to curing major diseases through gene therapy and pharmacological discoveries. Opponents decry its dangers, drawing attention to the inherent risks of genetic engineering, cloning, and the patenting of life forms.

As these debates have continued, biotechnology has become a dominant mode of understanding the very life of living beings. There is, however, the need to examine the double-edged dynamics by which the discourse takes place. A theoretical framework informed by Heidegger, Foucault, and Agamben reveals that biotechnology is a structure of thought in which living-in-general is constructed as a metabolic "standing-reserve" (Heidegger). In this structure, biotechnological archives hold "life itself" as an ontologically unthinkable placeholder for a general mass of metabolic activity.

The discourse of biotechnology constitutes its standing-reserves of the living-in-general by way of three modes that bring forth life for some, while sacrificing others. The first mode is eating, whereby the resources of the world were used to feed the bodies of Western Man, a prerequisite, according to Foucault, for the development of modern democracy. The second mode is incineration, exemplified by hot box experiments conducted by the U.S. Air

Force during World War Two, ranging from analysis of heating systems to fire bombing strategies. These experiments enacted the fiery incorporation of bodies in militarized systems that ultimately signified U.S. power. The third mode is feverish genomics, by which scientists store the genomic sequences of all living things in global bioinformatic archives. Intellectual Property Rights, whose prime example is the U.S. Supreme Court's approval of a patent on a genetically engineered life form (*Diamond v. Chakrabarty* 1980), defends all three modes as a right and expression of freedom by instituting the force of law.

It is only by understanding biotechnology as a sacrificial structure that theoretical work on its privileging of U.S. interests can become more ethically charged.

Keywords: Georgio Agamben; Biotechnology; Genetic Engineering; Intellectual Property Rights; Michel Foucault; Martin Heidegger

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For David Kelvin McFarlane, in thanks for lessons about a life worth living

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Chapter One

Introducing Unthinkable Biotechnology

Dear D—,

This morning I began my walk to the top of Mount Royal just before sunrise. It had snowed throughout the sleepy night and continued to snow heavily as I wound my way up the mansion-lined streets to the summit. Turning towards the lookout, I glanced back at the curtained windows of the city's English-speaking powerbrokers, their sleeping and secrets in tact. Over their roofs, dawn slipped the corners of evening and my eyes were drawn to the sombre apartments of Mies van der Rohe's Westmount Square. The relief of those modernist dwellings struck me today as void of urgent content, and it seemed their dull impression spread with the diffusing dawn. The morning simply settled against the helical staircases and jostling alleys of St. Henri, Little Burgundy, and St. Emard. My restless eyes followed the snowbound detours of these working class neighbourhoods and ethnic enclaves to the St. Lawrence river.

How slowly time passed amidst this expanse of frost and snow! An eerie sensation crept upon me as I watched the slack movements of this crystalline topography. The freshly blanketed city was so quiet, and even as people began to

stir and snow ploughs began their ease down the avenues it all seemed haunted by meaning and culture—a vast scene staged within the monumental phantasmagoria of a natural history museum. Perhaps you too have experienced such museal effects. Living life as you do, have you not, my more-than-brother, been a vigilant witness to the natural history of the contemporary?

"Living life as you do." I'm not sure what that means, but the more research I conduct into the discourse of biotechnology, the more prone I am to such musings. How can I reconcile this snow-ridden city with the fact that Industry Canada now refers to Montreal as one of the nation's "biotech clusters" or "megacentres"? The city has become a node within an increasingly expansive biotech network. Near the top of Mont Royal, just below the lookout and to the east, resides McGill University's concrete and glass Montreal Genomics and Proteomics Centre. As a key site, McGill positions itself in relation to other research universities in the city. It is from recently built university centres dedicated to basic research that the majority of biotech companies sprout.

Clustered near the universities are venture capital firms that provide seed money, management, and credibility. Below the summit and south of McGill are the offices of Sofinov, one of the early investors in Nexia Biotechnologies, which emerged from McGill University's MacDonald Campus, located on the West Island. Nexia's most well-known product is a herd of cloned goats genetically engineered with the genes of spiders and capable of producing silk proteins in their milk and urine. The company's aim is to weave "BioSteel™" by weaving silk threads—the material with the strongest strength-to-weight ratio on earth.

Woven into the cluster, as well, are various levels of government, which provide both access to laboratories and publicly subsidized buildings for the

biotech industry. Sofinov is, in fact, a government-owned organization. Knowledge and financial networks throughout the city work closely with all levels of government to ensure the provision of incentives, such as patent protection and tax credits for R&D (Niosi and Bas 790). Within the megacentre buildings have a different biological affect, and in this sense Montreal is similar to many larger urban centres.

Donna Haraway has described the corporatization of universities in the U.S. as a "clustering" with the private sector that marked the birth of the biotech industry:

> From the mid-1970s on, the social norms in biological research and communication changed from expert-communal and public ideals (if hardly always practice) to approved private ownership of patentable results, widespread direct business ties of university biological faculty and graduate students to corporations, marked convergence of "basic" and "applied" contents of research questions, and greater secrecy in research practice. From 1987 to 1991, the number of university-industry licensing agreements more than doubled, and one-quarter of patents awarded to universities between 1969 and 1991 were awarded in 1990-1991. The 100 largest universities got 85 percent of the patents. Formal cooperative research and development agreements between federal labs and private industry increased from 108 in 1987 to 975 in 1991. In 1993, showing a huge increase across the 1980s, more than 1,000 university-industry research centers in all scientific areas existed, spending about $3 billion/year on R&D, 41 percent of that for chemical or pharmaceutical research. Federal or state tax dollars contributed to building 72 percent of those centers. (92)

Montreal's development during the early 1990s as a biotech cluster followed initiatives taking place in the United States and the United Kingdom.

According to Niosi and Bas, from 1980 to 2000, the number of specialized biotechnology firms (SBF) in Canada increased from a handful to 358, and most were located in Toronto and Montreal. While 85% of the almost C$1 billion spent on R&D was spent on human health products, biotechnological R&D integrates human health with a much broader, convoluted cluster of biochemistry in general:

> Along with the SBFs, some 800 companies in the pharmaceutical, food, chemical, oil and mining, pulp and paper, and environmental industries use also biotechnologies in Canada in the R&D activities. These biotechnologies are used to develop new drugs, new plants and bacteria for microbial ecology, bioremediation, biofiltration, biopulping, biodesulphurization, etc. (791-792)

Extending beyond the classical borders of the city, the signs of biopharmaceutical companies are mounted in the suburbs of Montreal.

There is BioChem Pharma in Laval, which developed the AIDS cocktail 3TC/Epivir. In 2000, it was acquired by UK-based Shire Pharmaceuticals and became Shire Biochem. Laval is also home to Warnex Pharma, which provides analytical laboratory services for the health and pharmaceutical industries. You might be interested to know that their medical lab focuses on prenatal tests for Down's Syndrome. There is, as well, the multinational chemical giant Novartis in Dorval. With its headquarters in Basel, Novartis now operates in 140 countries. Its corporate history includes the production of dyes, chemicals, insecticides (including DDT), pharmaceuticals (including the development in the post-WWII period of psychotropic drugs, and drugs that reduce high blood pressure and alleviate the symptoms of epilepsy), and adhesives. By the 1980s the companies that would merge to create Novartis were engaged in biotechnology. In 2000, the

agro-chemical and agro-business divisions of Novartis and AstraZeneca merged to form Syngenta, the largest agro-chemical and third-largest seed company in the world. Their pharmaceutical divisions, however, remained separate.[1] As genetic engineering continues to interlace the DNA of products of the global food and health industries, the biotech industry is increasingly referred to by the more general, Life Industry. As the biotechnology industry continues to sprawl, its practices become increasingly concentrated within the singular rubric of "life."

There are so many signs of biotechnology's spilling of biology's and industry's classical boundaries within the disjunctive city *cum* megacentre. There's also "Biosyntech," "Theratechnologies," "Conjuchem"... but even as one walks amidst these signs, Montreal's architecture seems hardly to belong to the so-called futuristic city of *Gattaca* (Niccol 1997).[2] Attentive to the effects of biotechnology in the city, one is more likely to experience something of the androidal anachronism in *Blade Runner* (Scott 1982). This anachrony is the result, in part, of biotechnology's respatialization of the city's topography within a network of digital genomic archives and "wet" tissue banks. The "subject"—if we can still use that word with any authority—of these archival networks seems to be the phenomenon of "life itself," a metabolic bioinformatics network that challenges both classical teleological views of the city (as the natural site for the development of civic responsibility, coteries of friendship and trust), and social

[1] See www.novartis.com and www.syngenta.com

[2] Most of the exterior shots of architecture in *Gattaca* are of buildings constructed in the 1950s, including the CLA (Classrooms, Laboratories, and Administration) Building of Cal Poly Pomona by architect Antoine Predock and the Marin County Civic Center in San Rafael, CA, which was designed by Frank Lloyd Wright in 1957 and completed after his death in 1959.

contract theories (emerging from the Enlightenment's pitting of freedom against just laws).

My research has thus begun to trace the historic emergence of this disjunction between cities squared on the governance of humans and the metabolic, informatic megacentres of biotechnology. It is this disjunction that produces the museal effects of the city; the disjunction between what Giorgio Agamben distinguishes between *bios*—the form or way of living proper to an individual or a group—and *zoe*—bare life, or life itself (Agamben 1998).

This morning, as I stared out over the city I was reminded of Walter Benjamin's famous observation:

> The development of the forces of production shattered the wish symbols of the previous century, even before the monuments representing them had collapsed...All these products are on the point of entering the market as commodities. But they linger on the threshold. From this epoch [the nineteenth century] derive the arcades and *intérieurs*, the exhibition halls and panoramas. They are residues of a dream world...With the destabilizing of the market economy, we begin to recognize the monuments of the bourgeoisie as ruins even before they have crumbled. (13)

I did not need to dream of the future in order to translate Benjamin's jarring, anticipatory sense of passing through a city already in ruins into the discourse of biotechnology. As I stared at the snow-laden city, it occurred to me that "biotechnology" brings forth a waxen hyperrealism whose aesthetic marks the passage between the living and the dead, as well as between the true and the false. My thoughts drifted to memories of life masks and death masks, to the historic use of wax in embalming and forensics. Marina Warner once wrote that "Waxen artefacts, even when removed from the practical ground of their origin

and their legal and medical uses are no longer apparent, retain their challenge to the stuff of life, their antithetical connection with bodies and embodiment" (23).

Think of the seal of wax used as a stamp of authenticity, while at the same time denoting that the sender is no longer present. It has been used since the origins of the written document. The smooth and pliable impressions of wax are—like the works of biotechnology—associated with the casting of life. I'm reminded of Warner's description of S. Maria dei miracoli, a miracle-working shrine near Mantua whose nave was "barnacled" with wax castings of limbs and organs—breasts, kidneys, lungs, hearts—brought by petitioners. Above these are life-size polychrome figures of votaries marking the miraculous interceding moment in which they escaped death—a convict whose hanging rope snapped and an armoured soldier (27). Such artefacts mark, impossibly, memories of death. The relationship between the living and the dead and the marks of the living-dead have come to haunt my research and riddle the logic by which I perceive the metabolic city.

As I continued to stare from the summit, the staid scene of the *polis* below came across as a frozen diorama buried in ice, or abandoned in a museum storehouse, waiting for future historians to unpack its crate and interpret its cryogenic signs and civilization. In "the West," and today more than ever, biotechnology stages our lives as already passed. Instead of securing our memories of "our" biology, genetic archives seem to harbour the initial material basis from which the mud of the new world order is about to emerge, and consequently they have become a speculative resource for capitalists and historians alike.

The question that looms on the threshold of our biotechnological polis? What unthinkable transgenic kin hails us on the haunted walk through the ruins and residues of our too human dream world? And what hails from the unthinkable horizon of biotechnologically integrated food, health, and reproduction? The challenge of the megacentre's archives, therefore, is to rethink the question of kinship in relation to the troubled logic of its overflowing metabolism.

Yet as I turned to begin my descent through Westmount, my thoughts were drawn to you. My brother, you have always been more than a brother to me. Even before I can remember, you have been the magnet for the compass of my thought. I know not the precise nature of the persistent force that angles the needle of my deliberations towards you, but this force leaves an impression whenever I struggle to resolve the experience of anachrony with the future promises of biotechnology. It is as if I feel the weight of your stare. In truth I think of you in spite of my being persistently trained in an increasingly phenomenological culture. As I strolled through the plaza of Westmount Square, I saw what I took to be your blurred reflection in the glass. And then to my surprise the street lamps sizzled off. The dawn had broken.

With affection,

Your snow-scaped brother

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Genetic Engineering: The Usual Definition of Biotechnology

The discourse of biotechnology does not begin with its conception, with its being born onto the stage of history. There are numerous, rigorous historical accounts of the origins of biotechnology as a concept or idea—including Robert Bud's superb *The Uses of Life* (1993). As well, histories of the technical, scientific and institutional developments that made biotechnology possible are abundant (White 1988; Frank-Kamenetskii 1993; Grace 1997; Morange 2000). In *The Second Creation: Dolly and the Age of Biological Control* (2001), Ian Wilmut of the Roslin Institute, who is famous for the production of "Dolly," describes "a trio of modern biotechnologies... [that] propel humanity into a new age" (6): genetic engineering, genomics and cloning. Wilmut is here following the canonical history of biotechnology when understood as a set of tools. Its influence warrants a brief history because it shapes much of what is to come.

Wilmut situates the beginnings of genetic engineering in the early 1970s. The discovery in 1970 of restriction endonucleases or restriction enzymes provided tools to cut DNA at specific base sequences.[3] In 1972, Paul Berg cut sections of viral DNA and bacterial DNA with the same restriction enzyme. He

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[3] Restriction enzymes are used by bacterium to cut up and restrict viral infections. Viruses are DNA, or sometimes RNA, molecules with a protein coat. They infect their hosts by sending their DNA or RNA into a cell. The infected cell then devotes all its resources to synthesizing the nucleic acid and proteins of the virus until its membranes burst and viral particles spill forth, able to attach themselves to other cells. Restriction enzymes within bacterium, however, are able to distinguish between the bacterium's DNA and the infecting nucleic acid of the virus. After a bacterium's DNA has been replicated, a sequence of nucleotides is chemically modified, as if the bacterium earmarks its own DNA. If the bacterium's restriction enzymes encounter a similar sequence of nucleotides that has not been modified, they cut the molecule that Werner Arber was first to characterize as "restriction enzymes," which allowed scientists to "cleave" DNA (Arber 1979, 1979b). Hamilton O. Smith purified and identified the specific properties of these enzymes so that they could be used more accurately (Smith and Wilcox 1970). Daniel Nathans began using them to cut a Simian Virus (SV-40) into fragments in an effort to provide what would later be called a "physical map" of the viral genome (Danna and Nathans 1971).

then recombined the viral to the bacterial DNA (Jackson et al 1972). By 1973, Herbert Boyer and Stanley Cohen had produced the first organism with recombinant DNA: bacteria recombined with the genes of a toad (Cohen et al. 1973).[4]

Susan Aldridge describes genetic engineering as a "'cut,' 'paste,' and 'copy' operation":

> The gene transferred is first cut out of the DNA of the organism it comes from. It is then "pasted" into an intermediary DNA molecule called a vector, which carries it into the host organism. Here it is copied many times—or cloned—as the host organism replicates. Ideally each cell of the host adopts the new gene and expresses it as the required protein product. (104)

Recombining DNA is, according to Wilmut, what genetic engineering is all about:

> "Genetic engineers" transfer genes from one organism to another and, which is truly miraculous, the transferred genes may function perfectly in the new organism. The genetically engineered organism is then said to be "transformed," or to be "transgenic"; the transferred gene is called a transgene. (6)

Nexia's cloned goats that excrete spider protein are an example of transgenic organisms that extend beyond the classical taxonomies of biology. We still refer to them as "goats" but that designation is shadowed by the BioSteel™ bioreactor that confronts us.

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[4] Cohen and Boyer cut the gene for resistance to an antibiotic from bacterial plasmids (a circular DNA molecule that multiplies together with bacteria and is capable of passing from cell to cell) and spliced them with DNA from an African clawed toad to produce bacterial cells whose genes included those of the toad (Cohen et al 1973).

Before they do their work, however, genetic engineers need genes at their disposal. The problem is, as Wilmut points out, "most of the genes in most creatures remain unidentified." Genomics attempts to correct this problem:

> Over the past few decades, the science and technology of *genomics* has developed: the attempt to map all the genes in an organism and eventually to unravel their individual structures and find out what each of them does. (7)

A genome is the full complement of DNA in the cells of an organism. As Richard Lewontin succinctly explains:

> DNA is composed of basic units, the *nucleotides*, of which there are four kinds, adenine, cytosine, guanine, and thymine (A, C, G, and T) and these are strung one after another in a long linear sequence which makes a DNA molecule. So one bit of DNA might have the sequence of units...CAATTGC...and another the sequence... TATCGCTA...and so on. (1993: 139-140)

Genes are sections of DNA related to protein production. They are typically ten thousand base units long. Scientists attempting to map genes must "fish them out" from the entire genome. So in the case of the Human Genome Project, scientists are attempting to map an estimated thirty thousand genes from a genome that is approximately three billion bases long. Many genes, however, are "fragmented"; they are constituted by sections of DNA that code for protein production (exons) interspersed with long sections of non-coding regions (introns), commonly referred to as "junk DNA."

Again, as he did with genetic engineering, Wilmut situates the development of genomics in relation to the development, during the 1970s, of a cluster of tools and techniques used by scientists—in this case for the mapping and sequencing of genomes. Robert Cook-Deegan's *The Gene Wars: Science,*

Politics and the Human Genome scrupulously details the development of mapping and sequencing techniques, drawing special attention to the 1970s:

> The prospects for finding unknown human genes began to brighten considerably in 1978, as molecular biology attained sufficient power to address problems in human genetics. Techniques of molecular genetics developed in the mid-1970s laid the foundation for a new kind of genetic map. In 1970, enzymes that cut DNA at specific base sequences were discovered. [See the description of restriction enzymes above.] These quickly became precise tools to investigate DNA structure. A highly reliable way to separate DNA fragments according to their length was another major innovation of the early 1970s. Two groups of investigators independently discovered how to label short stretches of DNA with radioactive phosphorus to detect specific DNA sequences, opening the way for a form of chromosome mapping. In an early application of the technique, a fragment of DNA made from a hemoglobin gene distinguished just those fragments of DNA that included parts of the gene from among thousands of DNA fragments. A gene could thus be fished out of a sea of DNA. (33)

While the development of these techniques, and many others detailed by Cook-Deegan, facilitated the ability of scientists to "fish out" and map the location of genes on chromosomes, parallel developments in sequencing techniques culminated in Frederick Sanger's publication in 1971 of the first DNA sequence (Air 1978). This was followed, in 1977, by the announcement of a different, but extremely useful sequencing method developed by Allan Maxam and Walter Gilbert of Harvard University (Cook-Deegan 53-77). There are three key points to be understood about genomic sequences: they are bioinformatic, stored in globally networked computers organized by sophisticated software that can

compare the genomes of model organisms with others, and they are comprised of long strings of letters.

The third of Wilmut's "trio of modern biotechnologies," cloning, is described as the production of more than one creature by asexual reproduction. The more-than-one creatures collectively form a "clone." Most of *The Second Creation* is dedicated to describing the development of what the text refers to as "the age of nuclear transfer," the cloning technique used and developed by the Roslin Institute. As the name suggests, nuclear transfer is the transference of a nucleus into a different cytoplasm. Dolly, for example, was produced by transferring a Finn-Dorset sheep nucleus into the enucleated egg[5] of a Scottish Blackface ewe. One of the points suggested by *The Second Creation* is that the development of cloning techniques has led to the asexual replication of mammals. Like plants and microbes before them, mammals can now be replicated in a culture—where they can also be made subject to the field of genomics and the nuclear handiwork of genetic engineers. Wilmut tells us that "cloning, at least our version of it, is primarily conceived as an aid to genetic transformation" (22).

Wilmut summarises the work of the triangulated, biotechnological matrix as follows:

> Genetic engineering is the conceptual leader: transfer of genes from organism to organism and the creation of quite new genes, makes it possible in principle to build new organisms at will. Genomics provides the necessary data: knowledge of what genes to transfer-where to find them, and what they do. Cloning of the kind that we

[5] An enucleated egg has had its nucleus removed.

> have developed at Roslin and PPL [Pharmaceutical Proteins Limited][6] makes it possible in principle to apply all the immense power of genetic engineering and genomics to animals... Commentators at large were right to observe that, in principle, whatever can be done in sheep might also be done in people, but they did not for the most part perceive that cloning per se—mere replication—is only a fraction of what *might* be done. (9)

Wilmut gives a hint at what the future *might* hold: "Polly, born in 1997, shows the promise of times to come. She was cloned from cultured cells that were transformed genetically—a human gene was added to them—as they were cultured" (Wilmut 8; see also Schnieke 2130-2133).

Since the 1970s, then, techniques have been developed that are producing a general genomic index of living things. Genetic engineers cut, copy, and paste from this index, producing more-than-one creatures. Wilmut refers to biotechnology as the assemblage of the living-in-general within the rubric of these techniques. What distinguishes *bio*technology from technology in general is that it permits the growing of nature within cultures and thus ushers in "the age of biological control." But there is something troubling about this history. Historians that consider biotechnology to be an idea or set of techniques, or more generally an object of historical inquiry, are forever forgetting its meaning. Before all else, the different logic of biotechnology changes the way we ask questions concerning the biological objects before us—including ourselves.

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[6] PPL is the "collaborating biotech company" situated on the campus of the Roslin Institute.

Whither Biotechnology?

It is often remarked in the literature, for example, that biotechnology is changing what it means to be human. If biotechnology is changing "human nature," however, we cannot assume that this changed "human" will in fact be "human" at all. It can be wagered that the discourse of humanism and an ethical appeal to basic humanity will prevail as the dominant ideological forces by which we give meaning to the changes brought on by biotechnology; that is, that the definition of being "human" will change or evolve. But there are signs giving the impression that the returns from such speculations are far from guaranteed. As capitalists continue to use biotechnology in conjunction with patent law to gain control over vast natural resources, food systems, reproductive rights and health, there is no guarantee that the interests of "humanity" will be served. Nor is their assurance that capitalism (which has never been a system of justice in the classical sense) will continue to rhetorically organize its biotechnological expansion in the name of "humanity." And theoretically genomics and genetic engineering are not compelled to organize their practices around the figure of the "human." Is not the essence of biotechnology born on the promise of exceeding classical biological categories? The discourse of biotechnology therefore insists that the order of things will be different. A strange question follows from this different order of biological things: Who or even what asks the questions, What is biotechnology? And what constitutes its future? The subject is phenomenally uncertain because within the order of biotechnology it cannot simply be assumed that "whoever" raises such a question is human. Again, biotechnology brings what it means to be "human" into question, and because of this, the question of

the "who" is difficult to formulate in a humanist schematic. The phenomenon of biotechnology, including the cloning and the splicing of "human" genes with those of other animals, always raises the question of "who?" in a way that is impossible to biologically delimit. Hence the vast extent of the work before "us."

The Critical Corpus of Biotechnology

The impossibility of delimiting the organism and thus the subject of biotechnology has troubled and, in many cases, outraged lay and academic scholars. Broadly, commentators have expressed their concerns regarding the spectres of transgenesis and cloning through various calls for responsibility. They warn against the spirited fervour in the science community for the transgenic fusions and lexical confusions of biotechnology. The desire to initiate a Second Creation, they warn, smacks of a loss of commonsense, and is irresponsible. At the same time, many critics want to distinguish "our" "modern" culture, in most cases that of the West, from the unthinkable promises of biotechnological culture. Western culture, it is argued or assumed, entails access to the responsibly free self; that is, the subject of freedom is constituted as the essence of the West. So, on the one hand, there is the "demonic" biotechnology—here I use Derrida's description of the demonic as "that which confuses the limits among the animal, the human, and the divine, and which retains an affinity with mystery, the initiatory, the esoteric, the secret or the sacred" (1995b: 2). On the other hand, there is Western culture and its spirit of responsible freedom.

All the references to holy grails, the code of codes, Brave New Worlds, and Second Creations that pepper the discourse are symptoms of biotechnology's religiousity. By "religiousity" I mean that which negotiates the various passages of responsibility between a demonic biotechnology and the spirit of the West. This religiousity is necessary because biotechnology's essential drive is to exceed known categories. Faced with the delimited, one works with a limited knowledge. Responding to biotechnology thus requires faith, but in order to respond, one must at the same time give oneself over to a libidinal metabolism that is unthinkable and inhumane.

For the most part, while the critical corpus acknowledges biotech's metabolic heterogeneity, it also represses it by understanding that it waits for Man. For example, the prologue to *Remaking Eden: How Genetic Engineering and Cloning Will Transform the American Family* (1998), a popular science text written by Princeton University geneticist Lee M. Silver, ends on a hesitant, prophetic note reminiscent of Wilmut's *Second Creation*:

> Of one thing, I have no doubt. The growing use of reprogenetics is inevitable. For better *and* worse, a new age is upon us—an age in which we as humans will gain the ability *to change the nature of our species*. (13)

For Silver, biotechnological culture raises the question of kinship in the specific form of the American family and, more broadly, the family of man. Biological responsibility is tied to the question of both human and American kin—it will serve them "for better *and* worse."

The broadly humanist ethnographic trajectory of *Remaking Eden* is typical of many popular science discussions of biotechnology published in the 1990s.

These texts defined biotechnology instrumentally as a series of radically transformative reproductive tools. This instrumental understanding of biotechnology was promoted throughout the late-1980s and, as the Human Genome Project began in 1990, up until several years after Dolly was born in 1997. Historians of science carefully tracked the latest developments and grandiose claims were made by high-profile molecular biologists whose work began being consolidated around, or measured in relation to, the forcefully promoted "genetic revolution" (see Cook-Deegan 1994; Kevles 1995; Kevles and Hood 1992; Krimsky 1982; Mullis 1998; Shapiro 1991; Wilkie 1993; Wilmut et al 2000).

Critics responded by arguing that the promise of a harnessed metabolic onotology, at once transgenic, cloned and integrated with bioinformatics computing machines, challenged the humanist premises upon which "our" society was built (Lewontin 2000; Lewontin 1993, 1994; Hubbard and Wald 1993). Much of this literature weighed-in on biotechnology as a reductionist science. The claim, it was argued, that the genetic code determined life was both an inaccurate understanding of metabolic activity and ideologically specious in its devaluation of the role of socialization (Keller 2000; Lewontin 2000; Ho 1998). Both sides debated the promises and dangers of the instruments of biotechnology, without rigorously questioning the assumption that this new science was constituted by a set of tools and techniques wielded by Man.

The arrival of more general texts examining the intersections of biotechnology suggests the expanding field of study (Birke and Hubbard 1995; Critical Art Ensemble 1998; Fox 1992; Hubbard and Wald 1993; Kimbrell 1993; Nelkin and Lindee 1995; Rifkin 1998; Tokar 2001; Yoxen 1984). Topics have

included whether biotechnology was introducing a kind of eugenics, especially in relation to the development of new prenatal testing regimens (Bankowski 1991; Basen 1994; Arditti 1984, 1989; Franklin 1995); the effect of biotechnology on agriculture, ecology, and biodiversity and the potential health hazards of genetically modified food (Nottingham 1998). For the most part these texts have been concerned with describing the science and protecting both the sanctity of the body and the right to know what is in our food through policy. According to biotechnological culture, these texts can be seen as not only interested in food security, but also in securing the figure of the liberal body politic through just laws.

The desire to preserve, not just the human body, but its freedom through legal recourse is demonstrated in texts examining the transformation of agriculture and the infiltration of capitalism into farming by means of biotechnology (Kloppenburg Jr. 1988; Kneen 1997). The ETC Group (Action Group on Erosion, Technology and Concentration) has played an influential role in this regard by demonstrating how claims that biotechnology will increase and protect biodiversity in agriculture are false. According to the ETC group, five multinational companies (Monsanto, AstaZeneca, DuPont, Novartis and Aventis) accounted for nearly two-thirds of the global pesticide market (60%), almost one-quarter (23%) of the commercial seed market, and virtually 100% of the transgenic (genetically engineered) seed market. Four crops—soybean, maize, cotton and canola—"account for virtually all commercial GM [genetically

modified] crops planted in 2000" (www.etc.org).[7] At the end of the millennium therefore, five companies were genetically engineering four major food crops for two traits (herbicide and insecticide resistance), while developing their products in three countries to distribute globally (www.etc.org).

Thus the sprawling discourse of biotechnology is highly concentrated, with the seed industry being run by a few companies over a limited geography. "Uniformity, industrial agriculture and corporate concentration," argues the ETC Group, "would best describe the introduction of GM crops over the past five years—not diversity, or food security, or competitive markets" (www.etc.org). These scholars direct our attention to the operational violence of the increasingly consolidated Life Sciences. The discourse of biotechnology, it is suggested, must be understood in relation, not only to what it brings forth, but also in relation to a responsibility towards what it may be putting to death. This argument has had an impact when emerging from discussions of animals, especially the suffering of experimental transgenic farm animals, many of whom die or are put to death shortly after birth due to their biological state and status. The genetic engineering of farm animals so that they produce enzymes desired by the pharmaceutical industry in their milk and urine has come to be referred to as "pharming" (for the history of farm animals as bioreactors, see Krimsky and Wrubel 1996; for animal suffering, see Wheale and McNally 1995).

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[7] Here is a list of just some of the products and processed foods that may contain genetically engineered soy ingredients, such as lecithin, soya protein, soya flour and soya oil (often labelled as generic vegetable oil): mature whole soybeans, edamame, miso, natto, tofu products, frozen non-dairy deserts, soymilk products, soy sauce, bread, biscuits, cakes, baby foods, sausages, meat substitutes, pasta, ice cream, chocolate, and other confectionery. It is estimated that approximately 60% of processed foods contain genetically engineered ingredients (Nottingham 130-133).

The subject of biotechnology in these discussions is repeatedly extended beyond the human frame because of the transgenic range of resources by which pharming and food take place. The incorporation of genetic resources from around the globe within the bio-industrial and bioinformatics machinations of the ambiguously termed but corporately concentrated Life Sciences has brought, and continues to bring, a response from those concerned with indigenous rights. The terms "biopiracy" and "biocolonialism" have come to refer to the patenting by U.S. corporations and government of cell lines from indigenous crops, domesticated animals and people (Mehta 2005; Shiva 2002, 1997; Armstrong 1997; Hanley 1996; Shiva and Moser 1995). These terms have been rallying cries for international movements protesting genetically engineered food and the patenting of "living things," movements that culminated in the international Convention on Biodiversity (CBD), which was opened for signature at the UN sponsored Earth Summit in Rio de Janeiro in 1992 (see www.cbd.int). The CBD, however, ultimately pits humanism as the defender of biodiversity against the forces of reckless "development." More recently, the defence of biodiversity is described as *the* means to development. As Celso Lafer, the ex-officio Vice President of the Conference in Rio, understands it, a consciousness of our biological interrelatedness is a global issue that trumps national sovereignties and "the realism of national interests": "the development and environment nexus [has come] to be perceived as of interest to Humanity and not solely to States" (Secretariat of the CBD 9). Humanist ontology takes precedent over the interested management of biodiversity by the State. International policy manages the passage through the churn of biodiversity towards the fulfilment of a more responsible humanity.

The repression by humanism of biotechnology's challenge of biological delimitation carries tremendously effective ethical weight. The force of humanism, and the trace of its repression, can be felt throughout the plethora of texts whose writers wish to restrain the onslaught of biotechnology through a policing of policy that would protect the sanctity of the *polis*. Texts concerned with policy are most evident in the fields of human health, reproduction, rights-based legislation and ethics (Beck-Gernsheim 1995; Howell and Sale 1995; Silver 1997; Harris 1998; Fukuyama 2002; Habermas 2003); agriculture, ecology and biodiversity (Ho 1998; Kloppenburg Jr. 1987, 1988, 1988b, 1991, 1991b; Kneen 1997, 1999; Nottingham 1998, 2002); and legal scholars engaging with both the "body of law" (Hyde 1997) and the patenting of 'living things' (Gold 1996; Rao 2000; Resnik 2004; Paradise et al 2005; Boussard 2007; Nwabueze 2007).

The Constraints of Humanism

In order to better describe how the phenomenal force of humanism restrains the discourse of humanism, I want now to offer a close reading of Jeremy Rifkin's *The Biotech Century: Harnessing the Gene and Remaking the World* (1998). Rifkin is the President of the Foundation on Economic Trends and has served as an advisor to numerous governments on the impact of scientific and technological changes on the economy, the workforce, society, and the environment. He has played a significant role in the development in the United States of public discourse concerning the effects of biotechnology.

Rifkin's text provides an example of an informed and thoughtful writer whose liberal humanism nonetheless forcefully normalizes the question of

biopolitics. It begins by describing "the new operational matrix" as "an approach so far-reaching in scope that it will fundamentally alter humanity's relationship to the globe" (8). According to Rifkin, the approach of biotech's new operational matrix takes place by means of seven strands that together "create a framework for a new economic era." The strands include new techniques that "allow scientists and biotech companies to locate, manipulate, and exploit genetic resources for specific economic ends." The patenting of "genes, cell lines, genetically engineered tissue, organs, and organisms, as well as the processes used to alter them" offers commercial incentive. Globalization provides a planetary topography for the operations of the newly established "life-science industry." Genomics, the mapping and sequencing of genomes, and genetic engineering are "paving the way for the wholesale alteration of the human species and the birth of a commercially driven eugenics civilization." The return to favour of sociobiology amongst scientists provides a cultural context for the acceptance of biotechnology. The development of bioinformatics has consolidated the communication and organization of research. And lastly, new ideas about nature are being designed to suggest "that the new way we are reorganizing our economy and society are amplifications of nature's own principles and practices and, therefore, justifiable" (8-9). For Rifkin biotechnology promises to end life as we know it:

> In little more than a generation, our definition of life and the meaning of existence is likely to be radically altered. Long-held assumptions about nature, including our own human nature, are likely to be rethought. Many age-old practices regarding sexuality, reproduction, birth, and parenthood could be partially abandoned. Ideas about equality and democracy are also likely to be redefined,

> as well as our vision of what is meant by terms such as "free will" and "progress." Our very sense of self and society will likely change, as it did when the early Renaissance spirit swept over medieval Europe more than seven hundred years ago. (1)

Rifkin extends his analysis of the "operational matrix" throughout *The Biotech Century*, incorporating examples of its operation over a vast topography in order to argue that the promises of biotechnology are unjustified.

Nevertheless, the expansive movement of his text begs the question: to the extent that the threat of the "new operational matrix" is global, why does Rifkin repeatedly suggest that "the biotech century" promises the death of a singular genealogy—that of the liberal humanist subject? A subject whose origins Rifkin ties to Europe and its Renaissance? Thus, free will, progress, human nature, "ideas about equality and democracy," these remain the touchstones for a familiar defence of the liberal humanist subject.

By pointing out that Rifkin's discussion of biotechnology refers only to threats against the trajectories of Europe's humanism (are there any others?), I am not suggesting that he should have included the threats to other subjects and/or conducted a comparative analysis. Rather, I want to stress the coherence of a way of thinking about biotechnology that posits the genealogy of Europe's humanism and its liberal configurations as the singular alternative.

The conservative, normative force of Rifkin's text is made more clear when we consider how the opposition between biotechnology and humanism is structured. Rifkin concludes *The Biotech Century* by arguing that,

> The biotech revolution will affect every aspect of our lives. The way we eat; the way we date and marry; the way we have our babies; the way our children are raised and educated; the way we work;

> the way we engage in politics...all of our individual and shared realities will be deeply touched by the new technologies of the Biotech Century. Surely, these very personal technologies deserve to be widely discussed and debated by the public at large before they become a part of our daily lives. (236-237)

So, on the one hand, we have the genealogy of European humanism, and on the other, a transgenic biotechnological horizon that promises the death of Western civilization. The key, argues Rifkin, is to open public debate concerning the extent to which "our daily lives" should be modified.

Biotechnology is here again understood as a powerful, modifying tool. This instrumental definition results in what amounts to a limited or concentrated ethical debate concerning biotechnology that is structured by the opposition between the seemingly arbitrary development of new technologies—their so-called ongoing invention—and the desire to legally constrain them. In this opposition, the subject of debate is reduced to a species of the familiar question of whether the greatest freedom is derived from an unfettered human will or the constraint of just laws. The ethical choice becomes whether to respect the right to freely push on blindly with biotechnology or, what amounts to the same, to fight helplessly against its arrival, cursing it as a blight against "humanity."

In both cases, technological production, understood as the inventive procurement of means to an end, is essentially what it means to be human. "Human beings," says Rifkin, "are tool makers by nature" (233). The actual ethical debate is constrained to the extent of checks and balances to be used against the will to technological production. Further, if humans are essentially tool makers and biotechnology is a tool, then a biotech future seems relentless, arbitrary and inevitable—even if it is to be contested vehemently upon its arrival. It is not a

question of whether to reject biotechnology; "Rather, the question is what kind of biotechnologies will we choose in the coming Biotech Century?" (233).

Rifkin argues for a more conservative approach, but his desire for conservation is twofold. He concludes *The Biotech Century* with the following challenge:

> The biotech revolution will force each of us to put a mirror to our most deeply held values, making us ponder the ultimate question of the purpose and meaning of existence. This may turn out to be its most important contribution. The rest is up to us. (237)

Biotechnology's "most important contribution" is to initiate the alternation between the European humanist subject and the technical possibility of its future modification, because this should open debate within the bourgeois public sphere. Biotechnology, in this sense, provides the opportunity for the exercise of free will in relation to the law, within the ideals of liberal democracy. Ironically, choosing the extent to which humanity will be modified preserves its essence—even if this essence is the effect of a European ethnography, a narrative of modern democracy that Rifkin describes as being initiated in the Renaissance.

We are told "the biotech revolution will affect every aspect of our lives," but also that the "biotech revolution will force each of us to [look into a] mirror." In the end, the displacement of "humanity" is constructed as a force—one that helps the European trajectory of humanity see itself extended. The displacement of humanity is a force that opens the space for humanity to rebuild itself within the trajectory of liberal democracy. A renaissance of sorts: The king in dead; long live the king! Within the discourse of biotechnology, Rifkin preserves humanity through the passage of the dead-living. That is, he concentrates the whole of

biological interrelatedness and the ferment of all global metabolic transactions into a passage—of time. Humanity is in ruins but if it acts responsibly, if it responds well to its mirror image and constructs healthy policies, it will be reborn in the future.

Although Rifkin posits the potential for a rebirth, it is important to recognize that the logic in the way he structures the discourse of biotechnology represses the quandaries of kinship that provide the impetus for his text. In "the final analysis," Rifkin declares, "I believe that each of us is responsible, in some way, for determining the collective future we share together as a species" (235). Considering the transgenic subject of his text, such a statement is marked by acute catachresis. Is the call for biotechnological responsibility derived from humanity? Are biotechnological politics and law limited to the struggle for what essentially and ultimately amounts to humanity's legitimacy? Is the horizon of a radical biopolitics lost when the catachresis of a "species" is not marked? Surely, unmarked terms such as "community" and "kinship" come across as alibis for conservative aspects of projects subsequently unable to engage with the unthinkable loss of humanity that initiated the discourse of biotechnology. If humanity is in ruins, what does it see in the mirror?

My own work shares the frustration of scholars who have had enough of the persistent recuperation of humanism. "Humanity," as Avital Ronell slyly suggests, "is not yet just":

> Of course, we no longer exist in a way that renders manifestation possible: we have lost access to what is manifested and even to manifestation itself. Nothing, today, can be manifested. Except, possibly, the fact that humanity is not yet just. The indecency of a humanism that goes on as if nothing had happened. The task of

> extremist writing is to put through the call for a justice of the future. Henceforth, Justice can no longer permit itself to be merely backward looking or bound in servility to sclerotic models and their modifications (their "future"). A justice of the future would have to show the will to rupture. (1992: 21-22)

Humanity is not yet just in that it cannot properly manifest itself in relation to biotechnology. It may have been manifest in the past and perhaps future historians may be able to describe how it is currently manifested (if at all), but "we have lost access to what is manifested." Such is the unthinkable diorama of the contemporary.

But humanism is also not yet just—"indecent"—in that its concentrated vision is out of focus in relation to the rattling of kinship by biotechnology. It is not *justified*, therefore, in its conservative, normalizing refusal to engage with biotechnological rupture. "In the final analysis," humanism's call to responsibility can only come from the ghostly fantasy of its having already passed—its haunted mirror. It is not that humanism suffers from a lack of sight. Its defences of the subject such as Rifkin's are extremely insightful. It is just that its vision of the transgenic contemporary is not simply of itself but also, and impossibly, of its having already passed away. The vision of an insightful humanism is cross-eyed, or double, and its ethnographic view of the future is haunted by the spectres of the metabolic ferment that it would police and construct as demonic for its own purposes.

Kinship in the Biotechnological Passing of Humanism

My research joins the work of other scholars whose research marks how the discourse of biotechnology is circumscribed. Much of this scholarship focuses on problems of naming and taxonomy in order to demonstrate how different ways of thinking and speaking about our kinship with non-humans, and even inhumanity, are being foreclosed, normalized or made unthinkable. Or it describes how the trace of different genealogies are haunting the scene of biotechnology, leading to other ways of thinking about the subject.

The histories of science and the semiotic analyses of biological metaphors produced by Evelyn Fox Keller are extremely influential in this regard (1992, 1995, 2000; Fox and Lloyd 1992). In *The Century of the Gene* (2000), Keller argues that in "a post-genomic age...a radically transformed intra- and intercellular bestiary will require accommodation in the new order of things, and it will include numerous elements defying classification in the traditional categories of animate and inanimate" (9-10). Keller's recent work describes the lexical "defiance" produced by biotechnology. This troubling of lexicons initiated by "the new order of things," it is argued, creates a field of semantic contestation upon which the matter of political economy, society, culture and nature is being played out. This at once troubling and ex-citing "new order of things" is constituted by cloned sheep, mice, goats, cows, pigs, cats and monkeys. It also includes livestock that has been genetically engineered with human genes to either produce human proteins in their milk for the pharmaceutical industry or to be better suited for breeding and xenotransplantations (for examples, see Krimsky and Wrubel).

Beyond the "bestiary," the new biotechnological order is comprised of a network that includes genetically engineered microbes, plants, and insects. Food crops, for example, have already been genetically engineered for herbicide and insecticide resistance as well as for drought, frost, and poor soil tolerance (for an excellent summary, see Nottingham 1998). Monsanto has even attempted to genetically engineer cotton plants with genes that express blue pigment for the blue jean market (Nottingham 1998: 78). Tobacco, an extremely important biotech research plant, has been genetically engineered with the genes of fireflies (Ow et al, 1996: 856-859). Within the continuities and discontinuities of biochemical exchange networks involving everything from microbes to blue jeans, the very notion of kinship is repeatedly brought into question.

But what is it that unites these networks of biochemical exchange so that they can be recognized as "networks" in the first place? Richard Dawkins has (in)famously described the bodies of all organisms as the vessels, or colonies, of "immortal" self-replicating genes. He concludes his best-known text, *The Selfish Gene* (1976), with the following assertion:

> With only a little imagination we can see the gene as sitting at the centre of a radiating web of extended phenotypic power. And an object in the world is the centre of a converging web of influences from many genes sitting in many organisms. The long reach of the gene knows no obvious boundaries. The whole world is criss-crossed with causal arrows joining genes to phenotypic effects, far and near. (265-266)

Sarah Franklin (1995) and Donna Haraway (1997) have pointed out that by removing the gene from the organism, Dawkins' analysis and description of the "selfish gene" is tautological; the gene is "selfish" because it is conceived

theoretically as ultimately standing outside metabolic exchange. Haraway goes on to describe the "selfish gene" that operates both materially and on its own outside of materiality as a transcendental signifier:

> In this view, genes are things-in-themselves, outside the lively economies of troping. To be outside the economy of troping is to be outside finitude, morality, and difference, to be in the realm of pure being, to be One, where the word is itself. (Haraway 1996: 134)

Keller's argument in *The Century of the Gene* (2000) rebukes the concept of the gene operating as a transcendental signifier on the basis of an increasingly broad, metabolic approach to molecular biology that does not always refer back to the gene as responsible for coding cellular activity.

In fact, Keller's argument suggests that Dawkins' genetic determinism belongs to another era. Recent advances in molecular biology, she argues, suggest the need for a new paradigm that can engage with the dynamic cellular metabolic activity whereby "Various DNA, RNA, and protein components function alternatively as instructions and as data" (146). Keller concludes that, as its paradigm gives way to the metabolic dynamics of biochemistry in general, the metaphor of the gene may no longer have the utility it once had. Sarah Franklin echoes Keller when she argues that

> there remains the broad Foucauldian question of how [the cloning of Dolly and the introduction of genetically modified foods] can be understood as part of an ongoing re-alignment of life, labour and language. (2000: 188)

Later in the same essay, Franklin suggests that

> the consequences of molecular genomic prowess...entail *a respatialization of genealogy*, so that genetic information no longer necessarily passes in a one-way, linear path of descent from one

> generation to the next...The ability to recombine genes from different species has detonated the formerly rigid conduits of DNA transmission, enabling mice and goats to express human genes, plants to express genes from fish, and sheep to produce human proteins because they have been equipped with the missing parts of the human genome lacking in sufferers of rare inherited diseases, such as cystic fibrosis. Just as the human genome project represents a *molecular globalization* of human kinship, so the transgenic industry has created postmodern genealogy, shorn of the very limits by which consanguinity was once defined—the slow, predictable and regular brachiations of the familiar family tree now superseded by more flexible dimensions of genealogical time (as speed) and space (which is post-arboreal). (190; italics in original)

Ancestry, Franklin suggests, no longer unfolds through the meanderings of bloodlines. Instead, ancestry is being shaped by the speed of bioinformatics and the spatialization of bodies through the practices of biotechnology. For Franklin the "post-arboreal" body has become an instantiation of a spatial effect in which genes can be brought together from anywhere, duplicated, and sent around the globe (also see 2003).

Franklin describes this "respatialization of genealogy" through the work of Canguilhem (1994), who argued that the study of biology has shifted from concerns with the structure and function of living matter to the possibilities of information and communication theory. She also draws from Foucault (1970 and 1978) and his sense that the genealogy of "life" organized the spatial relations of a population and the angles from which people were viewed. For example, Foucault argued that the operation of "biopower" is related to a common grammar and syntax that *discursively* produces "life" and "sex," but also shapes civil planning, institutional design, the democratic state, and the topographies of

modern disciplines such as psychoanalysis, biology, and statistics. Thus Franklin's work also dialogues with Foucault scholar and anthropologist Paul Rabinow's (1992) now well-known assertion that society has shifted from being organized by sociobiology to a more spatialized "biosociality." Finally, Franklin's work draws from the warnings of feminist scholars, Valerie Hartouni (1997) and José Van Dijck (1998), for whom the new, spatialized and theatricalized order of technoculture provides a vast field for the (re)staging and reinforcement of well-known modernist categories.

Recent cultural theories of biotechnology have cut along this vein of "de-sanguinity" and described "the respatialization of genealogy" in relation to new or altered kinships. The most influential scholar in this regard is Donna Haraway, who has persistently tied the discourse of biotechnology to the question of kinship. In *Modest_Witness* (1997) Haraway asks,

> Who are my kin in this odd world of promising monsters, vampires, surrogates, living tools, and aliens? How are natural kinds identified in the realms of late-twentieth-century technoscience? What kinds of crosses and offspring count as legitimate and illegitimate, to whom and at what cost? Who are my familiars, my siblings, and what kind of livable world are we trying to build? (52)

Ultimately, Haraway concludes that "kinship is a technology for producing the material and semiotic effect of natural relationship, of shared kind" (53). To suggest that kinship creates the technological "effect of natural relationship" greatly extends but also, again, spatializes the field. Bloodlines are replaced by material and semiotic relations—which are textual effects. "All that is unhuman," writes Haraway, "is not un-kind, outside kinship, outside the orders of

signification, excluded from trading in signs and wonders" (8). All these scholars work against the temporalizing "forces" of liberal humanism by theorizing how contemporary practices are spatializing ontology. They are aware of humanism's reductive violence. To offer another example, Cary Wolfe begins *Animal Rites: American Culture, the Discourse of Species, and Posthumanist Theory* (2003a) by throwing down a gauntlet:

> I want to begin by suggesting that much of what we call cultural studies situates itself, if only implicitly, on what looks to me more and more like a fundamental repression that underlies most ethical and political discourse: repressing the question of nonhuman subjectivity, taking it for granted that the subject is always already human. (1)

Acknowledging that he may sound as if he were part of a "quaintly lunatic fringe" of scholarship, Wolfe goes on to accuse cultural theory of "speciesism"—"systematic discrimination against an other based solely on a generic characteristic, in this case, species"—and argues that developments in scholarship across a wide range of disciplines have made it untenable to equate the subject with *Homo Sapiens* (1).

Accusations of "speciesism" may seem like hurling popcorn at the walls of academia, especially considering the growing numbers of academics who are in concert with Wolfe, but the kernel of Wolfe's important work is that the increasingly pressing question of "animality"—including the surprise of 'our' (?) own—arises,

> not so much for the pragmatic reason of addressing more adequately our imbrication[s] in the webworks of what Emerson called the "Not-Me" (the environment, from the bacterial to the ecosystemic, our various technical and electronic prosthesis, and so

> on), but rather for the theoretical reason that the "human," we now know, is not now, and never was, itself. (Wolfe 2003b: xiii)

Wolfe is here offering a version of the post-structuralist argument I have suggested above: that humanism can never be assured of its ontological status because it concentrates its ontology in the passage between a past and future incarnation. Thus "the 'human', we now know, is not now, and never was, itself." The goal of this argument is to deconstruct the seemingly relentless dominance of humanist discourse in order to open it to other logics and/or experiences of kinship that correspond more accurately to the material, spatial and catachrestic effects of biotechnology.

Spacialization of Genealogy

My work is clearly indebted to the ongoing efforts to "spatialize" the field of biotechnology. I am wary, however, of a certain trend that I believe is the result of the influence of Foucault's notion of biopower on post-structuralist theories of biotechnology. I will have more to say about Foucault in the following chapter, but suffice it for now to point out that the notion of "biopower" is derived from a history—not a spatialization—of sexuality, a mode of kinship related to the genesis, genealogy and generation of life. "Biopower," I will suggest, is ultimately a temporal and libidinal force. There are dangers to circumscribing one's analysis around this kind of force, which is also akin to humanism's drive to reincarnate.

If, for example, the question of the animal tends to ask of our kinship to simians and other animals, the figure of the "posthuman" questions our

relationship to machines, databases, cyborgs, and digital technologies. The text most often cited is N. Katherine Hayles' *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature and Infomatics* (1999). And Hayles has made her reconfiguring of kinship even more apparent in her more recent *My Mother Was a Computer* (2005). Hayles' sense of the posthuman parallels Franklin's argument that genealogy has become (re)spatialized:

> As I argue in *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*, the posthuman can offer opportunities to reconceptualize the human in ways that take better account of embodiment, situated action, and interconnections with other intelligent entities. In making this argument, I connect the posthuman with the dismantling of the liberal humanist subject and trace its development from post-World War II to the present. Among the characteristics associated with the posthuman are a privileging of informational pattern over material instantiation; a construction of consciousness that sees it as an epiphenomenon rather than the seat of identity; a view of the body as an originary prosthesis that we all learn to operate at birth and that is supplemented later in life by other prostheses; and above all, a configuration of the human so that it can be seamlessly articulated with intelligent machines. (2001: 146)

In keeping within the horizon of "spatialization," Hayles distinguishes embodiment from the body. Spatialization is phenomenological in that things take on an ontological status—or are brought forth in ontology—in relation to a *dwelling*. This ontological status then emerges from the dialectical movement of pattern uplifted from randomness, or "noise":

> Whereas the body is an idealized form that gestures toward a Platonic reality, *embodiment is the specific instantiation* generated from the noise of difference. Relative to the body, embodiment is

> other and elsewhere, at once excessive and deficient in its infinite variations, particularities, and abnormalities. (1999: 196-197; my italics)

For Hayles embodiment is an instantiation of pattern, as opposed to a "body" which Hayles describes in the previous citation as a "material instantiation." There is an equation being made here between space and time ("instantiation") through the movement of dialectical thought. There is a pattern of this instantiation of pattern in which space is being incorporated into time—an ongoing instantiation.

Later in the same text, Hayles argues,

> In this [pattern/randomness] dialectic, meaning is not front-loaded into the system, and the origin does not act to ground signification. As we have seen for multiagent simulations, complexity evolves from highly recursive processes being applied to simple rules. Rather than proceeding along a trajectory toward a known end, such systems evolve toward an open future marked by contingency and unpredictability. *Meaning is not guaranteed by a coherent origin; rather, it is made possible (but not inevitable) by the blind force of evolution finding workable solutions within given parameters.* (285; my italics)

For Hayles what gets embodied in an instantiation of pattern from randomness is "the blind force of evolution" emerging from the "creative ground" of noise. Her theory of the posthuman thus embodies both creation theory and a theory of evolution.

In effect, the "creative ground" (noise) has been separated from the "embodiment" of the posthuman subject (pattern). It is as if, in the instantiation of the posthuman subject, the subject becomes an object whose creative force has

moved elsewhere. The figure of an embodiment whose force has moved elsewhere reminds me of Roland Barthes' claim that "photography transformed subject into object, and even, one might say, into museum object" (Barthes 1980). Barthes' comment on photography parallels Benjamin's assessment that the bourgeois *polis* was always already in ruins. It is as if Hayles' posthuman theory parallels the temporalizing structure of liberal humanism and its bourgeois incarnations, but substitutes a bio-technological subject for humanism's biology. It is as if in her theory the human is reincarnated as a biotechnological subject, which explains why she never drops the term "human" from her work. The term still has deep meaning: we will know what the horizon of spatialization of humanity *will have been* in time—the instantiation of the post-human.

Again and again scholars equate the "respatialization of genealogy" with a future-orientated, promising temporality. As Sarah Franklin has argued,

> Nature, we might say, has been de-traditionalised. It has been antiquated, displaced and superseded, and now it is only a trope—a mere shadow of the referent it used to signify. That does not mean it is less useful, as we have already argued, but nature is in a spin. In the place formerly occupied by "natural facts" is a new frame of reference, an offspring of the genomic era, which is life itself—now orphaned from natural history but full of dazzling promise. (2000: 190-191)

Effective spatialization within the "genomic era," it seems, has its own ontology: an internal geneticism that augurs forth "life itself"—a living force that passes through its biochemical embodiments.

Theories that focus and concentrate on the generative aspect of biotechnology risk diminishing its degenerative effects. And posthuman

ontology that parallels humanist ontology risks a blindness to the repetition of its violence. Why is it, for example, that Hayles' theory of human-machine networks is one of posthumanity, as opposed to postmachinery? Derrida has brought attention to the work of machines by drawing attention to their electric functioning—not their utility or meanings—specifically, the electric cord that marks that aspect of their operation making their calculus possible while existing outside it. This generative cord is attached to other networks and its work cannot be sublimated within the dialectic of pattern and randomness with which the computer is engaged (1982: 107). Is there not something unthinkable about the work of machines that cannot be uplifted in the service of the "blind force of evolution"? And why does Franklin maintain the phenomenon of biochemistry in general within an ontology of "life itself"? Why would the forces of transgenesis and biochemistry in general only refer back to life? Why not theorize biochemical generality in relation to death itself? Or, and this may amount to the singularity of death, why not a radically unthinkable biochemical effect? It is the more general phenomenon of biotechnology underwritten by streams of genetic sequences rendered in alphabetic form (ACTG) that is being concentrated within the repeated astonishment of language as the origin of history and biology. As if patterns, noise, and the junk of Western capitals were the only genealogical force of our era and not a violent menace to others.

Derrida has taught us to recognize a surprise that is "finally extended to the dimensions of a world culture," in this case by means of the phenomenon of biochemistry in general and the noise of flesh machines, such as computer data bases storing an ever-increasing number of genomic sequences—a bioinformatic

incorporation. The horizon of the spatialization of genealogy is planetary and it initiates what Derrida describes as

> a surprise incomparable to any other, a surprise responsible for the activation of what is called Western thought, the thought whose destiny is to extend its domains while the boundaries of the West are drawn back. (1978: 4)

I am wary of a critical corpus so focused on genealogical surprise that it provides the condition for a joint history of the subject, responsibility, and the West—a kind of Western metaphysical reincarnation that does not attend to the violence of biotechnology. I will argue that this surprising ethnographic history of the critical corpus is haunted by others and by death. The goal of my thesis is to dramatize and make apparent this haunting in order to contribute to the work of those scholars above who have already shifted the grounds of what can be heard and spoken effectively. I am following their steps towards the enunciation of, and participation in, a more responsible politics of biotechnology.

What Follows from the Letter

Earlier when I asked, "Who raises the question, 'What is biotechnology?'," I suggested such a question could not be restricted to the grammar, syntax, or even the very "humanity" of what we might have called the language of the West. And yet, the discourse of biotechnology is underwritten by genomic sequences. According to Wilmut and many others engaged in the Life Sciences, it is by means of genomic archives that genetic engineers begin their work. Before all else, therefore, *Unthinkable Biotechnology* begins by troubling the sequences of the following letters: ACGT. I will have to confront the unthinkable other

biological order of biotechnology—an "order" that exceeds the grammar of the West—by beginning with its being concentrated on the phenomenon of the Western alphabet: the letter.

Towards that end and against the grain of the temporalizing forces of the discourse, I seek to rethink how it is that biotechnology *takes place*. To do so I retrace the unthinkable etymology of "biotechnology" and describes three key modes by which the seemingly open-ended surprise of biotechnology is being coordinated, concerted, and enforced. In Chapter Two, "The Eatymology of Biotechnology: Biopower, Standing Reserves, and the Fiery Ethnography of the West," I describe the first use of the word "biotechnology" (1917) in a detailed text describing the operation of a massive pig farm in Hungary to be run by the state. The farm was a key component of a larger program aiming to both better feed soldiers and to bring Hungarian peasants into the flow of the industrialization of the West by means of stable food supplies. My discussion proposes that biotechnology is related to the efforts by European nations to better control the metabolic burning of calories within a nationally defined space. Hungary's project can be understood through Michel Foucault's notion of biopower, whereby the state comes to control and regulate the biological life forces of the population. Key to this project was the introduction of food crops and cooking techniques through colonization. Since Foucault's theory of "biopower" is articulated within a history of sexuality, he focuses on how things come to life and the regulation by the state of libidinal drives. Attending to the fact that the history of sexuality is underwritten by a history of colonialist eating allows me to articulate how biopower also operates as a sacrificial structure and as a system of violence and death. Others died, or their cultures were marked for

death, as part of a colonial structure that produced the well-fed European. Therefore, the first mode of biotechnology that I will discuss is the furnace of eating—the stomach—or what has been described as the fiery vanishing point at the centre of modern Man.

In Chapter Three, "Fiery Clusters: The Hot Boxes of Biotechnology," I recall the second time "biotechnology" was used in an English text. It was in 1947 and "biotechnology" was used to describe a new engineering program at UCLA. This program grew out of wartime "hot box" experiments that would test the heat tolerance of pilots in a loosely simulated cockpit. These experiments on how high pilots could fly and still function were related to others carried out by the USAF at Dugway testing grounds, in which life-sized "maquettes" of cities were fire-bombed in order to measure their efficiency through the study of incineration patterns. This systematizing of man and machine and the thought of efficient cities on fire was extended to civilians in the post-war period. A central component of the program in biotechnology, for example, became the development of heating, ventilation and air conditioning systems—the HVAC systems that help regulate the body in many architectural structures. The history of this program and the pivotal role of the Air Force in the development of the U.S. military industrial complex is a central historical narrative that describes the second key mode of biotechnology: architectural incineration. The trajectory of my argument reveals the first steps of an "Americanization" of European humanism.

In Chapter Four, "The Disappearing Body Politic: The Sublime Archives of Biotechnology," I draw attention to the final mode of biotechnology: the feverish archive. Given that the contemporary meanings of "biotechnology" are

premised on genomics, which are in turn premised on vast bioinformatics archival networks, the discourse of biotechnology is *basically* archival. After mapping the global extent of these archives, I turn to the historic and ontological intersections between the collecting of "life itself" and architectures of fire, including UCLA's "hot box" experiments and wartime incendiary testing grounds. It is through the feverish archival drive of genomics that we witness new formations of kinship being instituted. Drawing from theories of the sublime, Richard Doyle (1997) has argued that these archives have as their effect a "post-vital" body, a kind of cryogenic figure set on the icy abyss of its future formation. Through a discussion of the Human Genome Project and its origins in the dropping of atomic bombs on Hiroshima and Nagasaki, I demonstrate the limits of Doyle's argument. After turning the cities into architectures of fire, the U.S. Department of Energy sent in geneticists to study the effects of radiation on the body of survivors whose future death was nonetheless anticipated. Similar biotechnological projects involved indigenous peoples. I argue that the sublime object of biotechnology, like the sublime of the atomic bomb, is haunted by the shadows of those it anticipates will die. Crucially, I suggest that instead of sites of instantiation the feverish archiving that underwrites biotechnology, in effect, stages specific dramaturgies of ghosts. A responsible politics of biotechnology must learn how to speak with these ghosts.

In Chapter Five, "The Marks of a Proper Intellect: Intellectual Property Rights and the Staging of *Diamond v. Chakrabarty*," I ask, by what right do these three modes of biotechnology takes place? To answer this question, I argue that the right that underwrites the violence of biotechnology is sheltered by the law in the form of Intellectual Property Rights. To make my point, I examine the

granting of the first patent on a "living" thing—in quotes because its ontological status was in question. I argue that the U.S. Supreme Court, in granting a split decision, staged a dramaturgy of ghosts to solicit the opinions of the Founding Fathers. It is this staging that has solidified the Americanization of European humanism and underwritten its right of manifest destiny. After showing the contours of this ethnographic incorporation that takes the form of the law, I ask whether the science of biotechnology can really depend on the U.S. to manage the flows of global metabolism. Drawing from the work of Judith Butler, I conclude by offering instead an ethic of corporeal vulnerability as the basis for a more responsible politics of unthinkable biotechnology.

Chapter Two

The Eatymology of Biotechnology:

Biopower, Standing-Reserves, and the Fiery Ethnography of the West

Dear D—,

I have not left my apartment for what seems like a week. Across the street, parked cars disappear under mounds of snow. At first you could still see their basic forms, but they have since been buried by snow falling from the sky and snow ploughed off the street. Perhaps some of the cars left the scene while I was sleeping. It is impossible for me to tell. At times the light is so grey my eyes are unable to settle on a focal point. Confronted by this massing phenomena, thought becomes unthinkable.

This morning, however, I began once again to think of you, and especially the long pauses of our slow, discontinuous conversations. I sometimes hear your breathing or the movement of your lips as you whisper to yourself—or to some imagined audience. I can never make out the words. These pauses defy cultural expectations—or at least mine. Do you feel as anxious? These pauses—I'm reminded of Avital Ronell's description of her friendship with Kathy Acker and their absolute difference of opinion regarding Heidegger:

> It was our *differend*, if I may cite Lyotard's important term, which means a dispute or difference that cannot be resolved by the cognitive or linguistic resources we have at hand. One is simply stranded at a site that offers no legal recourse, knows no appeal, and can't be housed by the rules governing juridical syntax. (In court, it is a matter of what gets through, what's ruled out, such as the suppression of somatic testimony: the blushing, nervous foot shaking, stuttering, tics and "rhetoritics" that make up a legally unassimilable idiom). (2006: 17)

Juridically "un-housed," or uncanny. Not recognized as a subject of law. It makes me feel vulnerable, exposed.

I feel this vulnerability most over the telephone. The experience of the pauses get amplified by your lack of proximity and raise the possibility of your absence altogether. I often call out your name and ask if you are there. It is as if when I call you I end up trying to bring you back—to recall you. I conjure you sitting by the phone and staring at the books or dimmed computer in the small open study off the hallway between the bedrooms and bathroom. Or leaning on the counter in the kitchen. Or perhaps the phone was passed to you, sitting in the living room. In your absence you are impossible to locate with any authority. Often it is so confusing I want to dismissively hang up, but it is at these moments I feel the weight of your stare, your haunting return, or perhaps more accurately your growing authority in the call. The confusing pauses of the crackling line challenge me forth, and raise the spectre of another cultural *logic* altogether. Over the years I have become more familiar with the non-rhythm of our communication. They still disturb me but they have, like a habit, become something I can put on. I can wear "our" (the word trembles) communicative tears. But anthropology, medicine, biotechnology, family planning...read these

tears into your body. I cannot tell you how angry and scared this makes me. Furious. Your status as a subject before the law is precarious and historically been negated. The future promises of biotechnology promise the same. Outside the law, your vulnerability is corporeal. You are left open to violence without recourse.

You are not alone, however, in being open to corporeal violence without recourse. I was thinking of this as night and day came and went across the wall of my snowbound apartment. I have a watch, but my life has become regulated by intervals of writing and meals. In the pitch of last night I saw my reflection in the window eating cereal! Perhaps the sun was rising where you are? Living in different time zones, you and I have always been most immediately connected by food and eating, as opposed to a shared temporality. I almost always ask what you ate for dinner. At any rate, I must get out of this crypt—not least because my once well-stocked kitchen is now almost bare. I must venture out and follow the stumbling footprints to the grocer. Even during storms such as this, the parading silhouettes of hats, coats and boots have trudged a well-worn path in order to eat. You know, the fueling of civic bodies is the basis of modern kinship—and this has everything to do with the very thought and discourse of biotechnology. More than the ideologically powerful ruse of bloodlines, biotechnological relations are established through the mode of eating, that is, the burning of calories, and hierarchies of corporeal vulnerability.

Does it seem strange to suggest that I would not know, or even recognize you in the ways that I do, if it were not for a phenomenal history of eating that has shaped our lives? So much of the way we speak or think about the subject of biotechnology is organized in relation to the discourse of reproduction in ways

that exclude the discourse of eating—as if it were not necessary to eat well for reproduction to take place. And yet eating well has to do with our very constitution.

Jack Kloppenburg Jr. (1998) has, for example, briefly described the colonization of the Americas and the constitution of the United States in relation to the global movement of germplasm. He begins by pointing out that the only crops of economic importance to have originated in North America are the sunflower, blueberry, cranberry, and Jerusalem artichoke. Crops thought to originate in Mesoamerica, such as maize, beans, and squash, were adapted by Native Americans to the environs of what Europeans would tellingly refer to as "Virginia." Kloppenburg Jr. goes on to recite the familiar history of how the crops sown with seed brought from England by Jamestown colonists failed in 1609, resulting in two-thirds of the colony starving to death that winter. "Of necessity," Kloppenburg Jr. recounts, "the settlers [sic] turned to the Indian [sic] crops, which were not necessarily to their taste but which meant life" (50-51).

Kloppenburg Jr. then begins to track the phenomenal movement of germplasm from around the world into Europe's North American colonies:

> Each wave of new settlers brought with it a new set of crops and cultivars. The 1628 Endicott expedition to Massachúsetts Bay colony, for example, brought with it seeds of wheat, rye, barley, oats, beans, peas, peaches, plums, cherries, filberts, pears, apples, quince, pomegranate, woad, saffron, licorice, madder, potatoes, hops, hemp, flax, currants, cabbage, turnips, lettuce, spinach, radishes, onions, and peas. The complement of introduced species grew rapidly and with extraordinary variety. The English brought cowpeas, the French what is now known as Kentucky bluegrass,

> the Dutch clover, and the black slaves who worked the tobacco fields millet and sorghum. (51)

George Washington imported all sorts of seeds from Europe, "including the breadfruit tree then popular in the West Indies as a food for slaves" (52). Jefferson imported seeds directly from the superintendent of Les Jardins des Plantes, and was "particularly interested in rice and obtained varieties from China, Italy, Egypt, Palestine, and equatorial Africa" (52).

Seeds also arrived from American consuls and naval officers all over the world:

> By 1848, ships of the East India Squadron were regularly collecting plants. The Perry naval expedition of 1853 is best known for forcing open the harbors of Japan to American commerce. Perry's gunboats also brought home a tremendous variety of seeds and plant materials obtained from Japan, China, Java, Mauritius, and South Africa. (55)

The global collection and distribution of plant germplasm and agricultural statistics was initiated by the U.S. Patent Office and began receiving congressional funding in 1939. The Department of Agriculture and agriculturally oriented "land-grant universities" were founded in 1862. The Hatch Act of 1887 provided centralization and stable funding for the growing number of state agricultural experimental stations (12).

Throughout Kloppenburg Jr.'s narrative we are convincingly told that "Without a substantial infusion of exotic germplasm and its adaptation to American conditions, European colonization could not be sustained" (50). As well, "An adequate food supply was the material prerequisite for the establishment of a permanent European presence in the new land of America"

(51). Finally, he points out that colonizers bred crops by means of "simple mass selection," in other words, by accumulating standing-reserves of global proportion for future experimentation (52). Such a project, however, was also one of genocide and assimilation that took place on every continent.

One of the goals of my research is to show more clearly how this history and others relate to the discourse of biotechnology. I'm convinced now that before all else biotechnology takes place through the mode of eating whose fiery stomach demands the sacrifice of some for the constitution of others. I believe that articulating this genealogy of biotechnological eating will help you and me to communicate better—finally. I hope to mark a crease in the palm of biotechnological thought for the valuing of different ways of life—including our own, my more-than-a-brother. A different discourse for letters, such as the one I am sending to you now.

I hope you receive this and are well. I'm off to get some food. I'm thinking of some grilled samma with grated daikon and lemon, alongside a bowl of rice and gailan with oyster sauce. I think I hear you smacking your lips!

With affection,
Your hungry brother

***

The Eatymology of Biotechnology

Robert Bud, in *The Uses of Life: A History of Biotechnology* (1993), argues that the meaning of "biotechnology" is remarkably uncertain. He suggests that this uncertainty is related, in part, to its original use as an umbrella term for a widely diverse set of practices. Bud traces the origins of biotechnology to Europe, beginning in the eighteenth century, with the development of zymotechnology, the application of fermentation techniques for commercial ends. Zymotechnology was extremely important in the brewing industry, but also in the burgeoning chemical industry and related dye and tanning industries. By the mid-nineteenth century zymotechnology came to umbrella both the German Enlightenment's development of organic chemistry and "the rather younger upstarts of various biological disciplines—microbiology, bacteriology, mycology, and botany" (15).

The needs of the brewing industry whose production in Germany was the same in value as that of the steel industry, even at the end of the nineteenth century (17), linked the study of microbiology with that of botany, biology and agriculture. Eventually, American John Ewald Siebel's *Zymotechnic Magazine* would list the following topics in its subheadings:

> Valuation of Milk, Half Measures, Extracting Glycerine from Fatty Substances, Grease-proof paper, Preparing food for animals; Soap; Apparatus for Distilling Oil; Tanning with Sulphoeleic acid; Manufacturing Glue; To Preserve Eggs; A Cotton Seed Oil Scheme; Milk Analysis. (Cited in Bud 24; see also Thackray 7)

Bud argues that the word "biotechnology" began to be used to describe a more haphazard array of practices, while zymotechnology became more narrowly associated with the brewing industry.

Hungarian agricultural engineer, Karl Ereky is credited with coining the term *"Biotechnologie"* in 1917. From 1917-1919, Ereky published three volumes dedicated to the modernization of Hungary by means of the industrialization of agriculture. The last of these works was titled *Biotechnology of Meat, Fat and Milk Production in Large-scale Agricultural Industry* (cited in Bud 32-33).

One of Ereky's goals was to avoid wartime food shortages, which had crippled Hungarian soldiers and civilians alike. The word *"biotechnologie"* was thus first used for a project aiming to counter corporeal vulnerability for the sake of the nation. What held the Hungarian nation together, it is implied, was a kinship in hunger. In fact, recognizing this fact was, for Ereky, the first step required to achieve his major goal: the modernization of the Hungarian peasantry in order to transform Hungary into a specialized agricultural hub for the Austro-Hungarian empire by means of a scientific approach to intensive cattle and pig farming. Hungary, Ereky dreamed, would achieve a central role in the unfolding of European modernity by fueling its belly.

The scale of the farms planned by the fastidious Ereky was enormous. According to Bud,

> In 1914, Ereky persuaded two Hungarian banks to support an agricultural enterprise on an industrial scale. There would be a slaughterhouse for a thousand pigs a day and also a fattening farm with space for 50,000 pigs, turning over 100,000 pigs a year. The enterprise was enormous, becoming one of the largest and most profitable meat and fat operations in Europe after the war...The

> scale of Ereky's plans can be compared with the entire set of 22,000 German pig farms with an area greater than 100 acres, which together held only 880,000 pigs. Even today, the scale of Ereky's endeavour would count it among the very largest of pig operations. His factory-farm covered fifty hectares, somewhat more than a hundred acres. The pig houses, forty-five in number, were 100 metres long, and 36 metres wide. Through the estate ran an 18-kilometre-long narrow-gauge railway. The newly built mainline spur carried annually 5,000 wagon loads of pigs, 8,000 of fodder, and 7,000 of dung. (33-34)

Both the first and third of Ereky's volumes on biotechnology began by recalling how food shortages were a decisive problem for the central states during the war. After the war Ereky served as the Minister of Nutrition for the counterrevolutionary Horthy government, at which time the farm was designed as a model war machine to better feed the nation and prepare it for future battlefields. At the center of the war machine was the fiery stomach of a devouring pig. "To [Ereky]," says Bud, "the pig was a machine, converting carefully calculated amounts of input into meat output. Indeed, he described the pig as a '*Biotechnologische Arbeitsmaschine*'" (34). If soldiers were to sacrifice their lives in defence of the nation, civilians would play their role by sacrificing the lives of pigs to give their body parts to soldiers whose bodies needed to be replenished.

Thus the modernization of Hungary involved the biotechnological coordination of food with the nutritional and economic needs of the nation-state. Far from an umbrella term for a haphazard cluster of practices, Ereky's sense of biotechnology concentrated and mobilized the phenomena of living-in-general to be available as a food supply for the sake of the army's pure survival in a future

state of war. Between wars the modern subject of Hungary was to become part of the factory-farm's biotechnological cluster: at once visible and invisible, a civilian or soldier at once served by and fully integrated into the standing reserve.

But what does it mean to have the sacrificing of pigs at the centre of Hungary's post-World War One efforts to become a hub of Europe? I am not here making a plea for vegetarianism. Nor am I suggesting that pigs have a consciousness and subjectivity that is for Man unthinkable but should nonetheless be granted—though the historic and increasingly close relationship between Man and pigs, including their biomedical integration through transgenics, organ transplants, and insulin production, should at least keep us open to this possibility (see Niemann et al 2005). I am suggesting that what is unthinkable to Ereky's staging of the factory-farm is that pigs are not pure animals, nor pure machines. They are domesticated, and originally in Asia, with important archaeological findings in Turkey and China (Mathias 2007; Luikart et al 2001). In this way they are culturally produced and arrive in Hungry through a complex topography of cultural and bodily relations. There are so many other lives and other ways of life being purged through the drama staged by Ereky, when he imagines the furnace burning in the well-fed body of the modern Hungarian. I mean, what sort of fantasy imagines the reduction of pigs to pure flesh in a biotechnological slaughter of a thousand a day? Burning between World Wars, is this not an unthinkable holocaust required to produce a Europe constituted by those who eat pig?

Biopower

The critical need to articulate a theory of biotechnology in relation to its devouring genealogy becomes even more apparent through a consideration of Michel Foucault's notion of biopower. The influence of Foucault, and especially his discussion of biopower, on cultural theories of biotechnology cannot be overstated. Foucault's theory, however, has serious limitations. To begin a discussion of these limitations, I want here to again make the point stated in the previous chapter: the notion of biopower is articulated within a history of sexuality. The trajectory of this history is a mapping of how the modern state constitutes itself in relation to the regulation of a population's biological life. For Foucault, biopower is associated primarily with libidinal drives and their restraint. Libidinal and related to the bringing forth of life, biopower is articulated through a history of forceful manifestation. And yet, it is argued that modern biopower emerges from the older regimes premised on the governance of the body and death. If, however, the state of life rises from the government of death, then biopower's emergence is marked by the passing of that form of governance and thus is marked by an originary violence and death—*within* the exercise of biopower. Foucault's history of sexuality is always soliciting death, which is to say his history incorporates death—and then forgets it. It is as if the state of life incorporates and then represses a culture of death. These are, I will argue, grave limits to a cultural theory of biotechnology.

In the first volume of *The History of Sexuality* (1978) Foucault proposes that, beginning in the sixteenth century, a transformation occurred in Europe's socio-political organization that was, by the end of the eighteenth century, decisive. This decisive moment was initiated by the production of relatively

stable surpluses of food for Europe resulting from advances in agricultural techniques. This rich and complex history of food and eating will shadow Foucault's *The History of Sexuality,* and it is never grappled with in the same manner and with the same attention paid to questions of sexuality and reproduction—though it is the declared premise of his argument. It is as if the histories of entry into the European diet of foodstuffs from elsewhere are funneled into the exclusive, interior fire of a calorie-burning, well-fed European subject and then disappear into a vanishing point. We are speaking here of the histories of what would become significant food crops, such as potato and corn, which arrived within histories of genocide and colonialism in the Americas. There is a need, therefore, to rethink Foucault's argument in order to read it against the grain.

According to *The History of Sexuality,* the initial period of nutritional surplus in Europe during the eighteenth century accounted for the formation of a constellation of techniques concerned, not with fending off death, but with the production and regulation of "life." Foucault includes as examples "the emergence of demographics, the evaluation of the relationship between resources and inhabitants, the constructing of tables analyzing wealth and its circulation" (140). Through these techniques, an increasingly well-fed European population "put life and its mechanisms into the field of power/knowledge":

> This was nothing less than the entry of life into history, that is, the entry of phenomena peculiar to the life of the human species into the order of knowledge and power, into the sphere of political techniques. (141)

Life, the interior vanishing point of a living being, becomes a point of study that is distinct from the being itself. In short, life gains a life of its own.

As life begins to circulate in and between living beings, it creates a nexus for the operations of "biopower"—or forces invested in its regulated reproduction. Critically, life is not, properly speaking, an object for the executions of biopower. What is primary is not a specific man's life, or a representation of life in men's minds—but instead the regulation of a more fiery "sexuality." The discourse of sexuality is, argues Foucault, *the* regulatory regime of a political technology of life; it is *the* defining character of modern socio-political regimes; and it is *the* response to the historical appearance on the scene of a well-fueled European.

Once the European body politic was well-fed, there was a shift in the way sex circulated from what Foucault names the "*ars sexualis*" to the "*scientia sexualis*." Previously, sex existed primarily as an anatomical attribute, an activity and a set of practices that humans performed. By the end of the eighteenth century sex was transformed into an identity category that unified one's biology and anatomy. Within the purview of the *scientia sexualis* sexual activities became schematized and correlated with theories of psychic development. Sex became associated with not only bio-anatomical traits and sexual activities, but also with a psychic truth related to an individual's or community's essential identity that needed to be interpreted, normalized and regulated. As sex became subject to an array of emergent modern sciences organized around deciphering the essence of one's sex, the discourse of sexuality came to be that which defines us, that which speaks the truth of our identity, and that background which makes both psychoanalysis and demographics intelligible.

According to Foucault, biopower "is not individualizing, but, if you like, massifying" (2003: 243). It constitutes "the masses" and thereby, its own need to respond. In turn, demographics emerges as a response to the question, or problem, of the (growing) population, and the masses and population come to be conceptualized as

> a new body, a multiple body, a body with so many heads that, while they might not be infinite in number, cannot necessarily be counted. Biopolitics deals with the population...as a political problem...that is at once scientific and political, as a biological problem and as power's problem. (1978: 245)

Eugene Thacker's assessment of the massifying calculus of biopolitics is pertinent here. Recounting Foucault's discussions of the state's calculation of "birth and death rates, disease control and patient monitoring in hospitals, as well as more contemporary examples of consumer data, individual identification forms, health insurance, health data related to sexuality and psychology, and institutional surveillance of subjects," Thacker suggests that the emergence of biopower's operation on the masses marks the emergence of modern bioinformatics: "The methodology of biopolitics is therefore informatics, but a use of informatics in a way that reconfigures biology as an information resource. In biopolitics, the body is a database, and informatics is the search engine" (23, 25).

Foucault's argument that the decline of famines and epidemics allowed power to be reconfigured in relation to the life of the masses leads him to the provocative, sweeping suggestion that the French Revolution and the birth of modern democracy were symptoms of an emergent biopower that ultimately constituted the body:

> Western man was gradually learning what it meant to be a living species in a living world, to have a body, conditions of existence, probabilities of life, an individual and collective welfare, forces that could be modified, and a space for which they could be distributed in an optimal manner. For the first time in history, no doubt, biological existence was reflected in political existence. Power would no longer be dealing simply with legal subjects over whom the ultimate dominion was death, but with living beings, and the mastery it would be able to exercise over them would have to be applied at the level of life itself. (1978: 141-142)

Foucault proposes that the spirit of the West that expresses itself through constitutional democracy as one of freedom and liberty is underwritten by a biopower that converts the population into a libidinal, bioinformatic mass in need of regulation and normalization.

Why is it, though, that Foucault insists that this history of sexuality is an ethnography of Western man, when he declares at the onset that is itself underwritten by a history of eating that clearly exceeds the history and borders of the West? Why is the history of eating brought forth and then excluded from the origins of the history of sexuality? Is it not the case that such a familiar, eurocentric account of population growth represses the violent colonial history and horrifying European adventure that greatly improved the availability of calories to Europeans through the acquisition of food, germplasm (plants, seeds) and both cooking and agricultural techniques? *The History of Sexuality* is premised on, and cannot be separate from, a deadly history of colonialism and global food distribution. Marked by a history of eating that it incorporates and then represses, the genesis of the discourse of sexuality should be understood as

managing at once life *and* death, including the spectres of genocide, as well as the violent reterritorialization of the globe's microbes, plants and animals.

Death and the history of eating are incorporated within the structuring logic of the discourse of sexuality in ways that perpetuate the ethnography of the West and the anthropology of Man—both of which, ironically, Foucault sought to dismantle. Foucault's perpetuation of these can be traced to the mechanics by which he argued that things were *brought forth* by what he referred to throughout his corpus as "technologies of knowledge." Foucault's sense of technology as that which brings forth is derived from Heidegger, and his examination of how life appears in history is limited by the German philosopher's forceful eurocentrism and focus on the relation between technology and the ends of Man. Examining these limits to Foucault's sense of "biopower" through a reading of Heidegger allows for not only a historical corrective, whereby the entrance of foods into Europe are tracked, but also the development of a theory of biotechnology as operating and enframed by means of a sacrificial structure. Within this sacrificial structure, non-European ecobiomes are constituted as a standing reserve that hails the masses of the "Old World" to incorporate and manifest its metabolic topographies as a New World.

Enframing the Standing Reserve and Staging "the West"

In his famous essay, "The Question Concerning Technology" (1977), Heidegger argues that technology is essentially a way of being responsible for bringing something into appearance, for "bringing-forth," or "revealing":

> The word stems from the Greek. *Technikon* means that which belongs to *techne*. We must observe two things with respect to the meaning of this word. One is that *techne* is the name not only for the activities and skills of the craftsman but also for the arts of the mind and the fine arts. *Techne* belongs to bringing-forth, to *poiesis;* it is something poetic. (318)

Early on Heidegger establishes a hierarchy between the two meanings. He argues that instrumental conceptions of technology, which see it as a means and a human activity, should be understood within broader considerations of how things are brought forth through *poiesis*, the effect of a thing's matter, its formal aspect, the way the matter and form come together to suggest a purpose, and the pondering of the mind that gives matter purposeful form in the first place. *Techne*, we are told, is distinguished from *physis*, the arising of something from out of itself, which is also *poiesis*. The example of *physis* offered by Heidegger is the blooming of a blossom. In contrast, *techne* is a bringing forth, "not in itself, but in another (*en alloi*), in the craftsman or artist"—the art of bringing forth out of concealment (317-319).

Heidegger then distinguishes modern technology from the bringing-forth of *poeisis*:

> The revealing that rules throughout modern technology has the character of a setting-upon, in the sense of a challenging-forth... What kind of unconcealment is it, then, that is peculiar to that which results from this setting-upon that challenges? Everywhere everything is ordered to stand by, to be immediately on hand, indeed to stand there just so that it may be on call for a further ordering. Whatever is ordered about in this way has its own standing. We call it the standing-reserve [*Bestand*]. The word expresses here something more, and something more essential,

> than mere "stock." The word "standing-reserve" assumes the rank of an inclusive rubric. It designates nothing less than the way in which everything presences that is wrought upon by the revealing that challenges. Whatever stands by in the sense of standing-reserve no longer stands over against us as object. (321-322)

While *poesis* gathers matter and concepts, towards the production of a particular end-product, modern technology holds things in abeyance. They are gathered as "standing-reserve"—a general phenomena—for future projects. Things within the standing-reserve do not have object status; the object status of the "standing-reserve" will be determined in the future. In its function, therefore, modern technology produces the possibility of its own future.

Heidegger's understanding of modern technology delineates the contours of a clearing, an opening or passage for thought—a way of thought. His aim is to open the thought of modern technology to a less instrumental and more poetic relation to things. The more general rupturing phenomena of the standing-reserve calls for a response, a poetic re-worlding of the world as opposed to an instrumental engagement with known objects. This opening of thought, however, is marked by a forceful closure as Heidegger insists that the rupture of thought belongs to Man especially, and thus he preserves the discourse of humanism by means of the challenge brought forth by its rupture. There is a long history of Western thought instituting itself through its own rupture, including the appropriation by European states of lands inhabited by peoples whose socio-political organization was not recognized by means of the doctrine of *terra nullius*.

How is it, then, that Heidegger advances the realm of Western thought even as he describes its repeated rupture? According to Heidegger, Man has a

special relation to the actual that is revealed as standing-reserve. As the living being capable of self-conscious thought, it is Man who is first challenged-forth by the standing-reserve that (supposedly) addresses itself to him. Even though this Man arises as a response to the generality of the standing-reserve, in that arising he is posited as arriving on the scene in advance. For Heidegger the term "enframing" [*Gestell*] encapsulates "the gathering together which belongs to that setting upon which challenges man and puts him in position to reveal the actual, in the mode of ordering, as standing-reserve" (329)—and it is this enframing that is the essence of modern technology.

Enframing gathers Man by bringing him into question. Paradoxically, Man can respond to the call of the standing-reserve by establishing an instrumental relation to the world, but he is also in danger of becoming an automaton of his own creation, wired into a circuit whose fixation on instrumentality blocks him from the other possibility that being addressed by standing-reserve grants: that in being challenged-forth to order the world, Man is granted an experience of its *poesis* that ruptures his relation to the mysterious unfolding of the earth (see 331-337).

The way that enframing works, says Heidegger, is *absolutely* strange—because Man experiences the cryptic experience of enframing as the experience of death. Heidegger builds his argument in relation to the etymology of *Gestell:*

> According to ordinary usage, the word *Gestell* [frame] means some kind of apparatus, e.g., a bookrack. *Gestell* is also the name for a skeleton. And the employment of the word *Gestell* [enframing] that is now required of us seems equally eerie, not to speak of the arbitrariness with which words of a mature language are so misused. Can anything be more strange? Surely not. (325)

To use the figures within the etymology of *Gestell,* when Man approaches a bookshelf—that which enframes books, knowledge, language, property rights, and so forth, as standing-reserve—that standing-reserve challenges forth Man to order its generality. But the experience of that generality is the unthinkable experience of death. There is no proper language for it because generality is that which is defined as negated by, or on the outer edge of language and order—in the same way a bookshelf is on the outer edge of its contents. Thus the bookshelf is the skeletal frame of a standing-reserve of books that hails Man on his way to language.

Nothing could be more strange because the standing-reserve estranges Man from the thought of himself. The call of the standing-reserve is not born of human activity and it goes on in the radical absence of a human addressee. But the radical absence of a human addressee is unthinkable. Since it can only be experienced as the rupture of thinking, Man experiences the rupture as the experience of death, or the possibility of death. (The death of thinking is not the same as the thought of death. It is the experience of an absolute clearing of the subject.)

As a continuous granting of bringing-forth that goes on regardless of the presence or absence of Man, Heidegger argues that enframing *endures.* He takes pains to distinguish what he means by enduring from the sense of permanence. The essence of modern technology endures because its ongoing ruptures the necessity of the presence of Man. Far from a sense of permanence, Man experiences the challenging-forth of enframing as the rupture in presence, his "death" or the possibility of his "death" that is inscribed within the ongoing of the world.

Returning to the etymology of *Gestell*, the experience of enframing is the *stellar* destiny of Man. Man dies and will die repeatedly. The death of Man is inscribed in the enduring, other-worldly (unthinkable) stellar constellations of the heavens, the configurations of which metaphysics only dreams. Instead of offering a system of metaphysics, Heidegger insists on the enduring rupture in presence suggested by the skeletal meaning of enframing. Critically, enframing is Man's essential relation to modern technology. The standing-reserve enframes modern Man as a spectral figure. Emerging from rupture, he is on the way to being a subject. By being challenged forth Man arises as the question concerning technology.

Several points need to be made here. First, Heidegger articulates Man's relation to the standing-reserve as one of responsibility. Will Man respond to the challenging forth of the standing-reserve instrumentally, and lose himself within the cogs of his own creation; or will Man respond to the poetics of the worlding of the world in order to fulfill his destiny as a thinker and to construct a more philosophical culture? Second, the standing-reserve is incorporated within this movement of Man between the experience or possibility of death and an anticipation of coming to language and an enriched life. This incorporation takes the form of a generality. In other words, the standing-reserve is cleared of culture and becomes a *terra nullius*. Third, as a *terra nullius* it stands outside the law. Man's response to the challenging forth of the standing-reserve—including the violence that de-cultures the *terra nullius*—is therefore non-criminal. Instead, it is his responsibility and destiny. If, therefore, we are to engage with the discourse of biotechnology as that which brings forth from metabolic standing reserves, then we will be engaging with the discourse of responsibility in relation to grave

violence and death that would seem to be protracted outside the law and through a process of disidentification—a kind of alienated experience of the enduring violence for which Man is responsible.

But is the question of technology necessarily addressed to Man? Why does Heidegger restrict the question concerning technology that marks a fundamental rupture to the labyrinth of Man's ears? For Heidegger the question concerning technology is addressed to Man, because he alone is capable of *techne* and poetic thought. I am not suggesting that both the challenging-forth and call of responsibility are experienced equally by "bacteria," "mice," and "men," or that all three have a consciousness and thus experience *poesis* in a similar fashion. Rather, my argument is that in the call of responsibility originating from the *poesis* of the world, something always remains that cannot be appropriated by the logic of the other-Man, even if it is raised as a question. Rupture insists on this. As Derrida suggests,

> Something of this call of the other must remain nonreappropriable, nonsubjectivable, and in a certain way nonidentifiable, a sheer supposition, so as to remain *other*, a *singular* call to response or to responsibility. This is why the determination of the singular "Who?"—or at least its determination as subject—still remains problematic. And it *should* remain so. This obligation to protect the other's otherness is not merely a theoretical imperative. (1991: 110-111)

Heidegger slips around the challenge of absolute rupture by positing Man in advance. As Man is challenged forth by generality and the experience of death, there is no premise for the belief that what is challenged forth will be Man. When Heidegger argues that only Man is capable of thinking, and thus the call of the

standing reserve is to him alone, he is making a biological argument concerning the species. Ultimately, Heidegger's question concerning technology is fundamentally a question concerning *biotechnology*. The biology and skeleton of Man is what enframes the text.

Heidegger's question concerning biotechnology is narrated through a European ethnography. He does not, for example, engage with the possibility that other cultures have other ways of thinking about thinking and being. These are reduced to the generality of the standing-reserve. This ethnographic reduction allows Heidegger to make the doubly inflected argument that it is Man that comes before the standing-reserve. But if Man comes before the standing-reserve through the experience of death, then the only way we can think of Man is as a spectral anteriority—a staged ghostly figure whose life is posited as having already passed. Think of the bony bookshelves of Heidegger's dramaturgy. The thought of the haunted staging of Man—as opposed to his destiny—opens the ethico-political dimension of privileging Man as that which is challenged forth by the standing-reserve. It is the ontologically dense living-in-general that, in being identified as a metabolic generality, is put to death so that Man can proceed on his way to language.

The reductive structuring logic of the other-Man is inherited by Foucault through his Heideggerian sense of how technologies of knowledge *bring forth* discursive facts. Foucault is aware of this, because he is interested in articulating the force of the reduction. For example, in *The History of Sexuality*, he relays how modern politics are fundamentally normative and regulatory in that they are premised on the discourse of sexuality, which brings forth and regulates life. Thus when Foucault suggests that the regulation of life is the spirit of

constitutional democracy and the Rights of Man, he is suggesting that the anthropological production of Man and the ethnography of the West are implicated in these regulatory regimes. If Heidegger wishes to bring forth the poetics of the world from the rivet of instrumental thought, Foucault wishes to trace the possibility of an *ars sexualis*, a sexuality and way of life that escapes the regulatory regimes installed by the technologies of knowledge in the service of Western Man.

I am not convinced, however, that it is possible to write a history of sexuality that escapes regulation. How could sex be brought forth and recognized in an unregulated manner? When Foucault describes that which challenges forth the technologies of knowledge regulating sex, he uses terms such as "forces," "energies," and "activities":

> This is the background that enables us to understand the importance assumed by sex as a political issue. It was at the pivot of the two axes along which developed the entire political technology of life. On the one hand it was tied to the disciplines of the body [e.g. the psychoanalysis of pleasure]: the harnessing, intensification, and distribution of *forces*, the adjustment and economy of *energies*. On the other hand, it was applied to the regulation of populations, through all the far-reaching effects of its *activity*. (1978: 145; my italics)

While Foucault describes the regulation of sex, *The History of Sexuality* is written from a position that sympathises with a period before sex became cut off from the free expression of its forces, energies and activities. In fact, the text aims for their liberation.

How is it, then, that sex circulated before the solidification of regulatory regimes in the eighteenth century? From where did sex emerge to be

reconstituted by these regulatory regimes? Foucault is awkwardly silent on the subject. He makes two arguments. On the one hand, he argues that the state previously directed its energies towards the fending off of death, especially from famine and plagues, through the governance of the body. At this time, we are told, the interiority of "life" was yet to be born. So there was the body, and bodily sex—as if there was no distinction between them. If "sex" was separated from the body, then the history of sexuality would have already begun. In this scenario, we would have to imagine that, as the number of bodies and the duration of their lives increased, the regimes intent on managing them constituted sex almost mystically. First, there were these bodies and then sex emerged, cleaving itself from the body to circulate within the interiority of the masses. In this case we would have to ask what Foucault's motivations were in mystifying the pre-colonial body, as if sex and body were one before the large-scale traffic of peoples around the world?

On the other hand, Foucault vaguely associates them with the marginalised *ars sexualis*, whose practices he associates with classical "China, Japan, India, Rome, the Arabo-Moslem societies" (57). This argument seems to longingly oppose the "ancient Orient" and the modern West. But this argument suggests that the split from the *ars sexualis* occurred with, or before, the founding of the West, when East and West, body and sex, were still one. Biopower, or what I have been calling bio*techne*, would thereby be essential to the entire history of the Western subject, and the repeated acts by which it constitutes itself. If this were the case, would the eighteenth century still be the decisive moment for the emergence of biopower? Foucault cannot clarify whether the emergence of biopower takes places subsequent to the unity of an original presence. He

thereby risks containing, naturalizing, and normalizing the whole problematic of the discourse of sexuality within structures fundamental to Western metaphysics. There seems to be, at some time and some place, a body united with its sex, upon which biopower gradually begins to act.

Again, here are the oppositions structuring the birth of biopower: ancient East and modern West; the body on its way to death and the economy of "the fact of sex"; energetics and regulation. It is as if these oppositions are symmetrical, as opposed to relational. This symmetry, however, is hard to maintain from the vantage point of the culture of the West that not only distinguishes itself from (its fantasies of) a static, ancient East, but also incorporates that difference into the production of its own identity, which is at the same time Western and Orientalist. In a way the general structure of Foucault's history parallels the work of the regulatory regimes whose operation he wishes to expose. The ancient East, the body on its way to death, the field of energetics and for that matter, reproduction, all become "massified"—their specific histories generalized within the history of Western (is there any other?) modernity. *The History of Sexuality* therefore does not offer a history *per se*, but rather partially describes and fully enacts a structure of thought by which a general ethnography of the West is *staged*.

Eating: The Fiery Furnace of the West

In *The History of Sexuality* Foucault also assumes that a liberated sexuality has a meaning; that some forces, energies and activities are decidedly sexual and others are not. But are not many forces, energies and activities related to the

intellectual life and reproduction of peoples also brought forth by eating—especially those metabolic forces, energies and activities that increase the size of the population, and which Foucault locates in the emergence of biopower? The Eurocentric gloss of the history of eating that initiates *The History of Sexuality* is striking in this regard, and all the more so in that Foucault's work feeds off a previous text that describes the emergence of life from a burning hunger.

In *The Order of Things* (1966, 1970) Foucault argues that the functionalist zoology of the French naturalist, Georges Cuvier (1769-1832), provides the decisive epistemological framework for the bringing forth of life. Previously, the classificatory schemas and taxonomies of the Classical period organized and named beings: "the continuity of representation (signs and characters) and the continuity of beings (the extreme proximity of structures) were thus correlative" (272). The classification of plants into tables is the paradigmatic example. In contrast, Cuvier's focus on the function of organs brings forth the maintenance of life as an object of study. Life is made manifest in beings, but it is an invisible interiority that also exists separate from that being, as something that must be held on to and maintained. In this way, even though the differences between living beings proliferate,

> deeper down they fade, merge, and mingle, as they approach the great, mysterious, invisible focal unity...It is this transition from the taxonomic to the synthetic notion of life which is indicated, in the chronology of ideas and sciences, by the recrudescence, in the early nineteenth century, of vitalist themes. From the archaeological point of view, what is being established at this particular moment is the conditions of possibility of a *biology*. (269; italics in original)

Vitalist themes, Foucault argues, were easier to display with animals than with plants. Thus animals, and Man in particular, became the focus of biology, displacing the plants and tables of natural history (266).

Foucault uses the example of *eating*—and not sexuality—to explain the distinction between being and life and to suggest the mode of life as articulated by Cuvier:

> If the Ruminants are distinct from the Rodents, and if the distinction rests upon a whole system of massive differences that there can be no question of attenuating, it is because they possess different kinds of dentition, different digestive systems, differently formed extremities and nails; it is because they cannot capture the same kinds of food, or deal with it in the same way; it is because they do not have to digest the same forms of nourishment. The living being must therefore no longer be understood merely as a certain combination of particles bearing definite characters; it provides the outline of an organic structure, which maintains uninterrupted relations with exterior elements that it utilizes (by breathing and eating) in order to maintain or develop its own structure. Around the living being...there is effected "a continual circulation from the outside to the inside, and from the inside to the outside, constantly maintained and yet fixed within certain limits. *Thus, living bodies should be considered as kinds of furnaces into which dead substances are successively introduced in order to be combined together in various way.*" (273-274; my italics)

The energies of other lives are put to death and recombined by the body in the fiery expression of its own life. Living being cannot reside on a taxonomic table; it burns calories of the dead, instant by instant, and is in a constant struggle with death:

> For eighteenth-century thought, chronological sequences are merely a property and a more or less blurred expression of the order of beings; from the nineteenth century, they express, in a more or less direct fashion, and even in their interruptions, the profoundly historical mode of being of things and men. (276)

Life is brought forth, instant by instant, instantiated by living beings whose furious fire of the dead constitutes history.

As mentioned earlier, in *The History of Sexuality*, Foucault describes "the entry of life into history" as "the entry of phenomena peculiar to the life of *the human species* into the order of knowledge and power, into the sphere of political techniques" (141; my italics). In *The Order of Things* the entry of life into history is described as the entry of the phenomena of living-in-general into a sacrificial relation that puts things to death by eating them to fuel life. When Foucault invokes and then excludes the history of eating in *The History of Sexuality*, he is excluding, or what amounts to forgetting, the sacrificial structure required to fuel the consciousness of life that gives Man his modern identity.

A reconsideration of the history of sexuality in relation to the history of eating makes the sacrificial structure by which life is brought forth more evident. To begin, if *The History of Sexuality* is interested in liberating forces, energies and activities that bring forth life, then a reconsideration of the discourse of eating again raises questions related to the geographic and ethnological limits of Foucault's text, questions that allow us to see in more detail the contours of its periodization, or what I have been calling the staging of the West.

Foucault situates the progressive congealing of the discourse of sexuality during the colonial period, a time in which both sex and eating were being coordinated through the establishment of biopharmacopoeias of microbes, fungi,

plants, animals and people. From the beginnings of the Atlantic expansion of Europe, adventurers, natural historians, merchants, missionaries, and imperialists brought back precious metals, spices and luxury goods from the New World, but they also brought back plants and seeds (and animals) that increased the calorie intake and number of food sources for European workers. Wheat and other cereals began to be grown in Europe's northern forests and along the Mediterranean plains. Later, the Atlantic Islands (such as the Canary Islands, Bahamas, Bermuda, Azores, and Cape Verde Islands) were used as colonial sites for the commercial planting of cereals, sugar, dyes, and wine. Monocultural production was facilitated by both the development of the plantation and the use of slavery. Beginning in the twelfth century Muslim and other slaves were used to grow sugar in Syria, Cyprus and other Levantine colonies. This was followed by the use of African slaves throughout the Atlantic Islands (Wallerstein, 43-44).

In what Alfred W. Crosby has called "the Columbian Exchange," new food staples, the most significant of which was corn, were brought to Europe from the New World. Another significant crop, the Andean, or white, potato, was brought to Europe by the Spanish in 1576 and twenty years later cultivated in a private botanic garden in London (see Brockway 39). Food crops, plants and people also moved from Europe to the New World. Columbus' second voyage, for example, carried seeds and cuttings of wheat, olives, chickpeas, melons, onions, radishes, grape vines, sugar cane and citrus fruits to Hispaniola (see Brockway 38). A history of food and eating during the colonial period could go on and on, and include the holocaust of the Black Atlantic, the genocide on the Canary Island, the genocidal policies throughout the Americas and Caribbean,

and both the environmental destruction and loss of biodiversity characteristic of monocultural plantations.[1]

The first point I wish to make here is that the history of eating insists that Western Man is not brought forth solely in relation to forces, energies and activities associated with the *scientia sexualis*. He is brought forth through the regulation of the biopharmacopaiea, that is, in relation to the coding of the metabolic forces, energies and activites, what I will now call living-in-general. But he is also brought forth through the attendant violence, cultural ruptures, and putting to death that mark it. Western Man is brought forth through the sacrifice of other lives and ways of life, not all of which are human.

The relationship between Man and living-in-general is not symmetrical, as Foucault's work might suggest. Living-in-general in being perceived as such is already massified and ordered to stand by, to serve as a "standing-reserve" for future ordering. The creation during the nineteenth century of *ex-situ* experimental botanical gardens, such as Britain's Kew Gardens and the Dutch botanical garden on Java, to name only two, were symptoms of the asymmetrical relation by which Man is brought forth from the metabolic phenomena of living-in-general. The standing-reserve of the energetic phenomena of living-in-general is that which is yet to be brought forth by biotechnology. It is thus ordered to be ordered. Again, the structure here is relational and sacrificial. Enframing, incorporating, eating Man will bring forth life into history through the exclusion, re-ordering, and putting to death of living-in-general.

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[1] For further discussion of the movement of plants during the colonial period, see Schiebinger and Swan 2005; Schiebinger 2004.

If the discourse of bio*techne* is a sacrificial structure, and if it is the decisive structure by which life is delivered to history, then not only can the end of the eighteenth century not be granted absolute privilege as *the* decisive moment at which life enters history, but neither can Western Man be the privileged subject. Again, if Man is challenged forth by the standing reserve, the *terra nullius* of living-in-general, he does so through the absolute rupture of thought and the experience of death. In their clearing the forces of historicity do not necessarily privilege Western (is there any other?) Man. Challenged forth, Man has already passed. The only way that Man can be maintained as the privileged subject of the challenge of living-in-general is through the staging of a spectral teleology, or manifest destiny. Within this play Man who has already passed is staged as a spectral anteriority—a *staged* ghostly figure of death who will be reborn in the future.

But it is impossible to guarantee this speculative drama of manifest destiny, just as it is impossible for Foucault to write a history of sexuality as historicity. The discourse of eating insists that there are other discourses or cultures, other ways of being that are, as well, challenged forth. Eating and bringing forth life is not the privilege of the West. The *ex-situ* gardens and experimental agronomics developed in al-Andalus from the tenth to the mid-thirteenth century (see Sánchez 987) insist on this, and their erudite splendor situates the "Middle East" once again at, or before, the origins of modern European systems of eating. The prospect of eating Man having already been challenged forth and arisen elsewhere creates grave anxieties for the West's thought of its Self.

A text associated with the so-called "Andalusí school of agronomy," the *Calendar of Cordoba* by 'Arib b. Sa'id, provides an example of the state of Middle Eastern agronomy during the eleventh and twelfth century. It contains descriptions of each month of the year, along with relevant information for that time of year related to astronomy and meteorology, arboriculture, horticulture, gardening, magic, local traditions, economic principles, disease control, and ways to select good workers. It grouped plants into categories. Cereals, such as varieties of wheat and barley, were organized according to the colour of their kernel, the planting cycle, and the quality of bread made from them. They were grouped with leguminous plants, such as broad beans, chick peas, lentils and lupins, all of which played a crucial part in the nutrition of the al-andalusian diet. Vegetables and greens were enjoyed year round (squash, eggplants, kidney beans, water melons, cucumbers, turnips, cabbages, carrots, leeks, Swiss chard, spinach, artichokes). A large number of woody stemmed plants and fruit trees were grouped together, as were industrial plants used for textiles and the production of oil, sugar and dyes (cotton, flax, and hemp—used for cloth, writing paper, and rope—as well as dyeing plants such as safflower, saffron, wild madder, and sumach). Aromatic plants included the extensive list of spices used as condiments, flavourings, and perfumes that were cultivated in al-Andalusi and the source of significant commercial revenue. And ornamental and flowering plants were also listed together. Incorporated into the designs of gardens, these plants provided flowers, scent, colour, and shade, but also symbolism. Expiración García Sánchez suggests that the *Calendar* had an enormous influence on the gardens of Europe during the Renaissance, especially

those of Spain (Sánchez 1992: 988-993).[2] Kew Gardens, *Les Jardin des Plantes*, the menageries, conservatories, natural history museums of Europe are samples, not archetypical and certainly not paradigmatic exemplars of the sacrificial structures of biotechnology.

The massive reduction inherent in the privileging of Man begins now to become increasingly apparent. The reduction of living-in-general to a phenomenological encounter with "metabolic forces" refuses to see living-in-general as comprised of other ways of living not recognized as such by Man. They are instead put to an unthinkable death or marked with a future death. Critically, as we think against the grain of Man's privilege within the discourse of biotechnology, the topography of the violence and death inherent in that privilege also becomes increasingly apparent. We see this violence being articulated even within the arch of classical anthropology, where Man arises as the animal capable of consciously using tools and living processes to serve his own ends. A. M. Mannion (1998), for example, describes the "emergence of *Homo sapiens sapiens* as a controller of, rather than an integral component of, natural ecosystems" (1). Based on the finding of charred vegetative remains, it is thought that the domestication of plants began in "The Fertile Cresent" between the Euphrates and the Tigris Rivers circa 10,000-6,000 B.C. What is referred to as the "Middle East Centre" of crop origin spread its influence to Europe by 4,000-2,000 B.C., but also to adjacent parts of Asia, and probably North Africa and the Nile

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[2] My thanks to Marwan Hassan for informing me of this important text.

Valley (4-5). Therefore, the history of eating ironically locates the origins of Man in the Middle East.

According to Mannion, while agriculture signals the emergence of *homo sapiens sapiens*, it also marks the extinction of wild species and varieties. Biotechnology thus brings forth certain ways of living, in this case a certain androcentrism at the expense of others. Mannion describes the paradox marking the origins of agriculture:

> This activity [agriculture] facilitated the partial control of energy flows, transformed biogeochemical cycles and biotas and began a massive extinction event that today continues to deplete the Earth's surface processes, e.g. weathering, soil erosion and the hydrological cycle. (4)

The domestication of oats, wheat, peas, lentils, flax, olive trees, fig trees, and date palm trees in the Middle East; maize, beans, avocadoes, tomatoes, vanilla, and cocoa in Meso-America; tobacco, groundnuts, potatoes, cotton, tomatoes, pineapples, cassava, and rubber trees in South America (especially the Andes); and millet, rice, gourd, water chestnut, soya, and tea in the Far East (especially in North China)—in fact the domestication of crops within all four centres of crop origin—can be thought in relation to both the growth of certain ways of life and "massive extinction events."

The biotechnological promise of a certain way of life, therefore, has in the repeated instantiation of its originary historicity always been paradoxically premised on putting to death. Sex and eating are coordinated in any communal or cultural project—and not only those of population control. The discourse of sex, its history and historicity, cannot be cordoned off from the phenomena of living-in-general—now understood as more than metabolic forces, but instead

the metabolic trace of other cultures, communities and ecobiomes whose violent incorporation and repression mark in the most strikingly infidel way the "Middle East." It is this area that constitutes the passage between the East and West within the imaginary of the West. In the phenomenal metabolic reduction that privileges some as subjects before the law while others are not, perhaps we are witnessing biotechnology's unthinkable violence being cast on the stage of the world. Since some subjects are not recognized as legal subjects, the violence amounts to a non-criminal putting to death. To make this argument, however, one would have to show how a history of burning oil configures within the desire to metabolically control the burning of fuel and calories throughout the world. Such an argument will only be hinted at here.

For now let me conclude by suggesting that the stirrings of historicity arrive in relation to the *unthinkable* aspects of living-in-general. They are the impetus of a necessarily violent extension. If one were to dream, as Foucault so nobly did, of the liberation of forces, energies, and activities from the regulatory regimes and fiery violence of "Western Man," such a liberty is possible only *in the extent*—in the extent to which the project persistently and consciously presses itself upon the forces of extinction that blaze its path. My project, then, is to explore the critical implications of various symptomatic events in which biotechnological structures were put in play that expose both a consciousness of living-in-general, and the forgetting of it.

The speculation is that the discourse proceeds by fire, and in its formation operates as a self-incinerating discourse. This point cannot be stressed enough. When the word "biotechnology" is delivered to history, living beings are set ablaze. It is for this reason that my study seeks to account for the ashen traces of

biotechnology's hungry fire, from Cuvier's furnace to the broader socio-political efforts to track a complex of interrelated issues: the movement of calories through the bodies of slaves and workers, to the development of calorimetrics; the incinerating architectures of World War Two whose nexus of hot boxes within the military industrial complex provides the basis of the Human Genome Project; and to the burning oil that slicks the originary decision to grant patents on living things. Tracked in this manner, biotechnology comes across as an unthinkable project of "the West," a project that has left in its wake the relics and outlines of bodies in a city of melted clocks, and a project whose regulatory regimes are totalitarian in being set upon the standing-reserve of living-in-general. Unthinkable, it would have us follow its violent strain of thought, its very way of life, to the letter.

Chapter Three

Fiery Clusters:

The Hot Boxes of Biotechnology

Dear D—,

Another letter. Another day of snow.

In 1999 archaeologists excavated a 23-ton woolly mammoth carcass from Northern Siberia and airlifted it to be stored in an ice cave (now called "Mammuthus Lab") in Khatanga. The aim of this ongoing international project is to determine how the mammoth lived and died and to bring it back to life by means of cloning (Stone 2001).[1] In 2005 Hendrik Poinar, a McMaster University geneticist, in collaboration with genome researchers from Penn State University and the American Museum of Natural history, sequenced 1% of its nuclear DNA (Poinar et al. 2006). Poinar has argued that the woolly mammoth will be recreated from its DNA at some point, while many scientists—including key members of Poinar's team—have suggested that it is impossible to clone a

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[1] The excavation, airlift and storage of the carcass were documented by the Discovery Channel. The series, "Land of the Mammoth," aired in March of 2000. See http://dsc.discovery.com.

species that became extinct over 10, 000 years ago (Briggs 2005; Schmid 2007). What, however, does it mean to be "extinct" within the spatializing nexus of biotechnology?

Imagine if we could archive the codes for all the genes of all the living things of all time, and that genetic engineers could re-make and re-tool "Eden" from this genetic standing-reserve. This is the explicit fantasy of many scientists and the rhetorical frame for much of the Life Industry. The fantasy of genomic standing-reserves of the living-in-general, however, is essentially tragic because scenes of violence, death, and murder mark their own massifying genesis, which is as well the genesis of Wilmut's dream of a Second Coming. The dreams of the Life Industry are marked by what Derrida has described as a "pre-originary and properly spectral anteriority of the crime—the crime of the other, a misdeed whose event and reality, whose truth can never *present themselves* in flesh and blood, but can only allow themselves to be presumed, reconstructed, fantasized" (1994: 21). The mammoth woolliness of our visions! We are always trying to bring forth into a proper field of vision, to justify, to regulate and to bring to order, the monstrous *spectacles* of living-in-general and the spectral anteriority of unthinkable acts of extinction. Is the woolly mammoth dead? Biotechnology holds it in abeyance, not living, not dead, but living-dead: a silent, waxen creature, frozen in an ice cave, awaiting the arrival of those who would reconstruct its fiery life.

And yet, its reconstruction has already begun and a stage is being set for its return. No longer conceived solely within the brachial flow of bloodlines, the life and, in theory, the remote possibility of the woolly mammoth's "second life" is conceived spatially. If it is to be re-born, it will emerge from a nexus of Siberian

caves, gene banks storing DNA samples, genome databases, and museum collections that allow for cross-referencing with descendant elephants—in particular, the Asian Elephant. In other words, scientists will be trying to bring the woolly mammoth back to life by cross-referencing its DNA against its Asian descendants that are marked for extinction or have already passed away. Is this just an incidental irony? Or is it related to the complex cultural symbolic value of elephants and their biological vulnerability at a time when, to offer only one example, India's biotechnology industry is being described using the metaphor of looming elephants (Pierce 2007; Smith 2007)? How is it that "we" decide what to bring forth from the heterogeneous, partially systemic archival space of genes and bioinformatics?

All day I have been thinking about the fact that "Mongoloid Idiot" is written on your birth certificate. It was in 1866 that J. Langdon Down offered the first clinical description of what he termed the "Mongolian type of idiocy":

> The hair is not black, as in the real Mongol, but of a brownish colour, straight and scanty. The face is flat and broad, and destitute of prominence. The cheeks are roundish, and extended laterally. The eyes are obliquely placed, and the internal canthi [corner of the eyelids] more than normally distant from one another. The palpebral fissure [opening of eyelids] is very narrow. The forehead is wrinkled transversely from the constant assistance which the *levatores palpebrarum* [muscles that lift the eyelids] derive from the *occipito-frontalis* muscle in the opening of the eyes. The lips are large and thick with transverse fissures. The tongue is long, thick, and is much roughened. The nose is small. The skin has a slight dirty yellowish tinge, and is deficient in elasticity, giving the appearance of being too large for the body. (261)

Langdon's description remains an enduring classic amidst the rulers, skulls, and bones, remnants of Bertillonage,[2] fingerprinting cards,[3] photographs and stop motion films[4]...those systems of surveillance that constituted nineteenth century biometrics. Emerging primarily from policing and anthropology, biometrics put an eye on a body's behaviour and intelligence in the service of the state and colonization. This coalescing of biometrics brings forth the figure of "Mongolism" from living-in-general. "Mongoloid Idiocy" is thus a biomedical sample of the colonial discourse—the sacrificial structure of thought—that founds the modern state.

Down describes Mongolian idiocy as a sign of "degeneracy." His rather vague use of this term is, according to Edgar Miller, typical for the period:

> His thinking appears to have been very much along the lines that other manifestations of the human race are inferior to the Caucasian, with the Caucasian race presumably reaching its apotheosis in the British. Racial groups like the Mongols are at an earlier stage of evolutionary development. The Mongolian idiot therefore represents a degeneration to this more primitive type. (Miller 367-368)

The Mongoloid, however, was not simply a sign of a primitive type, as Miller would suggest, but a counter, degenerative force. The Mongoloid was assumed

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[2] Bertillonage is a system based on multiple bodily measurements developed in the 1890s to identify criminals by police desk clerk and anthropologist, Alphonse Bertillon.

[3] Richard Edward Henry's implementation for Scotland Yard during 1896-1897 of fingerprinting criminals in India is considered the introduction of the practice into European policing, though the state had used finger and palm prints for almost forty years.

[4] I'm thinking here of the work of Etiénne-Jules Marey, Edweard Muybridge and Thomas Eakins.

to be the result of physical or moral disease. Down noted, for example, that the mothers of Mongoloids often suffered from tuberculosis, and he speculated that the fathers might have been inebriated at the time of conception. For reasons such as these, the Mongoloid was seen as an anachronistic, degenerative eruption, a sign of moving backward *within* the Caucasian body, an instance of what F. G. Crookshank, in *The Mongol in Our Midst* (Crookshank 1925), described as "occidental mongolism" (9).

The equation of idiocy with an ethnicized anachronistic eruption would have Mongolian culture and peoples signify a degeneracy that is nonetheless surpassed; that is, even though their force is degenerative, their death or movement towards death is being overcome by the advancing *telos* of Caucasians, and in particular, the British Caucasians. The equation with idiocy suggests that it is the *thought* of Mongolians, or Mongolian thinking, that is retarding the development of Caucasian consciousness. Once again Asian culture is here constructed as static, archaic and that which is both surpassed and uplifted into the body of Western thought: Occidental Man. The Mongoloid is seen as an archaic figure *within* Man, neither living nor dead but erupting within as a living-dead figure.

There are parallels with that strain of Asian elephant that leads to the biotechnological resurrection of the woolly mammoth. The parallels, here at least, are not established through a shared history in the classical sense. I'm not suggesting a historical intersection of mammoths and Mongoloids. Rather, I'm suggesting that the biology of the two is brought forth by the same structure of thought. Transgenics has opened the technical possibilities of cloned goats with the genes of spiders producing silk in their milk and urine. The structure of

thought that is biotechnology also produces amalgamations that are unthinkable in any discourse that clings to the dream of species being. Humanism's thinking Man preserves the privilege of species being only in the spectral passage from a past to future tense.

Understanding the nature of Mongolian idiocy helps clarify the parallels with the resurrection of woolly mammoths. Idiocy is not the same as being dumb. Avital Ronell has traced the usage of the word to Plutarch: "In Plutarch, 'idiot' expresses social and political inferiority; it is not a certificate of citizenship—the idiot is the one who is not a citizen (*politês*)" (2002: 5). Idiocy is related to "being-outside-the-political." That said, idiots are not necessarily dumb, nor do they suffer from a lack of consciousness. They are thinking *subjects* outside of the law. Being-outside-the-political, Mongolian idiocy marks the thought of the unthinkable politics of the West. They are constructed as slow biological subjects invested with the stasis of "the archaic," like an elephant that never forgets, lumbering towards extinction.

It was not until the 1960s that researchers succeeded in applying enough pressure on scientific academies so that by the 1970s the scientific term "Mongoloid Idiot" was revised to "Down('s) Syndrome" (see, for example, (Spalding et al 1961). "Down Syndrome" is now increasingly referred to as "Trisomy 21." Here, amidst the biotechnological polis, corporations are developing and selling first-trimester screening tests that once again mark your body with the possibility of extinction. Is it the sacrificial structure of biotechnology that is repetitive and redundant? I will have more to say concerning "Trisomy 21" later. For now I will conclude with the reminder that Down claimed Mongolian idiots "have considerable power of imitation, even

bordering on being mimics" (Crookshank 261). It is as if they show the West its own idiocy, its incorporation of subjects who nonetheless stand outside the law and fail to be recognized as such. They also mark Down's Syndrome with the repeated bringing forth of violence, as if only in the absolute destruction of the Asian within, could Western Man see himself and purify his *state*.

When I try to think of what is meant by these "Mongolian" subjects outside the law, I remember that protests during the 1960s and 1970s against the term "Mongolian Idiocy" were also made by Mongolians, those that conjure a history of border raiding, and whose empire once spanned much of East Asia all the way to Kievan Rus (an amalgamation of what are now parts of Russia, Belarus and the Ukraine). The culture that inspired the term once influenced trade all along the silk roads to St. Petersburg—that wintry capital often described as the window onto the West. What happens to the West when mimicking "Mongolian Idiocy" stares back? I mean, of course, that haunted, pre-originary moment that is always already reinstated before the decision of who, or what, comes forth from the sacrificial structure of biotechnology.

With affection,

Your borderline brother

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The Politics of Monstrous Histories

To this point I have described how biotechnology's spatialization of kinship institutes a sacrificial structure that has privileged Man over those compressed into the standing-reserves of the living-in-general. Spatialized as such, kinship becomes biosocial and spectral.

In *Bodies, Commodities, and Biotechnology*, Lesley Sharp has described the biosocial kinships emerging from cadaverous organ transfers (Sharp 2007). There are over 24, 000 organ transfers performed each year in the United States that are derived from 13, 000 cadavers. According to Sharp, activist groups and individuals have increasingly overcome the policy of anonymity governing organ transfer. As a result, organ recipients and the kin of donors have been meeting at events, such as regularly organized large-scale picnics with multiple families and recipients. They have also engaged in activist memorial projects, such as the Patches of Love Quilt that honors the identity of donors, and the biannual Transplant Olympics (see 7-45). Many recipients speak lovingly of their "donor mom"—the mother of the organ donor who is, in the minds of many recipients, the mother of their rebirth and someone with whom they share a biological connection (64-66). Sharp goes on to describe how these kinship patterns are becoming more complex with the insertion of animal organs (particularly those of pigs), machines, and in the future, biotechnologically "grown" body parts, into those in need (77 ff.).

These biosocial kinships are spectral in that they are established in relation to the dead, and to the experience of death and violence. This is obvious in the case of cadaverous organ transfer, including the experience of death marked by

those who describe their "rebirth." This is not only a personal experience but also an unthinkable, more general experience related to the ontologically troubled biological nexus in which organ transfer and donor moms takes place. When we include the body parts of animals, intricate machines, and organs grown on biomedical scaffolds, the troubling of ontology becomes amplified. Add genetically engineered animals designed to grow organs for recipients—including the fantasy of the human clone as future organ storage unit, so vividly portrayed in the film, *The Island* (2005)—and the immensity of the sacrificial structure of biotechnology begins to leave its mark. There has already been a crime and a sacrifice of—the other—because it cannot be named within this unthinkable ontology.

The haunted spatialization of kinship puts monstrous histories into play. The discourse allows, for example, strange ties to be drawn between the future resurrection of woolly mammoths and those with Down's Syndrome, who are marked for extinction. These biosocial ties seem, at first, much broader than those between the nexus of people involved in organ transfer, until we remember that this nexus also involves machines and animals, and that the ontological status of all of those involved cannot be assumed. Historical lines are not so easy to follow within a spatialized mode of thought. Before we can follow its bits and pieces of history we must recognize that biotechnology is before all else a structure of thought played out on the corporeality of biological matter that is not quite dead and not yet living but living-dead. It is this structure of thought that has a recognizable history, and one that I am attempting to deconstruct in order to elucidate the contours of its violence.

If biotechnology is a structure of thought, it is important to identify the modes by which it is taking place—so that the haunting kinships constituting the biotechnological *socius* and *polis* can be better understood. This understanding is key to the development of a more ethically engaged politics of biotechnology. I have already argued that one of the modes by which biotechnology takes place is through the demand of sacrifice inherent in *eating*, understood broadly as the incorporation or ingestion of the corpse. Within any scene of biotechnology, there are always ontologically unstable living-dead things being moved from one site and incorporated into another. This devouring mode of biotechnology, I have suggested, has a history related to its significant role in the constitution of the modern state in Europe by means of colonialism, and formed the essence of a Western ethnography that had the fiery stomach of Man, the privileged subject. A radical politics of protest against, for example genetically engineered foods, would have to take on the massive colonial history of germplasm acquisition and organize, not so much in the name of humanity, nor the right for consumers to know what is inside an edible commodity, but in relation to the haunting sacrificial structure of eating. Who or what would speak for such a politics? This is, I believe, a crucial question for today in the face of the erosion of global food security and the obesity epidemic.

The second mode of biotechnology, which I will describe below, is incineration. I hope to make this clear later, but for now I want to suggest that incineration is the mode by which the United States systematically incorporates the discourse of biotechnology that was previously developed in Europe. If the trajectory of Europe's biotechnology took place through the fiery stomach of Man and his corpus, the incinerating mode of the United States' biotechnological

project takes place in relation to a series of "hot boxes" demarcating a history of cities and architectures on fire. This history of "hot boxes" signals the arrival of a different kind of politics, one that prioritizes the life of systems over Man. The emergence of this priority indicates how we might come to think of "biotechnology" and "cities" (*polis*) in a singular phrase: the biotechnological megacentre.

From Biopower to Fire Power

The work of Giorgio Agamben elucidates the subtle shift during World War Two in the mode by which biotechnology takes place from one of eating to that of incineration. In his rigorous yet troubling *Homo Sacer: Sovereign Power and Bare Life* (1995), Agamben elaborates on Foucault's notion of "biopolitics" and begins to articulate the political implications of biotechnology's architectures of fire. To begin, Agamben argues that

> The Greeks had no single term to express what we mean by the word "life." They used two terms that, although traceable to a common etymological root, are semantically and morphologically distinct: *zoe*, which expressed the simple fact of living common to all living beings (animals, men, or gods), and *bios*, which indicated the form or way of living proper to an individual or a group. (1)

Agamben follows Foucault and argues that the inclusion of *zoe* founds modern politics—that is, biopolitics—but he argues that this inclusion is premised on an exclusion. To articulate this paradox Agamben tells the story of *homo sacer*, the one designated in archaic Roman law as he who, in punishment for a crime, cannot be sacrificed according to the rules proscribed by divine law, and yet he

may be killed without his death being considered murder according to the laws of the city. *Homo sacer* comes to embody, for Agamben, bare life's excluded inclusion with regard to sovereign power.

Agamben then maps *homo sacer*'s historic relation to the sovereign, including the king and his double, the "wolf-man" of early medieval Anglo-Saxon and Germanic law, the *corpus* singled out in the writ of *habeas corpus*, and the citizen of the "*Déclaration des droits de l'homme et du citoyen.*" His narrative culminates with the point that citizenry in a democracy is obtained by birthright. Bare life secures citizenry and is thus "the immediate bearer of sovereignty" (128). It is at once included in and excluded from sovereign power. If rights-based legislation is declared to be concerned with the rights of Man and the citizen, they do so on behalf of the management of life itself. For Agamben, then, from the instant politics became biopolitics, "the only real question to be decided was which form of organization would be best suited to the task of assuring the care, control, and use of bare life." Echoing Foucault, he argues that modern politics is centred on the management of the masses—or more precisely a population's metabolism.

Agamben suggests that, within biopolitics, the efficient management, incorporation, and state of "bare life" has increasingly become an end in itself:

> Once their fundamental referent becomes bare life, traditional political distinctions (such as those between Right and Left, liberalism and totalitarianism, private and public) lose their clarity and intelligibility and enter into a zone of indistinction. (122)

Biopolitics come to be defined less by social relations and social vision, and articulated more in terms of the efficient management of Life, with more and

more states of exception, including those in the guise of a state of emergency, that constitute figures as *homo sacer*—those who lack protection from violence and murder under the law.

Agamben proposes that the political history of modernity, including the declaration of rights, National Socialist eugenics, and debates on the normative determination of birth and death all belong to the same biopolitical context:

> From this perspective, the camp—as the pure, absolute, and impassable biopolitical space (insofar as it is founded solely on the state of exception)—will appear as the hidden paradigm of the political space of modernity, whose metamorphoses and disguises we will have to learn to recognize. (123)

Agamben's argument is that the Nazi incorporation of bare life into the political by means of eugenic biologico-scientific principles is the paradigm, not the anomaly of modern politics. Within the historic executions of biopower, the genocidal gas chamber—and not the stomach as Foucault's work might suggest—stands at the centre of the "political space of modernity" that takes efficient biopolitics as its end goal.

According to Agamben, the rise of the Nazis is indicative of the growing divide between human rights and those of an increasingly self-interested citizenry dedicated to the efficient management of the bios as a means to political and economic security. To make his point, Agamben gives the example of humanitarian organizations forced to seek exceptional aid to feed the starving, as opposed to states forcefully engaging with the politics of global food distribution. The figure that challenges the executions of modern biopolitics is that of the refugee. The displaced break "the continuity between man and citizen, *nativity* and *nationality*...Bringing to light the difference between birth and

nation, the refugee causes the secret presupposition of the political domain—bare life—to appear for an instant within that domain." Following Hannah Arendt, Agamben argues that the refugee is "the man of rights" who operates "outside the fiction of the citizen that always covers them over" (131).

The implied aim of Agamben's discussion of the domain-less refugee is to reinsert the humanitarian basis of citizenry back into the political realm:

> The refugee must be considered for what he [sic] is: nothing less than a limit concept that radically calls into question the fundamental categories of the nation-state, from the birth-nation to the man-citizen link, and that thereby makes it possible to clear the way for a long-overdue renewal of categories in the service of a politics in which bare life is no longer separated and excepted, either in the state order or in the figure of human rights. (134)

The refugee is a radical "limit concept" because "he" is not a subject of the state and only subject to human rights—not the interested politics of citizenry. Displaced, his security is dependant on exceptional humanitarian and as such, reveals the inhumanity and violence of a citizenry founded in efficiency.

Can we assume that the refugee will wish to re-inject modern politics with "humanity"—or something that we would recognize as a reinvention of "humanity"? Is it not possible that refugees that are aware of the legacy of violence done in the name of humanity and humanism will want a different historical trajectory altogether? Why is it that Agamben would have this "limit concept" stand for that which calls into question the "man-citizen link" *and* still identify it as a Man? Why does Agamben enframe the refugee within humanist assumptions? Perhaps this unidentifiable figure that is excepted from civility and citizenry also marks the inhumanity *within* humanism. If this were the case, then

Agamben's argument would open to the more radical political question as to whether the humanist displacements *within* modern democracy mark the origin of modern terrorism by expanding the field of non-criminalized violence. In other words, the architecture of violence burning at the centre of modern politics is not solely constructed by the efficient management of life itself, but by the construction of *zoe* as a standing-reserve *in the service of Man*. The inhumanity of terrorism is produced by modern politics and the discourse of rights. It does not arrive from outside modernity, from an archaic remnant of other times.

Agamben does not pursue these questions in *Homo Sacer*. However, in a subsequent text, *Remnants of Auschwitz: The Witness and the Archive* (1999), he finds at the centre of the Nazi furnaces a figure that, suffering from severe malnutrition, became "a staggering corpse," "mummy-man," "the living dead." The name given to these "most despised" figures in the camps, the figures whose proximity to death drew violence from both guards and prisoners who feared to be associated with them, was "*Muselmann*." Agamben says of the "Muslims" found at the centre of the holocaust: "Every group thought only about eliminating them, each in its own way" (1999: 41-43). What, asks Agamben, can this unspeakable, living-dead figure haunting the death camps—what he calls the "decisive lesson of this century"—teach us? What is troubling in Agamben's account is that the living-dead Muslim becomes an ethical figure *par excellence* for European modernity, a figure whose death incorporates the death of all others within a more general holocaust of the French Revolution.

To a certain extent this troubling argument can be sustained if the lesson to be learned from the *Muselmann* is unthinkable; that is, if the *Muselmann*, like the refugee, is described as a limit concept that nonetheless marks the inhumane

essence of biopolitics. In being unthinkable, the *Muselmann* exceeds ideological construction and functions within a philosophical discourse—as opposed to a historical discourse—as a mark of systemic violence perpetuated by a biopolitical structure of thought on the living-in-general. The argument would be that as biopolitical Man is challenged forth by the living-in-general (or what Agamben calls *zoe*) and thereby experiences the death of thought that demands the subject's reconstitution, his thought opens up to the possibility of an unthinkable violence perpetuated on the living-in-general. Since this violence would be on life itself—not a subject of the law—it would be non-criminal. The zombie-like *Muselmann* then stands for the most grievous instantiation of the modern state's deadly efficiency with masses of flesh—a sheer efficiency rooted in the birth of citizenry. Familiar to the modern state in all its forms, biopolitics as an end in itself is non-ideological.

This argument, however, incorporates ethnographic inscriptions—in this case of the *Muselmann* and Jew, and for that matter the living-in-general—within the spectral narrative of a loss of Man and humanity that compels resurrection. It is only in this schematic that the blurring of Jew and Muslim in an analysis of modern politics can avoid further study. This is a blurring that is made possible, not only by Agamben's humanist intent, but also by his construction of *zoe* as what he alternatively calls "bare life" (10) and "pure being" (182). Agamben also refers to the biopolitical space of the camp as a pure space (123). In a sense, his humanist argument parallels the structure of modern politics in that his critique purifies the living-in-general in an effort to resurrect the community of Man.

If the fiery architectures of biotechnology put to death and clear the ground for the stirrings of historicity itself, there is no guarantee that those

stirrings will advance the thought of the other-human. The historical trauma and *Remnants of Auschwitz* cannot, strictly speaking, provide an archetype for the reinvention of European humanism. The history of biotechnology's fiery architecture of historicity is haunted by the spectres of living-in-general. Because such spectres are impossible to biologically delimit, they will never be restricted to a humanist schematic and the fantasies of Western Man.

This is not the place to pursue the complex of historically elaborate ethnographies enframing the *Muselmann*.[5] I will, however, make two points relevant to my argument. First, the *Muselmann* is that which refuses to eat. It is the refusal to eat that distinguishes this "zombie" from the Jews trying desperately to stay alive, and the Nazis trying to biopolitically constitute society as a singular unified body premised on an Aryan ideal. If the efficient violence in the camp is underwritten by the dehumanizing of Jews and, being starved, the Jews are forced to fight for their basic humanity, then the one who refuses to eat marks the outside of the economy of the camp from within. For the zombie the contest of humanity is already over. The living-dead zombie thus haunts the

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[5] Agamben's well-intentioned argument unfortunately comes to mimic what Zizek describes as the non-ideological kernel of Nazism. Zizek's argument has been summarized by Jodi Dean: "Contra Heidegger and with Alain Badiou, Zizek asserts that Nazism did not contain any 'inner greatness' [x]. Nonetheless, this does not mean that it lacked an "authentic" vision' [xi]. This vision, 'a notion of the deep solidarity which keeps the community of people together' was a kernel of non-ideology, an ideal or aspiration that cannot be reduced to an instrument of power [xii]. Zizek argues, 'Of course Fascist ideology "manipulates" authentic popular longing for a true community and social solidarity against fierce competition and exploitation; of course it "distorts" the expression of this longing in order to legitimize the continuation of the relations of social domination and exploitation. In order to be able to achieve this effect, however, it none the less had to incorporate authentic popular longing' [xiii]. People are not simply coerced. Nor do they directly accept open plays of power. Rather, their tie to an ideological formation is secured by utopian longings for something more, something better. Every ideology, including fascism, relies on such a non-ideological kernel" (Dean 2005; Zizek 2001).

camp by bringing forth its machine-like work. In this way the zombie haunts the guards and prisoners with their own living-dead status within the machine.

My second point is that the unthinkable machinations of the camp challenge forth their reinvestment with meaning, or with another logic that has been, historically, ethnographic. It is as if the unthinkable machinations justify such a reinvestment. Against the grain of Agamben's argument, the seemingly obvious needs to be stated. Within the spectral dramaturgy of the camp, a hierarchy of bodily vulnerability is in place, and its demand for sacrifice is secured through forceful ethnographies. Again, the structure of thought that is biotechnology is sacrificial, and always invested with ethnography.

Following the etymology of "biotechnology," it is possible to discern a subtle shift in the dominant ethnographic inscription of the discourse that occurs during World War Two, and in relation to the development of a more systemic biopolitics as exemplified by the concentration camps of the Holocaust, amongst others. Previously, the unthinkable discourse of biotechnology was reinvested with the privileged subject of Western Man, who constituted himself through his fiery stomach, that is, by eating, or incorporating the standing-reserve of the living-in-general. In order to inscribe itself as an ethnography of the West, European biopolitics was compelled to incorporate, through sacrifice, other systems of eating, and in particular, the highly developed systems of the Middle East. During World War Two, the inflection of the discourse changed. Increasingly systematic, the incorporation of the living in general came to privilege the system itself as that which was challenged forth. This shift of privilege was marked by a different mode by which the discourse of biotechnology takes place, a mode that emphasized architectural structures and

urban planning over and above the constitution of Man. This different mode inscribed a different ethnography that signaled the Americanization of the discourse. It is as if an ethnography of the United States incorporated, and then surpassed, a European biopolitics that culminated in the fiery architecture of the concentration camp.

Hot Boxes

The slender three-page document that marks the origins of the English etymology of "biotechnology" announces a particular strain of the discourse that leads to the "hot boxes" of California and Japan. It is this strain that would clear the ground for the Human Genome Project (see Chapter 4) and for what I will call the Law of the Letter (see Chapter 5), which would regulate and normalize the otherwise unthinkable thought of biotechnology and living-in-general.

The document that initiates this strain of biotechnology is an editorial that appeared in a 1933 volume of *Nature*. It was simply titled "Biotechnology." Robert Bud attributes the piece to chemist Rainald Brightman, a regular columnist at *Nature* (237; f.n. 84). Brightman's column reiterates an argument made in a previous issue of *Nature*, by Dr. J. Macmillan Brown, that there was a "need for building university education on broader foundations than the narrow specialisation which seems to prevail" ([Brightman] 1933: 597). For Brightman, a comprehensive biotechnology was required to respond to two separate and ongoing paradigm shifts, one in science and one in the social sphere.

Brightman attributes the paradigm shift in science to the great achievements in physics:

> We are indeed leading up to a final condition of physics in which all past discoveries are comprehended in a single unitary logical structure which is independent of the various possible methods of approach. (598)

Now that scientists have laid out the fundamental laws of physics, Brightman urges, they can turn their attention to the "human sciences." An enriched curriculum would integrate scientific training with the study of "Human actions in history [which] are so overwhelmingly complicated that general laws are much more difficult to discover, and consequently to apply, than are physico-chemical laws." Brightman's main point is that the "peril" of over-specialization in the sciences needs to be combated by a comprehensive biotechnology, because scientists can contribute in fundamental ways to "the interpretation of the many difficult social, economic, and political problems with which our civilisation is confronted" (597-598).

As an example of a "difficult problem" to which scientists should attend, Brightman describes what he perceives as a grave shift in the social structure of the West. He argues that "the civilised European nations are allowing their leading cultural elements to die out." Brightman makes the claim that "inherited differences in cultural endowment" are on the average proportional to one's social standing. The upper class, however, were reproducing at lower rates than the less "endowed" but more prolific lower classes. Repeating the eugenic arguments for what Julian Huxley had in the 1920s called "biological engineering," Brightman proposes that scientists have to help the leaders of Europe "achieve the best possible result with the least possible means" (598).

The troubling eugenic aim of Brightman's hygienic biotechnological vision focuses on the elimination of social obsolescence and waste:

> Few grasp the extent to which our modern social, hygienic and educational measures promote the well-being of the individual at the cost of humanity. The future of the world lies with the race that is the first to apprehend the true causes of cultural decay and to resolve to eliminate these causes. (598)

Brightman's biotechnology is eugenic in calling for the application of scientific rationale that eliminates "cultural decay" through the improved integration of individual "well-being." This sense of "well-being" was understood, in both the physiological and psychological sense, to preserve the inherent aptitude of humanity's best. It is no surprise that Brightman goes on to argue that what is under siege is the "fitness" of "Western Civilization":

> At this point we touch an ideal characteristic of our modern Western Civilisation—the technical ideal of fitness for a purpose for its own sake. This ideal, as distinct from mere utility, is behind much of the opinion urging the rationalisation of industry, the movement for scientific management, for scientific administration. It is in the direct succession of the ideal of pure science, the discovery of truth for truth's sake—a late development in the history of humanity. (598)

Brightman calls for biotechnology to fulfill a fundamental ideal that he believes essentially characterizes Western Civilization: the biotechnical ideal of an efficient and fit citizenry. This stated ideal only confirms Agamben's nightmare.

Brightman ultimately advises that "wise statesmanship," profiting from the teachings of scientific management, might be able to avert the profound social discontent characteristic of industrialization:

> In particular, there is the problem of leisure and how far it can be utilised to balance the mechanising influence of work and those other influences which perpetuate or increase the ratio of undesirable work. (599)

Pure fitness is, for Brightman, a socio-phenomenon that integrates people where they inherently fit best. His is a socio-biotechnology that anticipates the deadly boredom experienced by workers within the machinations of an expanding industrial capitalism.

Lewis Mumford, the well-known architecture critic for the *New Yorker*, literary critic and historian of technology, did not share Brightman's Social Darwinism, but he nonetheless echoed the argument that the solution to social strife lay in the development of a more hygienic "biotechnics." In other words, to the extent that Mumford is concerned with bio-efficiency, his liberal humanism belongs to a different place on the same bio-political continuum as the eugenics expressed by Brightman.

In *Technics and Civilization* (1934), published a year after Brightman's column in *Nature*, Mumford argued that the "biotechnic period," marked by the complete integration of the machine with human needs, was "already visible over the edge of the horizon" (1934: 353). As Bud argues,

> For [Mumford] too, the biotechnic age, in which things were made in a way respecting the workers' biological needs of clean air and light and designed in a way that would respect the customers' biological needs, was the next stage in design. Following [Patrick] Geddes, Mumford's greatest interest lay in town planning. There, above all, the distinction between the dismal paleotechnic factory town [an early industrialised town centered around steam power and the brutal conditions of the coal mine] and the modern green residential garden city of the biotechnic age highlighted the nature

> of progress...Mumford was horrified by the growth of the phenomenon he named the "megalopolis," and later the web of militarized power which so contrasted with his 1930s dreams of the biotechnic way out of the depression. (Bud 1993: 83-84)

Mumford, like Brightman, feared the waste and refuse of the city—though ultimately each was thinking of different kinds of waste in different ways. Nonetheless, both sought biotechnics as an antidote for the decay of urban health. For Brightman the biotechnological city would be a testament of the fortitude of "the leading cultural elements." A disciple of Social Darwinism, Brightman does not want to waste "good people." For Mumford the biotechnic future promised by the garden city was under threat by a new phenomenon: the megalopolis. What is wasted here is a human-based vision of the biotechnological city.

Brightman's call for scientists to take on social engineering, or what he called "biotechnology," and Mumford's fear that a new form of city, the "megapolis," came together in the United States, beginning most notably in 1917. According to Branden Hookway, on April 6, 1917, on the day the United States entered World War One, a group of psychologists led by Harvard professor and president of the American Psychological Association, Robert M. Yerkes, met with the Sanitary Corps, and effectively systematized the military's human resources (2004). Hookway describes how extensive aptitude tests were developed to help identify and predict psychological problems arising in combat situations:

> For Columbia psychologist Edward L. Thorndike, the work done by psychologists during World War I could be roughly divided between "*mass* work," pertaining to the organization of personnel and "*analytic* work," involving man-machine interactions. (27)

These tests were so successful that they were extended to civilians in the form of IQ tests, beginning in 1920 (27-34).

For the military, aptitude tests became ways of systematically integrating personnel within its bureaucracy. Aptitude tests were cross-referenced with personal history and education. As Hookway points out,

> The qualification card [a form of integrated personal record] provides an operative, rather than exhaustive, definition of individual qualifications. Its contents are meaningful only to the extent that they are compatible with both a specific systematized body of knowledge on human performance and a specific system of information retrieval. (34)

The point here is that the human body is replaced by "human performance," within a network of bioinformatic data, organized to meet the goals of the bureaucracy.

Psychologists at Wesleyan, Yale and UCLA carried out studies of the integration of man-machines, or "analytic work," by means of life-sized simulators of, for example, naval gun platforms. Other tests involved different kinds of gas masks by psychologically "different kinds" of users:

> As in the case of the simulator, this line of work required a simultaneous consideration of human factors and machine function. Together, these would constitute a *system*, a man-machine interaction that would effectively replace human subjective experience as the subject of psychology. (37)

Hookway points out that the construction of the man-machine as *the* subject of an informatic system during World War One culminated in later studies done under the auspices of the air force at the School of Aviation Medicine at Randolph Air Force Base outside of San Antonio, Texas, and the Aero Medial Research Unit of

the Air Corps Material Division at Wright Field in Dayton, Ohio. The focus of these studies would be on "the problem of maintaining pilot comfort and life support in combat situations and at high altitudes" (37). According to the OED, the first use of "biotechnology" in English emerges from these latter experiments with the man-machine.

In 1947 U.S. Army Air Force Captain, Craig Taylor and Llewellyn M. K. Boelter, the Dean of UCLA's new College of Engineering, co-authored an essay in *Science* with the title "Biotechnology: A New Fundamental in the Training of Engineers" (Taylor and Boelter 1947). The *Oxford English Dictionary* erroneously describes the essay as the first documented use of the word "biotechnology" in English—it is the second after Brightman's editorial. The essay written by Taylor and Boelter, which remains one of the inaugural texts of the discourse of biotechnology, has received little critical attention, as have their heat tolerance experiments done in a cockpit simulator at UCLA.

Robert Bud discusses the essay briefly (1993). Otherwise, the new program at UCLA has only received scant mention in histories of biotechnology. And yet the document that triggered the erroneous etymology of "biotechnology" suggests a different approach to the subject. Instead of pursuing, as many histories do, an understanding of biotechnology through developments in fermentation, biology, molecular biology, genetics, and so forth, the new program at UCLA's association with heat tolerance tests suggests that we approach the subject through postwar building projects in the United States aimed at producing architectural environments capable of extracting as much surplus value from workers as their "living systems" could tolerate. More specifically, the sense of a comprehensive biotechnology in the essay suggests

that we approach the subject in relation to one of its cornerstones: the hot box experiments. An analysis of these experiments in relation to the discourse of biotechnology—understood as a structure of thought—reveals not only the replacement of Man by the man-machine as that which is challenged forth by the living-in-general. It also reveals the historic ties of these experiments to the origins of the Human Genome Project.

Craig Taylor, a founder of UCLA's biotechnology curriculum, at work. Portrayed by *Life*, 9 February 1948. Photograph by Johnny Florea, *Life* magazine © 1948, Time Warner Inc. and Katz Pictures Ltd.

On February 9, 1948, a brief photo essay marking the origins of biotechnology appeared in *Life* magazine. The photos, taken by *Life* photographer Johnny Florea, documented experiments being conducted in the new College of Engineering at the University of California at Los Angeles. The lead photo depicted U.S. Army Air Force Captain, Craig Taylor, seated in the cockpit of the "hot box": an experimental chamber used to conduct heat tolerance tests. Subjects within this experimental crucible regularly endured temperatures between 160°F and 235°F in order to determine the maximal temperatures that human physiology and psychology could sustain, while still performing desired tasks. The photo essay in *Life* was suggestively titled "How Hot Can A Man Get" ("How Hot," 1948).

The hot box experiments were being conducted in the new biotechnology program that Taylor and Boelter described in their essay of 1947 (Taylor and Boelter 1947). Founded by Boelter, the interdisciplinary curriculum established biotechnology as the study of the intensifying relationship between engineered systems and their users:

> Implicit in the plan is the recognition that the conditions and trends of modern life involve in increasing degree the following sociotechnological elements: (1) the interdependence of man and machines, (2) the progressive extension of artificial control of human environment, and (3) the expanding role of the engineer in human affairs. Engineering practice, it is our conviction, will demand a much more precise formulation of human characteristics for its part in the solution of these problems: in short, a biotechnology to take its place with the physical technologies which are the bulwark of engineering training. (217)

One of the main goals of the new curriculum was to consolidate a multidisciplinary role for the engineer, who would then be more capable of constructing environments that integrated the bodies of workers with machines and the architecture of the workplace. William Van Vorst, a chemical engineer and colleague of Taylor and Boelter as the Unified Engineering program was established and gaining prominence, credits the hot box experiments in particular for getting engineering "to start thinking about life systems" (217).

In their description of these integrated environments, Taylor and Boelter stressed that ventilation, air-conditioning, heating, lighting and hygienic systems, as well as "functional aspects of industrial design, take their origin from human needs and tolerances." Tests of both physiological and psychological tolerance, such as those in the hot box, were thus to be developed as cornerstones of a project aimed at maximizing productivity and the extraction of surplus value: "Hours of work, on-the-job feeding, rest periods, etc. are also phases of the physiology of work which form an important part of a comprehensive biotechnology" (217).

Florea's ambivalent photograph of the somewhat placid, somewhat heroic, Captain Taylor in the hot box provides a historically important point for re-thinking biotechnology. Again, contrary to commonly held assumptions, this rethinking does not gain its originary impetus from the fiery belly of man, nor through the history of biology, genetics, or the rise of molecular biology. Biotechnology is here concerned with the integration of living systems within

architectures of fire.[6] A reading of the photo from *Life* enables us to consider how this new organizational matrix reorganized the space of biotechnology in relation to the ascendancy of the U.S. Air Force and the rise of the military industrial complex by means of "linkages." These linkages persist in the "biotech clusters" of biotech "megacentres," such as Montreal. I want therefore to trace the role of the air force in developing what I will describe as the incinerating hot box of the city.

The U.S. Military Industrial Complex

Classically, the military industrial complex is characterized by the escalating coordination of critical industries (electrical, energy, chemical, automotive, aircraft) with military needs, and the rise of what C. Wright Mills referred to as a "power elite" whose political and economic interests are served by defence spending (1956). Jonathan Galloway (1973) has described the increasingly oligopolistic operations in the United States of this "power elite" during the late 1960s:

> The share of assets held by the 100 largest corporations of 1968 exceeded that held by the 200 largest in 1950. Not surprisingly, in

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[6] To consider parallel developments in domestic spaces, we might turn to the work of Beatriz Colomina (2004), who argues that the aim of assembling flexible clusters and kits was a distinctive characteristic of postwar suburban home design. "Kits of parts," says Colomina, "were an integral part of the postwar culture" (19). Her key examples are Charles and Ray Eames' *The Toy* (1951) and the Eames House (1949): "The 1949 Eames House itself was understood as a kite—a gigantic, lightweight, colorful, rearrangeable toy; constructed of machined, off-the-shelf parts, remnants of the war industry. *The Toy*, a set of colored geometric panels designed for the amusement of adults and children alike, created 'A Light, Bright, Expandable World large Enough to Play In and Around', according to the label. A house, a world: *The Toy* was all scales, from domestic to planetary, collapsed into one open system" (19). The Cold War, argues Colomina, "was a hothouse, breeding a new species of space, a new organizational matrix" (12).

> spite of the antitrust laws, interlocking management between corporations has also increased...The dynamics of technological change may require that industries become increasingly interdependent, although they do not necessarily require an increasing concentration of capital and management. However, both processes have occurred, and they have significant impacts on policy at home and abroad.
>
> Thus, we live in an era of complex and constant change and incoherent transitions. The firm has an interest in controlling the potentially disastrous consequences of unforeseen changes. The distinctions between war and peace, public and private, domestic and foreign policy, economics and politics, are breaking down. The center will not hold; but the firm involved in the sinews of these transformations wishes to survive and prosper. (267-268)

Galloway's sense of the blurring distinctions between war and peace, public and private, domestic and foreign policy, economics and politics, is characteristic of the incinerating thought of biotechnology which brings forth Life while putting others to death.

In his convincing analysis of the political economy of the links uniting a "power elite," Galloway follows Marxist analysts such as Harry Magdoff (1969) by connecting the rise of the military industrial complex to the global operations of multinational industries in the post-war period. Galloway's central argument is that during the 1950s and 1960s industry giants, such as General Electric, Ford, and Standard Oil, as well as the "core of the military-industrial complex...Boeing, Lockheed, Hughes Aircraft, and North American-Rockwell," had stakes not only in defence spending but also in foreign policy facilitating the sales of arms and technologically-related consumer goods (automobiles, computers, electronics in general, chemicals), precisely because they were

operating as multinationals (269-270). As Magdoff has argued, imperialism is a structural necessity of multinational capitalist expansion (1969). The postwar intensification of *Pax Americana* and the military industrial complex thus emerged as requirements of the global expansion of monopoly capitalism and the neo-liberal conflation of the state's interests with those of its leading industrial capitalists.

Galloway continues to describe the political effect of this militarized expansion of multinationalism:

> It may be postulated that to the extent that multinational corporations, which are either under the influence of foreign nations or are not under the control of nations at all, are supplying some of the defense needs of a state, then military defense in that state is being multinationalized. In fact, while it is often said that no country wishes to be dependent on foreign interests for its defense, it is actually the case that cooperative projects in Europe have occurred more in the military than the civilian sphere. (271)

For cooperative projects, Galloway gives examples of the Multi-Role Combat Aircraft, the Anglo-French Jaguar, the Franco-German Alpha Jet, the Hawk ground-to-air missile, and the NATO air defence ground environment. His argument is that the rise of the military industrial complex should be associated with the militarization of politics in the United States and also in European states whose markets and defence came increasingly under the influence of American multinationals:

> The interconnection between the two spheres ["American industry, and the military or governmental market"] may have important consequences on such issues as: the incidence of war, foreign aid, arms sales abroad, the arms race, the prospects for a common

> defense market in the Western world, apartheid, government subsidization of research and development, the administration of antitrust laws, pollution control, unemployment policies, campaign spending, balance of payments, the future structure of the international monetary system, and policies for the energy crisis. (277)

Within the military industrial complex, problems of the state and governance are posited in relation to military and market solutions. Politically, the result is the militarization of statesmanship and diplomacy.

As Galloway's examples of significant cooperative projects suggest, the key industry within the global development of these military industrial linkages was aerospace, which accounted for almost 40% of arms spending. The expansion of the Air Force was bolstered by the 1948 Finletter Commission which argued that "the country must have a new strategic concept for its defense and that the core of this concept is air power" (cited in Pursell Jr. 178-187). The Commission called for both an expanded air force and a well-supported industry as the basis of a reinvigorated *Pax Americana*. The requirements of the Air Force were straightforward and included one-third of the military budget, a maximum of 400,000 servicemen, planes for that number of pilots, and foreign bases for the planes that could defend against foreign threat, primarily articulated as the Soviet Union (Pursell Jr. 7-8).

Florea's photograph of Captain Taylor in the cockpit of the hot box represents a core biotechnological cluster—aerospace and related industries—within what Roger Beaumont (1977) has described as the "quantum increase" during the World War Two of linkages comprising the military industrial complex (118-132). Taylor, in fact, played a notable role in the alignment of

academic scientific research with the interests of both the military and commercial markets.[7] During World War Two, Taylor conducted heat tolerance experiments for the Air Force at Wright Field. After the war, Boelter, who was Dean of UCLA's new College of Engineering, wanted to integrate the Captain's military research into a more comprehensive training program for engineers working in civilian contexts.

The application of military research regarding the interface between man and highly engineered work stations to civilian contexts was a major impetus for the development of the biotechnology program. According to the archives on the UCLA website,

> Research concerning the relationship between engineered systems and their human users, a life-behavioral studies area, was a major goal of Boelter's educational plan as part of his Unified Engineering Curriculum. (www.engineer.ucla.edu/history/heat.html)

To staff the new program, Boelter actively recruited those with military and aerospace backgrounds. Thomas A. Rogers, an electrical engineer who later became assistant Dean, joined Boelter at UCLA in 1945 after stints with Shell and Lockheed.[8] Andrew Charwat, who did experimental aerodynamic research, was recruited from Northrop Aircraft (O'Neill 1994). Like many other local aerospace companies, Northrop was interested in transferring technologies developed during the war to civilian contexts. With funding from the Veterans'

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[7] In his 1961 Farewell Address, President Dwight D. Eisenhower cautioned against many of the socio-political effects created by the military industrial complex, including the adverse effects of large government contracts which funneled academic research into the technological needs of government. A Republican, Eisenhower bemoaned the expansion of government as much as the decline of the "free university" into a technocratic service industry.

[8] See www.engineer.ucla.edu/magazine/inmemoriamf04.html

Administration, the company worked with both Taylor and Boelter at UCLA to develop artificial limbs for vets.[9] Taylor's own move from Wright Field to UCLA also extended the applicability of wartime findings, in this case to high-heat environments in general, including those of the biotechnological workplace. The UCLA-based hot box experiments were therefore directly part of the broader reintegration of military-trained personnel, equipment and technological research into American academia characteristic of the burgeoning military-industrial complex. The equipment used by Taylor and his assistants at UCLA, for example, was largely acquired from war surpluses, and the hot box was obtained from Ryan Aircraft Company in San Diego through the War Assets Administration.[10] It is as if the image of Captain Taylor wired into the hot box represents the cluster of aerospace networks into which his life is bound.

The archives of UCLA's College of Engineering website offer a detailed description of the hot box in which the Captain sits:

> The heat chamber or "hot box" is a five-feet long and wide steel cylinder shaped much like a beer keg; heated air is pumped into the chamber at 70 cubic feet per minute; it is sheathed inside with sheet metal, and insulated with rock wool; and it is entered by a heavy, circular door...A harness of nine thermocouples to measure skin and flight suit temperatures is worn by the subject...Measurements of skin and rectal temperatures, sweat loss and heart status (EKG) provide pioneering systematic data.[11]

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[9] See www.seas.ucla.edu/seas/pubinfo/fifty/50th4.html

[10] See the history page of UCLA's Department of Engineering web site: www.engineer.ucla.edu/history/heat.html

[11] See www.engineer.ucla.edu/history/heat.html

In Florea's photo, however, a skillet has been placed on a table-like surface suspended above Captain Taylor's crotch. An egg is frying in the skillet—sunny-side up. Why the egg?

To be sure, the egg serves as a prop that conveys how hot it is in the chamber. Perhaps the prop was necessary because Taylor himself shows no signs of heat stress, no signs of being "hot." *Life*, in fact, resorted to a caption that explicitly relayed the boiling heat being endured by the Captain: "As the temperature of his hot box rises above 220°F, Dr. Taylor squirms in his seat while before him an egg on a metal pan fries in the heat." The caption of another photo in the essay tells readers that there is no sign of sweat because the low humidity of the heated air causes rapid evaporation.

But Taylor nonetheless looks deadpan in relation to the sizzling egg. His steadfast gaze is not directed at the camera, producing a distancing effect that is supplemented by the automaton-effect of the breathing apparatus, head gear and wires extending from the harness of thermocouples attached to Taylor's heart, skin and, presumably, the thermometer in his rectum. Harnessed and wired, it is as if the stoic Taylor silently endures his fiery chains while becoming physiologically woven into the coils and machinations of the hot box. The deadpan Air Force Captain recalls an observation made by the Italian essayist, Eugenio Giovannetti, cited in Gramsci's chapter on "Americanism and Fordism" in the *Prison Notebooks* (1971): "The hero of technical civilization is not a man unchained: he is a man of silence, who can carry his iron chains up to the heavens" (306). Why is the techno-hero "a man of silence"? And what force leads him to the heavens?

On the one hand, Taylor seems in complete control of his environs. From this perspective, the egg in the photo serves as a symbol of the naked, originary force of Nature, which is compared to the human body supplemented by the techno-prosthetics of the experimental cockpit. The shell-less, vulnerable egg is fried by the heat, its tolerance exceeded, but the masterful man-machine shows not a drop of sweat. The Captain's supplemented body, it seems, can silently tolerate so much more due to technological enhancement. One could argue that Florea's representation of the warrior's technological mastery of fire becomes emblematic of humankind's evolution, as well as the path of civilization, a path dotted by technologies of fire. The photo could also be seen as offering an emblem of the Air Force's evolving military and technical superiority, displayed so forcefully during the war. The frying egg can then stand for the ability of the United States to mobilize natural resources that fuel the nation's own civilizing mission; as if nature's *oeuf* and *oeuvre* have been prepped and are ready to be ingested, like a three-minute breakfast, into the pumping vessels, thermo-coupling, fiery steel and phallic architecture of America's soaring beer keg *cum* hot box.

On the other hand, the boiling stress to which Taylor is subjecting himself and others marks the heroic scene of conquer with a feverish madness. Taylor seems so focused, so literally enrapt by the test of his bio-technological limits, that the scene of enrapture comes across as one of bondage, in both the material and the role-playing, sexy-crazy slave-to-technology sense. The title of the photo series picks up on this technologically enhanced virility: "How Hot Can a Man Get?" But it is difficult to determine whether the photograph celebrates or questions the dawn of a sunny new day in which human bodies are

comprehensively integrated, or completely absorbed, within technologically-driven environments. Does the photo suggest an evolving superhuman, or the mad scientist of a Faustian pact?

To the extent that the photo begs a comparison of Doctor Taylor with Goethe's Doctor Faust, it renders him as a man of action. Faust's pact with Mephistopheles is born of the desire to gain control by exceeding the horizon of both empiricism and philosophy. He does not, therefore, gain professorial knowledge through the deal but power over others. He wants to be a manipulator, a commander and engineer of various situations. Essentially, Faust desires to be a genius, one capable of causing the worlding of the world. He wants to inhabit the world without residing in the passages of its various unfoldings in the full and proper sense. He wants to haunt such unfoldings, to cause them without really belonging to their time. Paradoxically, Faust is a disturbed figure whose desires to know the inner machinations of the world reveal a fear of losing control. He turns to magic to direct an energetic worlding because, for all his knowledge, he cannot practically translate his impressions of its originary force.

Captain Taylor's pact, however, is not with Mephistopheles but an enframing technology, and the aesthetics of Florea's black and white photographs are, arguably, more akin to Weimer Cinema with its motifs of madness, technological obsession, historical trauma, and the crisis of male subjectivity. In fact, Taylor's research was directed towards practical solutions to particular problems related to aerospace, prosthetics and industry. Nonetheless, the ultimate aim of the hot box experiments was to extract predictable performance from engineered environments. They were not part of an

epistemological project in the classical sense but rather, a project of extension and programmatic energy dispersion. Their aim was to exceed the limits of the experimental subject—all that the body and mind can tolerate—through technological integration into a variety of architectural structures and open-ended networks for what were ultimately the utilitarian purposes of industrial capitalism.

In the hot box of *Life*, human nature is not simply supplemented; it too, like the egg in the skillet, is devoured, its meaty cells incorporated within the gorgeous, gorging, flickering system of the techno-sexy, heroic-Faustian, man-machine networks. As temperatures rise above 220°F, the Captain is also cooking. Further, the cooking Captain does not fly by himself, and it is in this sense that he is part machine—a mechanism without its own energy. He is wired inside the hot box, his bodily heat measured in relation to the performance of the system as a whole—the testing ground which will be the open air. To this extent, the body of Taylor's research has become integrated within a broader technocratic service sector of the military industrial complex. The appearance and disappearance of Captain Taylor—at once visible and comprehensively integrated—is the furtive mode of the super-natural phenomenon of a body without or beyond flesh, but still the body of someone or thing: a living-dead man-machine.

The spectre of a body without flesh haunting the biotechnological clusters of the aerospace node of the military industrial complex—who would name it? The hot box experiments were directly linked to the goal of improving the ability of pilots to withstand the immense heat stress related to bombing missions conducted from great heights. The strain of biotechnology that emerges from the

United States is thus related, not only to the heat tolerance experiments conducted on pilots at Wright Field and the development of aviation fuels at MIT, but also to the tests carried out at Utah's Dugway Proving Ground.

According to Mike Davis (2002), "since 1942, [Dugway Proving Ground has been] the primary test-site for U.S. chemical, biological, and incendiary weapons":

> Napalm was invented here and tried out on block-long replicas of German and Japanese workers' housing (parts of this eerie "doom city" still stand). Also tested here was the supersecret Anglo-American anthrax bomb (Project N) that Churchill, exasperated by the 1945 V-2 attacks on London, wanted to use to kill 12 million Germans. Project W-47—which did incinerate Hiroshima and Nagasaki—was based nearby, just on the other side of Granite Mountain. (51)

If the architectural remnants of fire-bombed European cities were a prominent characteristic of World War Two, experimental practice runs were carried out at Dugway. That is, the incinerated city was already part of the U.S. Air Force's system of testing—and I'm speaking broadly here. In the postwar years, tolerance tests were done on live subjects at Dugway, including testing the effects of Q-fever, nerve gas, and radiation produced by the deliberate meltdown of nuclear reactors. The nerve gas and radiation experiments were done in the open air, with the testers turning the site into an open hot box into which toxic, fiery air was strategically pumped. It was not the body that was being tested, but the adaptability of the system to a variety of bodies, architectures, and environmental conditions. Biopolitics had come to incorporate Man within the biopolitics of a system for the system's sake.

The sheer force of this militarized system insisted that bodies were now incorporated within the bureaucratic workings of the man-machine, whose "sublime" force was to be registered as the pre-originary spectre of the United States. Though the man-machine was to a certain extent disembodied, and thus potentially in excess of national borders and affiliations with specific citizens, it was constituted as arriving from the sky at the behest of the U.S. Air Force. The promise of a future human was now tied to an Americanized discourse of biotechnology understood as the deployment of systemic fire power.

The future promise of this Americanized discourse, however, cannot be guaranteed. The sizzling cockpit of the biotechnological hot box is an intestinal, thermo-coiling, vessel of war. Its pilot, at once visible and invisible, is a tailor of its own making, a tightly woven apparition of seams, tracing the planetary turn of the sun-baked sky. Its warpath blazes towards the fleeting horizon of a tomorrow's dawn. For the time being, let's call the scorching integrative force and vanishing traces of this military complex: "United States." But let us also keep in mind that if the hot box of biotechnology is a "node" within the clusters of an emergent military industrial complex, this node is an integration of living-in-general within architectures of fire—and vanishing.

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Dear D—,

Tonight it is so still and quiet I can hear the crackle of hoar frost amassing on my window. Outside there are no footprints, no signs of traffic or plough, no salt, dirt, fallen leaf. Simply the play of crystalline light. The city is on fire.

Your brother in arms

Chapter Four

The Disappearing Body Politic:
The Sublime Archives of Biotechnology

Dear D—,

Early this morning I dreamed of your survival. You were in an old age home or hospital or psychiatric facility—I'm not sure which—sitting with others who were eating or being fed.

I was sitting beside you but slightly away from the table. A visitor whose seat angle would hide or repress any complicity, any blurring of the borders between the inside and outside of the institution—if anyone cared to notice or remember my attendance—I stared at your tapping foot, listening to all the slightly enlarged, fleshy tongues pressing too hard against the back of teeth. Buccal effects were produced throughout the room—a layered clucking, grunting and whispering. The abandonment of words at the dinner table was striking. Speech had been retarded to a molecular commotion on the fissures of swollen, sticky tongues.

I never looked up but one just assumes the appearance of death in this sibilant space: in the skulls of the diners that are draped with flaccid cheeks and slightly oily hair; in the age spots and dry skin patches and bruises on limbs with waning motor control; and in the thinning lips of one resident who can no longer

eat being stroked with an ice cube. The fluorescent lighting, the scuffed tile floor, the wheelchairs, the slippers and bathrobes in various states of deterioration—one just believes in it as one believes in the exterior wall and the doors of the institution.

In my waking state I could not identify the kind of institution in which the dream was taking place. What kind of site had brought you and I together? And what was being instituted? Where? How? The furniture, the electrical outlets at the head of the beds, the various trays and pans, the yellow hazard bins with needles, the uniforms of the staff, the architecture of wards—all seemed so familiar. And yet the place seemed at once to belong to a past time, and ways that our society used to care for us, but also to the future and radically different ways of caring for us. And we were sitting there, with you eating and clucking with the others, all of us somehow surviving.

The questions hang: what is it that continues to bring you and I together? Or are "we" a fading fiction, a half-forgotten dream of mine sent in the form of a letter to one who is no longer here? With you gone, what is it in you that I have lost—or never had?

With affection,

From your lost brother

***

Dear D—,

Since the 1980s a growing number of studies have suggested that most, if not all, people with Down's Syndrome (DS) develop Alzheimer's disease (AD)—and onset begins much earlier than the general population (Whalley et al, 1982; Chandra et al, 1987; Schapiro et al, 1989; Schupf and Sergievsky 2002; Potter 2008). Britain's Down's Syndrome Association claims that "the incidence of [AD] is no higher than in the general population, though it is thought to occur 30-40 years earlier" (Holland 1999). The results of studies vary but Norberto Alvarez's recent review of current literature suggests that 10-25% of people with DS show symptoms of AD when aged 40-49 years, and 20-50% by the time they are in their 50s (Alvarez 2008). In contrast, the U.S. Alzheimer's Association claims that approximately 10% of people 65 years of age within the general population have AD (2005: 8).

How is it that Down's Syndrome gains meaning in relation to Alzheimer's disease? By what means are the two being materially brought together, and what impact does this research have on the relationship between those with DS and those of the "general population" suffering from AD? More pressingly, I am asking, how is our kinship being established within biotechnological networks and regimes?

Initial reports of a higher incidence of AD amongst those with DS were based on a number of post-mortem autopsies that confirmed the presence of plaque and "tangling" throughout the brain—which are the hallmarks of AD. Sample tissues were then distributed to scientists through brain repositories, for example, the Harvard Brain Tissue Resource Center, the largest brain repository in the world, which distributes tissue derived from its over 3,000 brains to

neuroscientists internationally. The majority of its collection consists of brains for studying neurodegenerative diseases like Alzheimer's, and neuropsychiatric disorders like schizophrenia (see brainbank.mclean.org).

Scientists in Hong Kong who are interested in developing diagnostic tools for pre-natal DS testing have begun compiling a specific genomic database for DS. They will be able to cross-reference it with the chromosome 21 database that is part of the Human Genome Project. (DS is the result of having a third 21st chromosome). Scientists studying the relation between AD and DS also accessed genomic databases to help map the location of genes expressing degenerative or "mismetabolising" proteins believed to be the cause of the brain deterioration characteristic of AD. In 1991 John Hardy and David Allsop of St. Mary's Hospital Medical School in London put forth what became known as the "amyloid cascade hypothesis." In this hypothesis they argued that increased expression of amyloid precursor protein (APP), related to genes located on chromosome 21, resulted in the build up of plaques, which would then disrupt synaptic transmissions, leading to the death of tangle-bearing neurons and thus dementia characteristic of AD (Hardy and Allsop 1991).

Many of the actual experiments regarding the expression of degenerative proteins are done on model organisms. While the amyloid cascade hypothesis has been debated and modified (for a review see Tanzi and Bertram 2005), it has nonetheless resulted in numerous experiments using mice genetically engineered to mimic the trisomy seen in DS and to locate, amplify, and increase the expression of the gene responsible for the production of APP (see, for example, Salehi et al 2006, who conclude that increased APP disrupts transport of "nerve growth factor").

If we are to begin to understand how DS gains meaning in relation to AD, we must therefore rethink the question of the body and kinship in relation to the archival networks constituted by the two interrelated but different genetic archives: genome databases and biological "wet" banks, such as brain repositories. It is this heterogeneous yet increasingly integrated bio-archival network that is underwriting the emergence of a different body and different forms of kinship.

In Kinship,

Your brother

***

Genetic Archives and Kinship

Paul Rabinow's description of the shift from sociobiology to biosociality (1992)—mentioned briefly in Chapter One—provides a starting point for a discussion of the relationship between genetic archives and kinship. Following Foucault's identification of modern forms of power as "bio-technico-power," Rabinow says,

> In the future, the new genetics will cease to be a biological metaphor for modern society and will become instead a circulation network of identity terms and restriction loci, around which and through which a truly new type of autoproduction will emerge, which I call "biosociality." If sociobiology is culture constructed on the basis of a metaphor of nature, then in biosociality, nature will be modeled on culture understood as practice. Nature will be known and remade through technique and will finally become

> artificial, just as culture becomes natural. Were such a project to be brought to fruition, it would stand as the basis for overcoming the nature/culture split. (241-242)

According to Rabinow, biosociality is organized around social groups with genetic similarities and shared biomedical needs, replete with "a heavy panoply of pastoral keepers to help them experience, share, intervene in, and 'understand' their fate" (244). Employment, insurance, medical care—all will be increasingly shaped by one's genetic make-up, one's propensity to cancer, hyperactivity, and Alzheimer's disease.

We see Rabinow's sense of a biosociality comprised of a network of identity terms and restriction loci emerging in relation to the extension of prenatal genetic screening for DS. In 2007, for example, the Society of Obstetricians and Gynecologists recommended that all expectant women undergo prenatal screening for DS. Previously this had been recommended for only those over 35. In a position paper, the Canadian Down Syndrome Society (CDSS) called the recommendation discriminatory. They claimed that too many recommendations for screening are not attentive to language and biased against having DS children. In other words, a key point in their protest is that the "pastoral keepers" counseling prospective parents on the genetic aspect of childbirth are using discriminatory descriptions of what it meant to have kin with DS (CDSS 2007).

The prospect of genetic screening prompted the formation of advocacy groups, many of whom were comprised of parents of children with DS, with the goal of intervening in the counseling process. Advocacy group members would meet the prospective parents, counselors, hospital board members and so forth,

often with their DS children in tow. Rabinow would point out how social networks were being formed in relation to chromosome 21. Similar groups have now organized internationally with the aid of the Internet. There is, for example, the European Alliance of Genetic Support Groups, and more relevant to this discussion is the international breadth of the web page for the Japan Down Syndrome Network (jdsn.ac.affrc.go.jp/dowj1-e.html).

The advocacy groups speaking out against the extension of prenatal testing have argued that those with DS go to school, work and got married—just like the general population. The appeals of the CDSS and advocacy groups are therefore made on the basis of equality; they are calls for those with DS to be recognized as fundamentally equal and valuable members of society. In relation to biotechnology, should we not ask the more ontological question: equal to what body? Or to what "human"?

The desire to expunge the DS body from the public sphere and the emergence of international advocacy groups in response reveals the global extent of the normalizing forces put into play by the relevant biotechnological archives. In effect, there is the promise of a healthier body and society—the eugenic promise of better living—premised on the prenatal screening which anticipates the future elimination of DS. But how is it that in spite of all the advances made by DS organizations in Canada, the US and Britain beginning in the 1960s for those with DS to be recognized as human and capable of enriching citizenry, they have nonetheless come to stand for those without a future? In this respect, those with DS are not alone. In 1997, for example, James Watson paralleled the undesirability of the DS child with that of gay children, arguing that if the

technology were developed, parents should be allowed to abort a "gay fetus." *Washington Post* reporter, Michael Gerson recounts Watson's line of thought:

> "If you could find the gene which determines sexuality and a woman decides she doesn't want a homosexual child, well, let her." In the same interview, he said, "We already accept that most couples don't want a Down child. You would have to be crazy to say you wanted one, because that child has no future." (2007: A19)

Gerson reminds readers that Watson's views are not typical of scientists but he nonetheless insists that genetic and prenatal testing produce a eugenic "temptation" that expresses itself in the desire for human perfectability. Gerson, like the CDSS, argues instead for the greater need for human equality.

There are grave limits to a politics that appeals to an ideal of human equality from the haunting position of a figure already behind the genetic screen. First, it is to misread how the phenomenal expansion of biotechnological archives works in relation to bodies and the social body. There are two main types of biotechnological archives that are increasingly global in their operation: wet and informatic banks. Since World War Two, body parts have been collected in tissue banks (often called wet banks, gene banks or "libraries"). We now have brain tissue banks, breast tissue banks, blood banks, umbilical cord banks, sperm banks, and tissue repositories for studying AIDS, Alzheimer's, mental illnesses, and aging. More than 282 million archived and identifiable pathological specimens from more than 176 million individuals are currently being stored in United States repositories. At least 20 million new specimens are added each year (Andrews and Nelkin 4).

Plant germplasm archives are now everywhere. During the 1940s, international agricultural programs initiated by the Rockerfeller Foundation,

private interests, and American funding agencies also began collecting plant germplasm. Initially, their archives focused on maize and corn but later included a broad range of crops. Currently, all fifteen major food crops in the United States, worth over $1 billion annually, depend on germplasm from other countries. Germplasm for corn, potatoes, tomatoes, and cotton comes from Latin America; rice and sugar cane from Indochina; soybeans and oranges from China; wheat, barley, grapes, and apples from West Central Asia (Lehman 1). It is now estimated that 68% of all crop seed, 85% of fetal populations of livestock breeds, and 86% of global microbial culture collections (yeasts, fungi, bacteria, etc.) are archived in industrialized countries (Mooney 23).

The Consultative Group on International Agricultural Research (CGIAR) coordinates 16 food and environmental research organizations that are located worldwide. They contain over 600,000 accessions of more than 3,000 crop, forage, and pasture species (see cgiar.org). They are located in Columbia, Brazil, Costa Rica, Mexico, Nigeria, India, Peru, Kenya, Ethiopia, Italy, Cote d'Ivoire, Syria, the Netherlands, the United States, Sri Lanka, Malaysia, and Indonesia, and they are controlled by the United Nations under the direction of the World Bank.

While the collections of many of these repositories have a specific focus, cell line repositories are becoming increasingly general archival resources that serve a broad range of research programs. The archives function with a totalizing, seemingly heterogeneous horizon content because the essence of biotechnology is to exceed the classical categories of biology and to facilitate the development of the Life Sciences. Thus, within repository systems such as the American Type Culture Collection (ATCC), human tissue is incorporated within the more general economy of molecular biology. The ATCC is a non-profit

repository located in Virginia that boasts "the largest and most diverse collection of microorganisms, cell lines and molecular biology materials in the world" (see atcc.org). The collection includes animal viruses, bacteria, bacteriophages, plant seeds, plant tissue cultures, plant viruses, fungi and yeasts, protozoa and algae, a mammalian gene collection with a focus on humans and mice, and extensive collections of molecular biology materials (clones, vectors, oligonucleotides, membranes, relevant libraries, etc.).

Informatic databases are sites for research directed by bioinformatics, as well as software development. They also underwrite the scientific research produced from matter withdrawn from wet banks. Since the early 1990s, genomic databases continue to be assembled at a feverish rate. These databases are digital architectures that house the extremely long genomic sequences that are established comparatively using model organisms, including humans, e-coli bacteria, the ring worm, the fruit fly, and the mouse. In the case of the Human Genome Project, the genome resides in an international network of computer databases. This network is maintained by the International Nucleotide Sequence Database Collaboration that coordinates three main databases in the United States, the United Kingdom, and Japan. These three databases are the global deposition sites for nucleotide sequence information. They exchange information every twenty-four hours.

According to Eugene Thacker,

> There are currently some 200 such databases online, with more than 500 commercial software packages for sale and a host of noncommercial freeware or pen source projects as well. Aside from genomics databases, there are databases for comparative genomics (genomes of different organisms), disease genome databases, and

> databases dedicated to specific DNA fragments such as singe nucleotide polymorphisms (SNPs) or expressed sequence tags (ESTs). (17)

Furthermore, entire nations are building genetic databases: "Currently Iceland, Singapore, Estonia, Sweden, the UK and Canada are setting up genetic databases that will contain DNA data about a substantial share of their populations" (Waldby and Mitchell 7).

How, then, do we begin to understand "the body" and "social body" in relation to what Thacker describes as the spiraling ways that wet and informatic databases work? And how can we begin to see the screened DS body within such intertwined networks? Can the category of the "human" still provide a self-sufficient category with which to equate the DS body? Or does the term serve as a placeholder for a past possibility and a future promise?

Before all else, the body, the social body and the human—that is, the polity and politics of biotechnology—*take place* in relation to biotechnological archives. Biotechnology is fundamentally, or more accurately, *basically* (as in based on sequences of nucleotide bases), an archival discourse. So how do biotechnological archives work?

Archives of Biotechnology

In their important study of wet banks, Catherine Waldby and Robert Mitchell (2006) demonstrate how the material circulation of "tissue" (used by the authors as an umbrella term for bio-matter such as blood, cells, organs, biowaste and umbilical cords) "has complex and ontological implications for the form of social polity" (10). *Tissue Economies* describes how the "the dichotomy of gift and

commodity" (10) is put into play in the formation of wet banks, and how this dichotomy is reconfigured by both the development of biotechnologies and changes in the legal status of tissues:

> we focus on the place of tissue banks in developing and circulating tissue economies, particularly how they must now adjudicate between the ontological and communal values associated with gratuitous donation, and the market values introduced by the growing role of biocommercial enterprise in developing tissue-based therapies. (27)

To begin their analysis the authors draw heavily on Richard Titmuss' *The Gift Relationship: From Human Blood to Social Policy* (1970), though they believe Titmuss' arguments to be less applicable in the contemporary context. Waldby and Mitchell recall that the history of larger scale blood banking began during World War Two, primarily in the United States, the United Kingdom, and Northern Africa. Giving blood was not only strategic in wartime, it was also "a way for civilians to participate in the sacrifice made by soldiers at the front, to defend the integrity of the nation by giving part of their bodies...[Thus blood donation] is historically associated with the bonds of citizenship and the defense of the nation, an idea which in turn emerges from nineteenth-century ideas equating blood with race and race with national citizenship." Blood banks served the body politic through the discourse of the gift—in this case "the gift of health to an unknown other with whom one has nothing in common other than the shared space of the nation" (2-4).

For Titmuss the gift of health to an unknown other appeals to the "dignity" of the human body, that which keeps the intrinsic and unquantifiable status of the body beyond commodification and price. "Only an unqualified and

unquantified civil generosity, the direct sharing of bodily substance, would adequately maintain the material relations of the welfare state and guard against the dehumanizing, fragmenting action of corporeal markets" (19). The preservation of the gift of blood was for Titmuss a fundamental necessity for a healthy social and economic life—achieved through regulation.

Waldby and Mitchell then describe four significant limitations to Titmuss' appeal. First, they outline the "disjunction" between the ideal, dignified citizenry espoused by Titmuss and the increasingly fragmented nature of biomaterial exchange: "Since the mid-1970s a donated unit has generally been fractioned into a number of components—plasma, red cells, white cells, and platelets—and rarely transfused as whole blood...This form of circulation...indicates a disjuncture between the technical systems for the circulation of blood and the social economies of citizenship [organized as exchanges between individuals]" (22).

The link between biotechnology and citizenry is more apparent with donated tissues, "which are not simply transferred in tact from one person to another, but rather diverted through laboratory processes where they may be fractionated, cloned, immortalized, and multiplied in various ways...So, for example, a single donated embryo may form the starting point for several immortalized cell lines that can be copied, divided, sent to laboratories and clinics around the world, and eventually used to treat an open-ended number of patients" (22). Far from a discrete exchange amongst citizens, tissue transfer is "mediated by biotechnical processes and an institutional complex of tissue banks, pharmaceutical and research companies, and clinics." Furthermore—and this is Waldby and Mitchell's second point regarding the limitations of Titmuss'

efforts to preserve the gift relation in the context of blood donation—the institutional sites of mediation are located beyond the regulatory and geographic bounds of the nation within international networks of exchange:

> Hence the movement of tissues from one body to another is likely to take place beyond the relationships characterized by national citizenship and the body of law and governance that regulates national space. The difficulties of regulating transnational tissue exchange are manifested most urgently in the growth of global black markets for kidneys or corneas from live donors, who sell their body's long-term capacities for cash. (23)

Here, Waldby and Mitchell conjure more fully Rabinow's description of a biosociality of networks formed around biotechnological "identity terms and restriction loci"—a global polity networked with biotechnological archives and infused with the inequitable relations of power between "developed" and "underdeveloped" countries characteristic of capitalism. Within such a biosociality the dignified body is hard to sustain, as the body parts of the poor can literally end up within the bodies of those who can afford them. Instead, the spectres of a more brutal body of violence come to the fore under the rubric of survival.

The third limit that Waldby and Mitchell see in Titmuss' work resides in his Kantian distinction between the dignified body and that which has a price. This distinction reveals itself in Titmuss' adherence to "the English common-law principle that persons do not have a property right in their bodies, and hence cannot sell themselves or purchase another" (23), which fails to anticipate the practice of converting tissue donations into commodities either through sales by receiving parties (hospitals routinely sell tissues to pharmaceutical or cosmetics

companies, for example) or transformed into cell lines or gene sequences and patented" (23). In their analysis Waldby and Mitchell follow the argument of John Frow, who asserts that "gift and commodity are not mutually exclusive modes of transaction, since they tend to have in common certain forms of calculation, strategy, and motivation. The gift therefore cannot and should not be conceived as an ethical category: it embodies no general principle of creativity, of generosity, of gratuitous reciprocality, or of sacrifice or loss" (Frow 1997: 124; cited in Waldby and Mitchell 25). Waldby and Mitchell's fourth point regarding the limitation of Titmuss' work is premised on the socially contingent nature of things that can be both gifts and commodities—and then gifts again, "according to the network of relationships in which it circulates at any given time" (25).

This, then, is their main argument: the polity that takes place in relation to biotechnological archives will do so in time through the contests and interlacing of the gift and commodity exchange. To this they add "the autologous economy":

> Here the donors use the regenerative powers of their own bodies for themselves rather than for others, and use the tissue bank not as a point of redistribution but as a place to set up private tissue accounts to save their tissues for the future. (28)

The main examples offered are blood and stem cord blood banks. I am not convinced that these banks exist outside of commodity exchange, in some pre-capitalist sense of hoarding. Rather, the access to cryogenic matters is the privilege of those who can afford to rent the space for the health of their future selves. I will discuss the problems of these cryogenic fantasies in more detail below. For now I want to discuss some of the limitations of Waldby and Mitchell's central argument.

The authors argue that donations to blood and tissue banks no longer offer the gift of life to a body politic based on the bloodlines of its citizenry and national belonging—as if they ever did. If the constitution of wet banks suggests how we are constituted socially, then we are not autonomous citizens. We need blood, organs, skin and hearts. We need to eat again and again. We desire to live better, or to do ourselves no harm, and we are getting older. Friends are dying or have died. We are exposed, if not subjected to bodily violence. As Judith Butler argues,

> This means that each of us is constituted politically in part by virtue of the social vulnerability of our bodies—as a site of desire and physical vulnerability, as a site of a publicity at once assertive and exposed. Loss and vulnerability seem to follow from our being socially constituted bodies, attached to others, at risk of losing those attachments, exposed to others, at risk of violence by virtue of that exposure. (Butler 2004, 20)

Biotechnological archives insist that our bodies are socially constituted—both materially and symbolically—as vulnerable and anticipating loss. Socially constituted, we are always already losing our bodies to others.

Blood banks make this loss more apparent. If the dignified and thus ethically transcendent body arises from the gift of blood, the transfusion of that bloody supplement marks a passage that moves arterially in and between bodies but which arrives, at the same time, from outside what we know as "the body" altogether. This means we cannot claim to be materially discrete but also that our relation to others is marked by secretion. The passage of this secretion between the inside and outside of the body, and our transfusion with it, suggests that conceptually we must submit to a transformation, the extent of which we cannot

know in advance. Not knowing the state of our vulnerable bodies is the viral risk of blood transfusions. Bloody secretions constitute the body of a secret, unknowable state, both materially and conceptually. Socially vulnerable, the concept of the body is always already tenuous—if not unfathomable—before a transfusion takes place. But between what? Vulnerable "leaky bodies" (Shildrick 1997)? Ultimately, Titmuss' effort to salvage human dignity is just that, a salvage operation that represses, rather than corresponds with, the secreting, already fragmented tissues constituting the polity.

Waldby and Mitchell, however, in their discussion of the "embryonic gift" and the creation in the United Kingdom of the Stem Cell Bank, a centralized state-run stem cell repository, do point out the direction of how a polity is taking place:

> The bank should also militate against some of the problems of imagined community presented by the dispersed nature of the stem cell economy. The bank cannot provide an absolute sense of destination, nor can it be the final recipient of the embryonic gift. However, it will provide a stable location for the master cell banks that will generate working cell lines, and a public site where the various possible uses of the tissue will be adjudicated according to principles of public interest and donor protection. In the words of the Medical Research Council guidelines for managing human tissues, the bank can be the custodian of donated material. (79)

The argument appears to be that the physical location of the master cell banks will provide a stable site for the distribution of working cell lines in the public's interest. "The bank," we are told, "should also militate against *some* of the problems of imagined community presented by the dispersed nature of the stem cell economy."

The authors are, however, describing the international distribution of embryonic stem cells: those cells with the potential to develop into more specialized cells, such as muscle, blood, nerve, or bone cells. According to the U.S. National Institute of Health, the most important use for stem cells are cell-based therapies that, if developed, would use stem cells as a renewable source of replacement cells and tissues to treat diseases, including Parkinson's and Alzheimer's diseases, spinal cord injury, stroke, burns, and heart disease (see stemcells.nih.gov).

The use of human embryo cells in research has been a lightening rod for debates concerning the proper limits of the body. The research, for example, is opposed by those that believe human embryos are human lives, and thus entitled to protection. The thought of stem cells passing through various international sites without "an absolute sense of destination" (both geographically through the involvement of third parties and materially) surely always already makes the quest for a rigorous definition of "humanity" vulnerable. So too are any discrete notions of the individual, family, citizenry and national body. Such a state raises a problem of governance and order.

Waldby and Mitchell emphasize that the Medical Research Council will act as the custodians of the archive and enforce the "public interest." What this means is no longer clear, but the state of things suggests that the "public interest" will be to an (un)certain extent arbitrarily determined, that is, bio-technological as opposed to natural, or more accurately, bio-hypothetical. As for the promise of donor protection, the figure of the donor is always already secret in relation to the biotechnological archive.

How, then, is it that the custodians of biotechnological archives enforce order and establish a stable site for the public interest? How is it that they deploy what Jacques Derrida has described as the power of *consignation*? Derrida:

> *Consignation* aims to coordinate a single corpus, in a system or a synchrony in which all the elements articulate the unity of an ideal configuration. In an archive, there should not be any absolute dissociation, any heterogeneity or *secret* which could separate (*secernere*), or partition, in an absolute manner. (1995a: 3)

Two questions arise. How do the custodians order and interpret the archive, despite "the problems of imagined community presented by the dispersed nature of the stem cell economy"? And how do the politics of the fundamentally archival discourse of biotechnology take place? According to Derrida,

> This question [of the politics of the archive] will never be determined as one political question among others. It runs through the whole of the field and in truth determines politics from top to bottom as *res publica*. There is no political power without control of the archive, if not of memory. Effective democratization can always be measured by this essential criterion: the participation in and the access to the archive, its constitution, and its interpretation. (4, fn.1)

To cite Waldby and Mitchell again, the circulation of tissue "has complex and ontological implications for the form of social polity."

Paradigm Shift: Towards a Sublime Object of Biotechnology

According to Harvard biologist, Walter Gilbert, there is one type of biotechnological archive that provides the basic order for all others. In 1991 the Nobel Laureate published a one-page manifesto in *Nature* whose rhetoric drew from the language of Thomas Kuhn to herald a radical "páradigm shift" in

biology (Gilbert 1991; also see Kuhn 1962). Through a detailed discussion of this brief manifesto, we begin to see the cultural and biological contours of Gilbert's description of the paradigmatic archive of biotechnology. This paradigm shift not only anticipates the coming of a new biology, it also perpetuates the priority of Western thought through phenomenal violence.

In his manifesto Gilbert describes the new theoretical biology as displacing the paradigm of biology that begins with experiments focusing on questions of biological function:

> [I]n the current paradigm, the attack on the problems of biology is viewed as being solely experimental. The "correct" approach is to identify a gene by some direct experimental procedure—determined by some property of its product or otherwise related to its phenotype—to clone it, to sequence it, to make its product and to continue to work experimentally so as to seek an understanding of its function.
>
> The new paradigm, now emerging, is that all the "genes" will be known (in the sense of being resident in databases available electronically), and that the starting point of a biological investigation will be theoretical. An individual scientist will begin with a theoretical conjecture, only then turning to experiment to follow or test that hypothesis. (99)

When Gilbert describes biology as moving *towards* a paradigm shift, he suggests that biology is in the process of exceeding itself. *In theory*, biology is more than biology and never self-identical to itself. Even now that the first working draft of the Human Genome Project has been published, a new paradigm is yet to emerge:

> We find it humbling to gaze upon the human sequence now coming into focus. In principle, the string of genetic bits holds long-

> sought secrets of human development, physiology and medicine. In practice, our ability to transform such information into understanding remains woefully inadequate (IHGSC 914).

Thus biology is becoming primarily theoretical at the same time that biologists lack theories to give meaning to the "string of genetic bits [that] holds long-sought secrets."

Richard Doyle offers a reading of Gilbert's description of the movement from a functionalist biology towards a speculative biotechnology. More than a faithful comprehension, Doyle's psychoanalytic reading effectively animates and amplifies Gilbert's heralding of the new paradigm. It is as if in his amplification of Gilbert's enthusiasm for a theoretical biology Doyle the theorist comes across as perceiving the true object of biology more clearly than the Nobel Laureate. This is not to say that Doyle understands biology better than Gilbert. Rather, I am suggesting that we, like Doyle, take seriously Gilbert's claim that biology is becoming primarily theoretical. In his reading of the manifesto, Doyle argues that in between the paradigm shift that Gilbert describes biological bodies disappear:

> Phenotypes, bodies, have disappeared as referents for the sequence of nucleic acids, which have themselves become "all there is." The new biology, Gilbert writes, will be dominated by "theoretical conjecture" and "interpretation of sequences." (22-23)

Within the new paradigm, Cuvier's furnaces of life have been scattered into information bits and biologists are left to theorize disembodied data.

From this point on Doyle's reading will attempt to reconcile the two different demands of the discourse of biotechnology. First, there is the structuralist demand of the informatics systems that store DNA sequences. Both

Gilbert and Doyle comprehend this network as "the total knowledge" of organisms. This "totality" is "disembodied" and organized by the internal logic of electronic databases in which information bits have meaning only in relation to each other. It is the network itself of sequencing information, a totality that includes the databases of private companies such as Celera Genomics as well as those of the international consortium, the Human Genome Organization. The structuralist demand of biotechnology requires that we see this global architecture of data as a plenitude of sequences divested of force. Disembodied, these genetic sequences are no longer determined; they escape the prison of natural history's taxonomies and the enslavement of functionalist biology.

Second, there is the genetic demand of the discourse of biotechnology. The genetic demand requires the search for a body as the genesis and basis of the structure. We see the effects of this demand in the Human Genome Project in Doyle's search for the missing body of biotechnology. From the beginning Doyle resists the difference between the originary bodies and DNA databases and instead he looks to reconcile them. In his search for an originary body Doyle organizes his quest in relation to models of perception. He desires somehow to see the bodily source of the DNA sequences. Initially, Doyle's quest fails. In the new biotechnological paradigm, he tells us, biological bodies have disappeared from sight. Here, however, in the space of this initial failure to perceive, Doyle posits a symbolic body, what he calls "the new sublime object of biology." The critical and decisive point is that, at the sublime vanishing point of the failure of vision, Doyle institutes an already given objective body that provides the basis for a psychoanalytic reading of DNA bases.

Doyle argues that the sublime object of biology is "visibly invisible in two ways." First, it is a memorial object. Genes are themselves databases—literally data bases—that register a history of inheritance. Thus a genetic sequence harbours "a memory of a body, a body of memory that functions as a repository of the 'past choices of its ancestors'." Doyle describes the memorialized body stored in data as "postvital":

> While the modern body of the organism announced, through its character and anatomy, the deep unity at work in its depths ["life"], the postvital body is a memorial. It is a site of the memory of the modern body, where the characteristics and the behavior of organisms can be found. If under the modern regime life, hidden in the body, was "perceptible beyond disease," the postvital body is a transparent sequence that has nothing behind or beyond it. (13)

The postvital body, however, does not reconcile but instead maintains the difference between the genetic and structuralist demands of biotechnology. The databases that store the postvital body archive its generative, genetic documents that register a history of "past choices" but they neutralize their meaning: "the postvital body is a transparent sequence that has nothing behind or beyond it." Present and absent, visible and invisible, the postvital body, what Doyle will later call a "cryonic" body, maintains both the generative and structuralist demands of biotechnology as a cryonic state, a distant memory of a body waiting to be brought back to life. In between paradigms, the postvital body is a flickering ghost in the machine.

The second way that the sublime object of biology is "visibly invisible" is that it is nothing, and "while it may be 'no-thing', it nonetheless has its effects as

a virtual object. To explain the operation of this "no-thing," Doyle turns to Slavoj Zizek's Lacanian account of the sublime body.

The sublime body is "a fantasy in which there exists a 'body within the body' that resists the cycle of generation and corruption"(21). Zizek's example of the sublime body comes from the feline cartoon character, "Tom," the suffering half of the duo, "Tom and Jerry."[1] Though the cat's body is repeatedly destroyed in every episode, it is repeatedly resurrected for the next one. Zizek argues that the cartoon negotiates what Lacan describes as the difference between two types of death: biological and symbolic. Tom's biological body is repeatedly destroyed, but the death of his symbolic body is deferred, "maintained by the techniques of animation and rhetoric that keep the cartoon going and keep 'Tom' alive." There is the episodic story of Tom's biological body and there is the ongoing narrative of the cartoon that maintains his symbolic body. Tom's indestructible symbolic body exists within the biological body of Tom in that it *informs* his character. But it also exists beyond the frames of what we see, in the spaces in which Tom's biological body is restored.

Doyle establishes a parallel between the death of "life" in "Tom and Jerry" and the death of "life" in molecular biology:

> Beyond each fragment or frame of a narrative is a story that moves, and this "beyond," that which exceeds any individual fragment, is the site of the sublime object. In the case of Tom, this object is an indestructible body that returns "between" frames. In molecular biology, the end of the grand narrative of life, the "death" of life is

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[1] For Zizek's account of the sublime body and his reading of "Tom and Jerry," see Slavoj Zizek, *The Sublime Object of Ideology* 134-135.

> overcome through a new story of information, in which a sequence of "bits" is strung together or animated into a coherent whole through the discourse of "that is all there is," a story of coding without mediation or bodies. Thus we read in Walter Gilbert's "Towards a Paradigm Shift in Biology," "Molecular biology is dead—Long live molecular biology." (22)[2]

Doyle's argument is that, within Gilbert's paradigm, biologists engage first of all with a totality of lifeless, disembodied data. However, because these worldwide databases maintain "all there is" to know about organisms, they maintain the symbolic body of biology as a sublime object—within their networks and on the horizon of future possibilities.

The sublime object of biotechnology is not information itself but rather, the horizon of a symbolic body that is yet to return. This sublime body is maintained in the network, in the inter-spaces (between the "frames") of global informatics systems. Thus when Doyle reads the header of Gilbert's manifesto, "Molecular biology is dead—Long live molecular biology!" he sees the "—" as a mark of the sublime body whose resurrection biotechnology ceaselessly moves towards:

> While some biologists mourn the loss of their old paradigm in a malaise, longing for the mediations of phenotype and behaviour, Gilbert calls for a new basis of narratives, one that finds new density and inspiration from the "nothing" behind the massive, complete knowledges found in databases of information. This nothing is certainly no thing; rather it is a network of hardwares,

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[2] The quotation that Doyle attributes to Gilbert is from a header to the essay that was most likely written by an editor at *Nature*.

> wetwares, and softwares that reconstitute the sublime object of biology at the mark of "—." (23)

While disparaging the boredom and malaise of "some biologists" as signs of a misguided nostalgia, Doyle celebrates Gilbert's new paradigm as "not simply a progressive shift" but also "a displacement of the very terms of an 'understanding' of 'life'":

> ... insofar as life becomes identified with genetic sequences and their translation, it becomes distributed, situated not within the sublime, sovereign interior of organisms but in and emerging from the strong readings proffered by theorists and their tools. The effects of a network of tools, rhetorics, and work, "life" is not some transcendental object, some "thing" that is "studied." Rather, the biological object, the postvital organism, is in the position of a cryonic body, dependent on the network of technologies, people, and narratives in order to fulfill its promise of a life it has dislocated. (24)

For Doyle "biosociality" is organized around a cryonic body whose "shepherd" practices the reading/writing, cut/paste/copying of biotechnology. The biological object, the "postvital organism," depends for its resurrection on the readings of biologists grappling to animate the cryonic codes of "all there is to know." The future biologist of the new paradigm of biology is, like Doyle, a postmodern literary theorist.

There are grave reasons to be concerned about Doyle's postmodern literary theory, not least of which is its fascination with and celebration of biological death. I will suffice myself here to simply point out that 1) Doyle's description of animation is that of a flip-book as opposed to other animation technologies including digitalization; 2) a certain childhood nostalgia is at work

in Doyle's use of "Tom and Jerry," a nostalgia that imbues biotechnology and disembodiment with a trope of innocence, and a technical purity which make possible his discussion of the sublime.

Doyle himself delimits the field of his theorization:

> I forget, for example, the history of (extra-rhetorical) instruments, the history of funding, the history of scientists. Such exclusion cannot, and should not, be overlooked; it is in fact an integral part of my analysis to foreground the irreducibly contingent and appropriative nature of historical analysis, indeed of narrative in general, including my "own." This violence extends to a silence regarding the irreducibly raced and gendered "nature" of the discourse under discussion here, a silence I deploy not because I find the gendering or racing of molecular biological unimportant but because I am looking for the rhetorical possibility conditions of race and gender in their current and emerging configurations. (8)

Such a marking of limits is a delimitation to the extent that Doyle suggests his theory engages with the fundamental structures from which the entirety of social possibilities emerges. Here Doyle's theory parallels a certain biological determinism whose rhetoric helped forge the financing of the Human Genome Project. Doyle's search for the "body" of biotechnology is in concert with what Gilbert, in his search for the "total knowledge" of an organism, referred to as a quest for the "Holy Grail" (see Gilbert 1992: 83-97).

Doyle's search for the "body" of biotechnology is, like the Human Genome Project's search for what Daniel J. Kevles and Leroy Hood call the "code

of codes," *visionary*.[3] The structure of his essay is forged on the initial failure to perceive a biological body ("phenotypes, bodies, have disappeared as referents for the sequence of nucleic acids"). His goal has been from the beginning to unveil the "secret" site of the absent body. What Doyle finds is the trace of nothing. Before embarking on his description of the sublime object, he tells us: "I now want to trace out the shape of this nothing, because while it may be "no-thing," it nonetheless has its effects as a virtual object" (21). Because the body has disappeared, we only experience or maintain it virtually in our psyche as what Doyle describes alternately as a sublime object, a symbolic body, or a cryonic body whose meaning has been frozen.

The secret site of the body that has disappeared, however, remains beyond any psychological orders. Nonetheless, the prototypical body has an objective status that is registered as an intentionality that comes from an unlocatable secret space, a concrete intentionality that produces the virtual effects of a body. This is why Doyle describes the biotechnological body as "no-thing." If biotechnology is, as Gilbert suggests, primarily theoretical, that theory has a history: the history of phenomenology.

The history of phenomenology begins with the loss of meaning. In this case, the loss of meaning in relation to the totality of sequences (ATTCGAGGG...) concentrates our vision on "the body." This concentration of vision (Doyle tells us that historical contexts are not part of his focus) on "the

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[3] Kelves and Hood use the phrase "the code of codes" as the title of their important anthology of essays on the Human Genome Project. See Daniel J. Kevles and Leroy Hood eds., *The Code of Codes: Scientific and Social Issues in the Human Genome Project* (1992).

body" posits *it* as the singular, historically pure, sublime object that makes the database possible and whose absence threatens its meaning.

We see this concentration of bodies into one in the Human Genome Project's quest to sequence a prototypical "body." The U. S. Department of Energy which, along with the U. S. National Institute of Health, spearheaded the Human Genome Project reports where we read:

> The human reference sequence will not represent an exact match for any one person's genome. In the Human Genome Project (HGP), researchers collected blood (female) or sperm (male) samples from a large number of donors. Only a few samples were processed as DNA resources, and the source names are protected so neither donors nor scientists know whose DNA is being sequenced. The human genome sequence generated by the private genomics company Celera was based on DNA samples collected from five donors who identified themselves as Hispanic, Asian, Caucasian, or African-American. The knowledge obtained from both efforts will be applicable to everyone because all humans share the same basic set of genes and genomic regulatory regions that control the development and maintenance of their biological structures and processes.[4]

We will discuss below the Department of Energy's deracinating and gendered claim that the sequence of the prototype is applicable to everyone in the human race. Here, the point is that the Human Genome Project's ahistorical, absent prototype of a "human" concentrates our vision not on "the body" but rather, on what Doyle calls the "secret" site of molecular biology (11).

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[4] This information is derived from the U.S. DOE's web site. See http://www.ornl.gov/hgmis/faq/seqfacts.html#whose

The "secret" site is the pure space that harbours the pure body we can no longer see. For Doyle it is the "—" between paradigms. For Gilbert it is the cup of the Holy Grail. For molecular biology it is the "genome." In theory, this space in its purest form is beyond history. It is the purest space from which history emerges. It is historicity itself, telos, or what Derrida calls "structurally genesis itself" (1978: 167). Within this site the totality of sequences—the genome—is neither an archival architecture that houses the genes that generate organisms, nor is it a meaningless vessel that disembodies organisms, leaving them in bits. Instead, the secret site of the genome is a pure labile force that maintains the difference between the genetic and structural demands of the discourse of biotechnology. This pure labile force announces itself unceasingly to the genome, but it is always deferred by the historic antagonism between the structuralist demand for disembodiment and the genetic demand for an originary body. The pure body of biotechnology is always about to be; that is, the prototypical body is *virtual*.

In its quest for a pure, prototypical body, the sublime aporia of the paradigm shift of biology is dangerously suggestive of a eugenics movement. In this system the pure body gives itself to be thought in the disjunction that separates two forms of recollection. It is a gift that negotiates the gap between an interiorizing memory, which permits the pure body politic to dream of absorbing other cultures into itself, and a thinking memory, which situates the pure body in relation to a set of other cultures which it cannot interiorize. The difference between these two forms of recollection manifests itself in the work of mourning.

As Freud suggests, "the work which mourning performs" is a process of interiorization by which we take the departed other, almost always the dead, into

ourselves in order to psychically prolong our relationship to the lost object. Mourning gives us time to loosen our "memories and expectations" of that object "bit by bit" until "respect for reality gains the day"(1984, 11: 253). According to Doyle, living in the new paradigm of biology is to belong to a database of sequences—an electronic archive that only makes sense to the extent that it stores within it the memory of an organism that has been disembodied and turned to bits. It is as if the thought of biotechnology ironically thinks "life" as a sublime act of mourning. In the age of biotechnology we interiorize the idealized memory of "the body." Eventually, our memories and expectations—both personal and socio-political because "the body" is the basis of liberalism and representative democracy—begin to erode "bit by bit" in relation to the pure totality of sequences and the practices of genetic engineering. Respect for reality is here equated with the ex-citement of a sublime technocracy.

This interiorizing memory is contrasted with a memory that is oriented towards the approach, rather than the departure, of the other. Once the idealized memory of the departed body is interiorized, the departed no longer exists except within us. This raises a problem because, when understood as an idealizing interiorization, mourning requires that the "self" provide an enclosure where the other's existence can be prolonged until mourning has done its work. But the enclosed self that holds the interiorized other constitutes itself only in relation to an other who is never interiorized. The enclosed self that makes mourning (interiorizing the departed) possible is also the condition of its impossibility (the enclosed self by definition requires an other who has not been internalized).

The only way that mourning can work is by grieving for an other who has yet to be disembodied and turned to bits. Mourning begins early, before the disembodiment actually happens. The self builds its self-enclosure in relation to others who are mourned but not yet de-parted and disembodied—in this case in relation to cryonic bodies that are virtually about to be disembodied. The disembodiment of others remains outstanding and it is their unpaid debt.

The Example of the *Hibakusha*

The initial living-dead subjects of the Human Genome Project were *literally* produced through the dropping of the bomb. According to Cook-Deegan, the Department of Energy's plans for a human genome project "spun off from an effort to study changes in DNA wrought in the cells of the atomic bomb survivors known in Japanese as the *hibakusha* ('those affected by the bomb')... The history of the genome project is linked to an attempt to determine if there would be a final, genetic wave of effects from bomb exposure" (93). Notably, the DOE study was confined to information collection and not to addressing health needs.

> Specifically, investigators wanted to assess the *frequency* of inherited mutations caused by exposure to the atomic bombings. Those exposed to the bombings suffered through many *phases* of radiation effects. Many people were vapourized, burned to death, or otherwise killed immediately by the bomb blast. Among those who survived the first hours, many died of radiation sickness that killed cells in the immune system, skin, and intestinal lining... A few years later, a *wave* of leukemias passed through the *hibakusha*. After a decade, they began to show somewhat *increased rates* of

> cancer in the breast, thyroid, gastrointestinal tract, bone marrow, and other tissues. (93-94)

The living-dead were to pay their debts to the future of the species—eventually. The *hibakusha* paid through the event of the dropping of the bomb but also through the event by which the pure labile force announces itself unceasingly to the genome. This latter event continuously converts the disembodiment of the *hibakusha*, that is, their dying, into their value. The pure force is marked by the investigators' concentration on questions of "frequency," "phases," "waves," and "increased rates." Amidst the suffering of Japanese people, the DOE biologists theorized about the prototypical "genome" by marking time.

The enthusiasm of the DOE for the Human Genome Project has been well documented. The DOE's bio-archival research collected from the "survivors-about-to-die" is the historical basis for its continued interest in genetics and biotechnology. The Department's Manhattan District Project was a key initiator of the Human Genome Project, even converting labs, such as those at Santa Fe, towards genetic research. The interdisciplinary organization of the DOE's labs provided a model for the Human Genome Organization (HUGO). And DOE's involvement was also a plus for its tarnished public image. Mark Bitensky, a physician at the Los Alamos National Laboratory responded to the proposal of a human genome project by referring to J. Robert Oppenheimer's famous quote from the *Bhagavad Gita*, uttered upon the explosion of the atomic fission bomb test at Alamogordo, New Mexico: "Oppenheimer's statement 'I am become death, the Destroyer of Worlds' gives way to 'the National Laboratories are become the ultimate advocates for the understanding of human life'" (cited in Cook-Deegan 97). The sublime object of biotechnology was born.

The anticipation of the death of others is an integral part of the Human Genome Project. To aid in the achievement of its goals, the Human Genome Project is also interested in characterizing the genomes of "model organisms" such as e-coli bacteria, yeast, roundworms, fruit flies, laboratory mice, and indigenous peoples. As Pat Roy Mooney points out,

> As part of the Human Genome Project...a Human Genome Diversity Project has been established to collect and "immortalize" the DNA of between 10, 000 and 15, 000 indigenous peoples from approximately 722 indigenous communities. Identified by the project as Isolates of Historic Interest (IHIs), the samples will be collected and stored in the American Type Culture Collection in Rockville Maryland (USA) where they will be studied for not only their historic significance but also their commercial pharmaceutical properties. (45)

What makes these "target" populations Isolates of Historic Interest is not only the genetic isolation but also the assumption that their isolation and way of life is eroding in the contemporary unfolding of modernity. They are of historic interest in that their biological value, like the *hibakusha,* is established in anticipation of their passing away.

These are some of the anticipated deaths that are concentrated in the mournful memory of "the body" marked by the "genome." The Department of Energy's claim that the prototypical human genome will apply equally to the whole human race has been discredited repeatedly and accused of being an ideological as opposed to a biological construct. We might call this ideology, "American Type Culture Collection." Harvard University's Alexander Agassiz Research Professor, Richard Lewontin, and professor emeritus of biology at Harvard, Ruth Hubbard, have repeatedly raised concerns about the ways in

which the Human Genome Project theorizes the operation of DNA abstractly, that is, outside of the metabolic operations of the cell. Hubbard argues that precisely because the relationship between genes and traits is site-specific, a "prototype" does not make sense. She suggests that studies should be done on a case by case basis (Hubbard and Wald 54-55).

Lewontin has long been an outspoken critic of genetic determinism (see 1991, 1994). He argues that sequencing is more descriptive than explanatory and that sequencing projects are ideologically as opposed to scientifically driven. Here is his response to the narrative of the Holy Grail that organizes much of the rhetoric of the Human Genome Project:

> The problem with this story is that although it is correct in its detailed molecular description, it is wrong in what it claims to explain. First, DNA is not self-reproducing; second, it makes nothing; and third, organisms are not determined by it.
>
> DNA is a dead molecule, among the most nonreactive, chemically inert molecules in the living world. That is why it can be recovered in good enough shape to determine its sequence from mummies, from mastodons frozen tens of thousands of years ago, and even, under the right circumstances, from twenty-million year-old fossil plants. (2000: 141-142)

For Lewontin the belief that DNA is a blueprint or master molecule of the body "transfer[s] onto biology...the belief in the superiority of mental labor over the merely physical, of the planner and designer over the unskilled operative on the assembly line" (143-144).

Lewontin's description of DNA as "a dead molecule" is very different than Doyle's description of the sublime object of biotechnology as a "cryonic" body. Doyle's theory will not let go of the dead. He tries to preserve them in

memory. There is a memory of *the* lost body but it has been frozen and made cryonic within the totality of DNA sequences that the biologist must, first of all, theorize. Only *after* this frozen network has been theorized will these cryonic bodies breathe the fire of life. For Doyle, then, the international network of databases is not without meaning but rather, it is haunted by meaning and culture. As Derrida suggests,

> This state of being haunted...is perhaps the general mode of the presence or absence of the thing itself in pure language. The pure language that would be housed in pure literature, the object of pure literary criticism. (1978: 5)

Doyle's visionary, postmodern literary theory dreams of a pure memory of a pure body, the "thing itself" housed in sequences that he understands as the pure matrix of a language waiting to be born—not dead DNA. The anticipatory dream of such a sublime birth, however, requires the nightmare rationalization of eugenics.

It is the anticipation of a sublime body, an anticipation driven by the dream of a pure text, the ACGT of the infomatic, post-vital body that is normalized by the discourse of biotechnology. The culturally monolithic force of this normalized anticipation is eugenic, and it is repeatedly defended as a right. It is right and one has, above all else, the right to freely act on the *terra nullius* of the textual body that constitutes post-vital genomics. This defence of freedom is the spirit that underwrites the discovery of the New World.

Eugenics and the violence of eugenics are repressed by the dream of the postvital because violence cannot kill that which is already postvital, the haunting shadows behind the genetic screen: the *hibakusha*, fetuses and those

living with DS, "gay fetuses" and those living beyond the frames of the heterosexual imperative, indigenous peoples—all of those who cannot be mourned because they are, within the archives of biotechnology, yet to be born. And yet survivors refuse to die and gays, those with DS, and indigenous people keep being born. The violence of biotechnology's archival system must therefore continually renew itself. The mode of this renewal is the force of anticipation itself, and this anticipation for the new world disseminates violence through every aspect of the biotechnological field, defending it as a right.

Chapter 5

The Marks of a Proper Intellect:
Intellectual Property Rights and the Staging of *Diamond v. Chakrabarty*

Dear D—,

I have been reading through my newspaper clippings this morning. It is such a messy pile, constituted by fragments of various size and stock, some folded, some not. I used to have several folders organized by topic. There was one that had to do with biotechnology and agriculture, another was focused on biomedicine, and still another on the Human Genome Project. Several years ago, as the sprawl and interrelatedness of biotechnology expanded, I stopped trying to organize them. I am tempted to start a new folder every six months, and write the start and end dates on the subject line. It is as if the governing principle of my thinking regarding biotechnology is being normalized by an increasingly monolithic temporality. I feel its force. What's next?

This temporality has to be resisted but it is difficult when the media is fixated on instrumental understandings of biotechnology, delivering news of the latest technological development. Ethical debates come to be structured by the opposition between the seemingly arbitrary development of new technologies and the desire to legally constrain them. In this opposition the subject of debate is reduced to a species of the familiar question: whether the greatest freedom is

derived from an unfettered human will or the constraint of just laws. The ethical choice boils down to whether we should respect the right to freely push on blindly with biotechnology or, what amounts to the same, to fight helplessly against its arrival, cursing it as a blight against "humanity." In both cases technological production, understood as the inventive procurement of a means to an end, is essentially what it means to be Man and is the essential expression of his freedom. As a consequence the actual ethical debate is limited to a discussion of the extent of checks and balances against the will to technological production—a debate that assumes in advance and normalizes the autonomy of the human subject before the law, and therefore fails to recognize the ethical responsibility towards others. It all gets quite complicated, I know, but let me try to unravel the intellectual knot.

With affection,

Your brother

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Corporeal Vulnerability, Genomic Interrelationships

We can begin with Judith Butler's call to heart that we attend to the passions by which are bodies are *socially* constituted and *not* autonomous:

> [M]ost of the time when we hear about "rights," we understand them as pertaining to individuals [or corporations, which are accorded the rights of individuals]. When we argue for protection against discrimination, we argue as a group or a class. And in that

> language and in that context, we have to present ourselves as bounded beings—distinct, recognizable, delineated, subjects before the law, a community defined by some shared features. Indeed, we must be able to use that language to secure legal protections and entitlements. But perhaps we make a mistake if we take the definitions of who we are, legally, to be adequate descriptions of what we are about. Although this language may well establish our legitimacy within a legal framework ensconced in liberal versions of human ontology, it does not do justice to passion and grief and rage, all of which tear us from ourselves, bind us to others, transport us, undo us, implicate us in lives that are not [our] own, irreversibly, if not fatally. (24-25)

In effect, Butler calls for an ethics of corporeal vulnerability which, like the desire for autonomy, is an "ongoing *normative* dimension of our social and political lives, one in which we are compelled to take stock of our interdependence" (27). As Butler points out, even before we are understood to have a formed will our bodies are implicated with others whose proximity we did not choose. Butler thus asks,

> If I build a notion of "autonomy" on the basis of the denial of this sphere of a primary and unwilled physical proximity with others, then am I denying the social conditions of my embodiment in the name of autonomy? (26)

Butler's question can surely be asked in relation to biotechnology and the ongoing formation of its increasingly interrelated genomic databases that are underwriting the discourse of biotechnology.

Genomic interrelatedness is, to use Butler's phrase again, "an ongoing normative dimension of our social and political lives." Since Frederick Sanger's announcement in 1977 of the first DNA sequence—of the phi-X174 virus (Sanger

1977)—the genomes of yeasts, the cresslike *Arabidopsis*, and the roundworm *Caenorhabditis* have all been mapped. According to Evelyn Fox Keller, as of 2000, the genomes of more than 25 microbial organisms had been completely mapped (Keller 2000: 4). The first draft of the human genome was jointly announced via satellite from the White House and Downing Street on June 26, 2000.[1] Still more recently, mouse, dog and mosquito genomes have appeared on the pages and web pages of the respected scientific journals, *Science* and *Nature*. The Roslin Institute—of Dolly fame—is especially interested in livestock and has collaborated with other labs to map the genomes of poultry, sheep, cattle and pigs.

Genomic interrelatedness makes evident that the unthinkable nature of biotechnology is put into play by the two normative aspirations identified by Butler: the desire for autonomy before the law and the vulnerable, always already secreted socio-political body. A vulnerable body politic and biosociality, argues Butler, is attentive to hierarchies of grief. Always cautious of the limits of an unthinkable biotechnology, I have tried to show the inequitable distribution of violence and death within the three modes by which an unthinkable biotechnology takes place: the furnace of eating, architectural incineration, and feverish archiving.

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[1] The first draft of the human genome sequence was ultimately completed by means of a tense "collaboration" and contest between 1) the Human Genome Project, led primarily by both the U. S. National Institute of Health and the U. S. Department of Energy, and 2) the biotech company, Celera Genomics, founded by Craig Venter. The Human Genome Project's sequencing and commentary were published on February 15, 2001, in *Nature*. See IHGSC (2001). Celera Genomics' sequencing and commentary were published on February 16, 2001, in *Science*. See Venter et al (2001).

These three fiery modes of biotechnology have as their effect the incorporation of *zoe*—bare life, or life itself—into an anticipatory *bios*—the form or way of living proper to an individual or a group (see Agamben 1995: 1). For Agamben the ongoing incorporation of *zoe* into an anticipatory *bios* is fundamental to the development of the modern state, which is increasingly dedicated to the efficient and technological management of life itself at the expense of attending to vulnerable social relations. As a result, the *bios* has become dehumanized and more concerned with the vested rights of its citizenry than the rights of Man.

The incorporation of *zoe* or "life itself" in state forms also operates on a planetary scale, as the rights of its citizens are translated into intellectual property rights (IPR), which in turn convert living beings into a *terra nullius,* or standing-reserve, or bioinformatics archive that awaits the coming of the future inventive mind capable of reconstituting them in a new world order, an order in which property ownership becomes sacrosanct. However, the arrival of this inventive thinker is staged as coming from a *future* order, and is thus conceived as a post-human, or other-biotechnological-Man, a "human" that exceeds the ontological limits of what we currently understand to be a human. Given his status, his coming is repeatedly theorized as a libidinal force, a sexual energetics that is conflated with the essential spirit of becoming self-conscious, of Man realizing himself. And as a coming his arrival is conflated with the force of historicity itself. The entire ecobiome is thus reduced to a phenomenological opening of time for the coming other-biotechnological-Man, a movement towards instantiation within which current lexicons operate as *place holders*—because they are held in the movement towards their being exceeded.

My argument is that the coming future order of biotechnology, legalized through the institution of new copyright practices, is constituted as a sacrificial structure. To make this argument thus far I have followed the etymology of the word, "biotechnology." The first time the term was invoked, in 1917, Ereky used it to describe the workings of a massive pig farm within a broader plan to better feed members of the Hungarian state—especially soldiers. Ereky's use of "biotechnology" to describe the metabolic rationalization of the nation-state was explicitly linked to his goal of transforming Hungary into a modern state. I argued that his use of the term should be thought more broadly in relation to the constitution of the modern state through what Foucault called "biopower" and its transformation of the discourse of sexuality. Biopower, according to Foucault, emerged as a means for European states to manage growing populations resulting from the stabilization of food supplies. Biopower and modern sex regimes aimed to manage life and the living. It was eating, understood as fueling the furnace of the stomach, that in turn fueled the infrastructures of modern European regimes. This fueling process took place, in part, in tandem with the incorporation through colonialism of other foods, medicines and peoples, elements of life that came to be sacrificed to the mandates of state policies.

The second time "biotechnology" was used in English it described an aspect of a postwar engineering program at UCLA. The program was dedicated to engineering human bodies into architectural spaces in order to maximize their efficiency, and it emerged, in part, from wartime "hot box" experiments designed to test the heat tolerance of fighter pilots in cockpits. The engineering program and the experiments can be understood as symptomatic of the conversion of cities into "testing grounds" for heat tolerance experiments. I

proposed that the bombings of Hiroshima and Nagasaki, when the cities' inhabitants became the testing grounds for the effects of radiation on the body, are paradigmatic expressions of the discourse of biotechnology.

More recently the feverish assemblage of genomic archives has underwritten the contemporary meaning of biotechnology as that which is associated with genetic engineering and cloning. The model organisms of genomic standing reserves are derived from projects that are planetary in scope, and they include indigenous "Isolates of Historic Interest," those like the *hibakusha* whose suffering and deaths were anticipated within the "inevitable" unfolding of Western modernity.

How do hierarchies of bodily vulnerabilty gain coherence and perpetuate themselves within the discourse of biotechnology? By what right? These questions are important because biotechnology remains a seemingly uncertain term. The identification of three modes of biotechnology helps to focus an analysis of the discourse, but it nonetheless remains difficult to identify with its violence—and for critical reasons. The standing reserves include "us" through disidentification. "We" are always already deconstructed. This leads Butler to argue that before we stage our political autonomy in a self-interested fashion, we must, ethically, give ourselves over to hierarchies of corporeal vulnerability.

By corporeal vulnerability Butler refers to literal violence but also, and first, to the violence endured by those regarded as less than human, or other than human: those, for example, whose death is anticipated due to what is assumed to be inherent or bio-cultural limits; or those, like people with DS, regarded by many as protracting a life not worth living; even ecological systems that are devalued and sacrificed within the hierarchies of capitalist expansion. Butler

refers to those who have been devalued as having been made "unreal." She then explains how violence takes place within a sacrificial structure against the unreal: "If violence is done against those who are unreal, then, from the perspective of violence, it fails to injure or negate those lives since those lives are already negated" (33).

The protraction of violence against the negated—in effect a non-criminal act of violence or putting to death—is the essence of what Derrida means by a "sacrificial structure":

> I feel compelled to underscore the *sacrificial* structure of the discourses to which I am referring...it is a matter of discerning a place left open, in the very structure of these discourses (which are also "cultures") for a noncriminal putting to death. Such are the executions of ingestion, incorporation, or introjection of the corpse. An operation as real as it is symbolic when the corpse is "animal" (and who can be made to believe that our cultures are carnivorous because animal proteins are irreplaceable?), a symbolic operation when the corpse is "human." But the "symbolic" is very difficult, truly impossible to delimit in this case, hence the enormity of the task, its essential excessiveness, a certain unclassifiability or the monstrosity of that *for which* we have to answer here, or *before* which (Whom? What?) we have to answer. (1991: 112)

Following Derrida, it can be asserted that if the discourse or "culture" of biotechnology infuses the symbolic order with uncertainty, then it opens "life itself" to a non-criminal putting to death. Any person or thing that is not a subject before the law is open to non-criminal violence. This violence is non-criminal because it takes place beyond the purview of the law.

In order to respond to what, in effect, is the sacrificial structure of biotechnology, Derrida puts into question the viability of a "politics" and

"ethics," asking instead that we think more broadly in relation to the question of responsibility. An unthinkable biotechnology carries an injunction from those who have been put to death, allowed to die, or sacrificed, within a system that allows us to eat, to be sheltered, and to be cared for through the latest developments in biomedicine. Citizenry and so-called modern governance remain haunted by their inherent violence protracted through the gravely unequal distribution of corporeal vulnerability. Derrida thus adds his own injunction:

> "One must eat well" does not mean above all taking in and grasping in itself, but *learning* and *giving* to eat, learning-to-give-the-other-to-eat. One never eats entirely on one's own: this constitutes the rule underlying the statement, "one must eat well." It is a rule offering infinite hospitality. And in all differences, ruptures and wars (one might even say wars of religion), "eating well" is at stake. Today more than ever. (115)

Eating well involves learning how our bodies are interrelated with others, but it also involves knowing that our bodies circulate in ways that exceed our knowledge systems. (Derrida is punning on the dark "well" of "eating well"). Biotechnology makes the unthinkable experience of eating well more evident, as both food and bodily systems become increasingly strangé. In this condition responsibility begins with learning hierarchies of violence but also knowing that the sacrificial structure of biotechnology does violence to ourselves, always already undermining our autonomy. Learning and knowing both involve giving ourselves over to others—to eat. Because the project of biotechnology aims to always exceed classical categories, the practice of hospitality will always risk violence—as the double entendre of Derrida's use of "hospitality" would

suggest. So we always eat well in the face of a darkness that can well up and swallow us in ways we would never have fathomed. Eating well is always a haunted act.

Once again it is Butler who helps us think through the haunted dramaturgy of biotechnology's fiery incorporations. She points out that those who have experienced being made "unreal" and thus vulnerable to a non-criminal putting to death "have a strange way of remaining animated and so must be negated again (and again)" (33). These reanimations might be mnemonic recollections of the history of colonialism and its ongoing formations, or the ongoing lives of those who are expected to disappear within the culture of biotechnology (the growing populations of indigenous peoples and the ongoing births of those with DS are just two examples). As Butler points out, from the perspective of the biotechnological culture,

> [The unreal] cannot be mourned because they are always already lost or, rather, never "were" [never obtained the ontological status of a 'human'], and they must be killed, since they seem to live on, stubbornly, in this state of deadness [thwarting the *realization* of biotechnological culture]...The derealization of the "Other" means that it is neither alive nor dead, but interminably spectral. (33-34)

In effect, Butler is arguing that repressed violence returns *interminably* to haunt biotechnological culture. Thus the culture of biotechnology is forever speaking with its ghosts and forever producing means, including legal mechanisms, to contain or otherwise appropriate the violated lives that those ghosts represent.

If biotechnological culture gains its coherence, institutes and perpetuates itself by means of repeated violence executed through a sacrificial structure whose levers are at least three modes of incorporation, on what basis does it have

the right to continue to manifest itself? In this final section of my research on the discourse of biotechnology, I want to think through the haunted dramaturgy of its fiery incorporations and how it is that the discourse is constituted through its *stagings*—in both the performative and temporal meanings of the term. The staging of the autonomous subject bringing forth an other-Man, for example, is performative and institutes a humanist anticipatory temporality. The performative nature of the other-Man is made evident and always haunted by the sacrificial structure of the culture of biotechnology, which makes the precarious performance and increasing violence of the other-Man more apparent. Within the culture of biotechnology, absorbed by it and wanting to act more responsibly, we must learn to speak with its ghosts in order to stage it differently. We must learn to speak to the conditions that made these ghosts in the first instance.

Nowhere are these conditions more apparent than in the granting of the first patent on a genetically engineered thing in *Diamond v. Chakrabarty* (1980). In this legal event we witness the dramaturgy of biotechnology taking place, and we also see exposed the constitutive means by which seemingly global genomic archives come to be converted into an ethnographic text, in this case, that of the United States. A close reading of the court case—in a sense, an example of a haunted ethnographic encasement—will hopefully open up a critique that enables us to hear the voices of those sacrificed to the discourse of biotechnology.

The Staging of Diamond v. Chakrabarty

To begin, let us consider the scene that sets the stage for *Diamond v. Chakrabarty*[2]: On March 16, 1978, the Amoco Cadiz ran aground, pouring 68.7 million gallons of oil off the coast of Brittany, France. On November 1, 1979, the Burmah Agate collided with the freighter Mimosa, spilling 2.6 million gallons of oil near the entrance to the Gulf of Mexico, with an additional 7.8 million gallons consumed by fire. On June 3, 1979, the IXTOC I exploratory well blew out into the Bay of Campeche off Ciudad Carmen, Mexico. An estimated 140 million gallons of oil was discharged into the waters before the well was brought back under control, resulting in the second largest recorded oil spill of all time. On March 24, 1989, the grounding of the Exxon Valdez on Bligh Reef poured 10.8 million gallons of oil into the biologically rich waters of Prince William Sound, Alaska. More recently, on November 19, 2002, the Prestige floundered on its way to Singapore via Gibraltar, spilling 21 million gallons of oil off the coast of Galicia, Spain. Fueled on the fossils of others, the institution of industrial capitalism is always already contaminating the ecobiome—with deadly effects.[3]

The devastation of past spills and the anticipation of others to come set the stage for the granting of the first patent on a genetically engineered thing. In 1971 microbiologist Ananda Chakrabarty applied to the U.S. Patents and Trademarks Office (PTO) for a patent on a genetically engineered microorganism designed to

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[2] The written decision is available at http://digital-law-online.info/cases/206PQ193.htm

[3] For a list of oil spills historically relevant to *Diamond v. Chakrabarty*, see http://library.thinkquest.org/26026/Statistics/largest_oil_spills.html and http://www.infoplease.com/ipa/A0001451.html

consume oceanic oil spills.[4] At the time Chakrabarty was an employee of General Electric in Schenectady, New York. The microorganism he sought to patent was engineered from strains of *pseudomonas* bacteria that were each capable of degrading certain but not all components of crude oil.[5] Chakrabarty took plasmids[6] from three strains of *pseudomonas* and recombined them in a fourth. The patent application claimed that Chakrabarty had invented a single *pseudomonas* capable of degrading four different oil components—a property not possessed by naturally occurring *pseudomonas*. "I simply shuffled genes," Chakrabarty explained to Giovanni Brel of *People Magazine,* "changing bacteria that already existed" (cited by Kimbrell 192).[7]

Chakrabarty applied for three types of patents. One type was for claims related to the *process* of producing the bacteria. A second type involved claims for *inocula,*[8] that is, for the design of specific pathogenic delivery systems required to

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[4] See U.S. Patent No. 4,259,444. Patents granted since 1976 can be viewed at the U. S. PTO web site: www.uspto.gov

[5] For example, one strain of *pseudomonas* was capable of degrading camphor, another, octane.

[6] Plasmids are small, circular DNA molecules that exist primarily in bacteria, but operate separately from the single bacterial chromosome, and are capable of replicating independently.

[7] Sidney A. Diamond, Commissioner of Patents and Trademarks, petitioner, v. Ananda M. Chakrabarty et al., 65 L ed 2d 144, June 16, 1980, 305, n.2. According to Brian R. Dorn, "Dr. Chakrabarty filed claims for two recombinant *Pseudomonas* strains. P. aeruginosa strain 1c (ATCC 15692) was transformed with plasmids containing genes for octane, salicylate, and naphthalene degradative pathways to produce P. aeruginosa NRRL B-5472. P. putida NRRL B-5473 was created by transforming P. putida strain PpG1 (ATCC 17453) with plasmids containing genes for camphor, salicylate, and naphthalene degradative pathways in addition to RP-1 drug resistance" (Dorn 2000: fn. 2).

[8] An inoculum is the material used to introduce a pathogen (i.e. virus) or antigen into a living organism; it is the substance of an inoculation. While Chakrabarty made claims on several inocula, the U. S. Supreme Court made special reference to "claims for an inoculum comprised of a carrier material floating on water, such as straw, and the new bacteria," as exemplifying a second type of claim.

insert foreign DNA into the host bacteria. There were also claims for an inoculum that would help deliver the bacteria to the oil and to float in a concentrated manner in open water—basically, a straw medium. The third type of claim was on the genetically engineered bacteria itself. The PTO allowed the claims of the first two types, but rejected those related to the third. The examiner argued that U.S. patent law did not intend for patents to be held on living things. The PTO's decision noted that if Jefferson or Congress had intended as much, the Patent Law of 1793 would have explicitly permitted patent claims on the living. While acknowledging that there were instances in which patents were granted on living things—specific plants—the examiner noted that Congress made these patents possible through specific legislation, not the PTO.

Chakrabarty and GE appealed and the Court of Customs and Patent Appeals (CCPA), to the surprise of many, narrowly (three to two) overturned the PTO's decision. The CCPA premised their reversal on the basis of their previous decision in *In re Bergy* (1977), which held that for the purposes of patent law "the fact that microorganisms...are alive...[is] without legal significance."[9] According to the letter of the law, the CCPA suggested, patents could be held on any product of human invention (as opposed to naturally occurring phenomena) that was novel, useful, and not of an obvious nature.

The PTO, under the guidance of Commissioner Sidney Diamond, appealed to the Supreme Court. On June 16, 1980, the U.S. Supreme Court ruled

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[9] *In re Bergy*, 563 F.2d 1031, 1038 (1977) "involved a patent application for a pure culture of the microorganism, *Streptomyces vellosus*, found to be useful in the production of lincomycin, an antibiotic." See *Diamond v. Chakrabarty*, 306 f.n.4.

by a split decision to uphold the decision of the CCPA. A genetically engineered microorganism was deemed patentable subject matter under U. S. patent law.

Reading the Consequences of *Diamond v. Chakrabarty*

Many discussions of the U.S. Supreme Court's decision to legalize the patenting of living beings have argued that the fact that *pseudomonas* are bacteria, and not animals, facilitated the Court's ability to represent the claim as applying narrowly to a particular "composition of matter" as opposed to a life form. According to Andrew Kimbrell, GE sought to capitalize on the "lowly nature" of this environmentally friendly bacterium. The company knew, well before the Court's decision, that their product did not work on the open seas; they had even abandoned the possibility of marketing it:

> [GE] was using the Chakrabarty patent claim on the oil-eating microbe as an altruistic seeming test case to establish the ground rules for the patenting of life. If the GE patent succeeded, the patent profit floodgates would be opened. GE and other corporations could then maximize their profits in the coming multibillion-dollar biotechnology industry. (193-194)

Kimbrell's argument parallels others that insist that *Diamond v. Chakrabarty* is of historic significance because it functioned as a test case to establish whether patent claims would be granted on living organisms. I am not convinced, however, whether the *pseudomonas* was living—while key—was *the* question structuring the Court's decision.

Nevertheless, the PTO, dissenting judges and Jeremy Rifkin's People's Business Commission, which filed an *amicus* brief in support of the government,

all took up the position, in arguing their opposition to the Supreme Court's ruling, that the *pseudomonas* was living. In his brief and tersely written dissenting opinion, for example, Justice J. Brennan represented the bacteria as living, as something whose *genes* attested to the fact that its *genesis* was in nature. As such the manufactured bacterium was subject to ontological principles prescribed to living things, understood broadly as those living in nature in general. In the eyes of the dissenters the bacteria represented not only something living but also natural history and the beginnings of life—*there*, in the fiery oil consuming churn of that bacteria—regardless of the ways in which they had been affected by human intervention. Brennan went on to suggest that the Court should follow Congress' lead when it came to granting monopolies on living organisms: "The only question we need to decide is whether Congress, exercising its authority under Art. I, § 8, of the Constitution, intended that [Chakrabarty] be able to secure a monopoly on the living organism itself, no matter how produced or how used."

Brennan also argued that granting patents on living things would create monopolies that would infringe upon the freedom of inventors and scientists. "The patent laws," Brennan put forth, "attempt to reconcile this Nation's deep-seated antipathy to monopolies with the need to encourage progress." Finally, Brennan agreed with Counsel for Diamond and the PTO that the previous need for congressional legislation of patents on a narrow list of living things indicated their reluctance to broadly interpret the Constitution's patent laws. He cited the 1930 Plant Patent Act, which afforded patent protection to certain asexually reproduced plants, and the 1970 Plant Variety Protection Act, which authorized the patenting of certain sexually reproduced plants—not all plants:

> First, the [Plant Patent Act of 1930 and the Plant Variety Protection Act of 1970] evidence Congress' understanding, at least since 1930, that § 101 does not include living organisms. If newly developed living organisms not naturally occurring had been patentable under § 101, the plants included in the scope of the 1930 and 1970 Acts could have been patented without new legislation. Those plants, like the bacteria involved in this case, were new varieties not naturally occurring. Although the Court...rejects this line of argument, it does not explain why the Acts were necessary unless to correct a pre-existing situation. I cannot share the Court's implicit assumption that Congress was engaged in either idle exercises or mere correction of the public record when it enacted the 1930 and 1970 Acts. And Congress certainly thought it was doing something significant...Because Congress thought it had to legislate in order to make agricultural "human-made inventions" patentable and because the legislation congress enacted is limited, it follows that Congress never meant to make items outside the scope of the legislation patentable.

The dissenting opinion thus argued that first, granting a patent to Chakrabarty was against the spirit of the Patent Act as conceived by the Founding Fathers (the Patent Act of 1793 was written by Jefferson), and that second, it was against the very spirit of the nation to open nature to the prospect of monopolization. This spirit, Brennan concluded, was reflected in the willingness of Congress to only grant patents on specific plants in very narrowly defined terms.

Ted Howard, who wrote the brief for the People's Business Commission, amplified the rhetorical register of the opposition and argued that *Diamond v. Chakrabarty* would decide "the very nature of life":

> The case before the court may not appear to involve the life and death issues and passions of abortion, euthanasia or brain death

> rulings. Nonetheless, appearances aside, this case actually eclipses the import of these others because, in reaching a decision, a precedent-setting determination of the very nature of life will have to be decided upon. Whether such a definition is explicitly stated by the Court or not, hardly matters. If a ruling in favor of patenting genetically engineered living organisms is forthcoming, then manufactured life—high and low—will have been categorized as less than life, as nothing but common chemicals.[10]

Despite the magnitude of the arguments against the Supreme Court's ruling, I am not convinced that the critical question structuring the Court's reasoning was whether or not the *pseudomonas* was living. I do not want to diminish the importance of these arguments, but I feel they limit the analysis of *Diamond v. Chakrabarty*. Jeremy Rifkin's suggestion that the Court's opinion was "audacious," or Andrew Kimbrell's claim that it was a "complete failure...to correctly assess the impacts of the *Chakrabarty* decision," fail to address the decision itself and subsequently limit their sometimes compelling analysis of the biotechnological order. A closer reading of the decision itself shows that the law and ethics of biotechnology are being ordered in other ways.

In delivering the opinion of the Court, Chief Justice C. J. Burger was careful in upholding the letter of the law. "In cases of statutory construction we begin," he said, "...with the language of the statute." He argued that the language of the Patent Act was ambiguous and that the Founding Fathers had

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[10] Ted Howard, "The Case Against Patenting Life," brief on Behalf of the People's Business Commission, Amicus Curiae, in the Supreme Court of the United States, No. 79-136, 29. Cited in Andrew Kimbrell, *The Human Body Shop* 194. The People's Business Commission has subsequently been renamed the Foundation on Economic Trends.

intended it to be so. The Court's decision was made in accord with 35 U. S. C. ∫ 101 which provides that

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirements of this title.

The use of the terms "manufacture" and "composition of matter" in the Patent Act, Burger insisted, did not distinguish between living and non-living things. According to Burger, the ambiguity itself was intended to promote progress through inventiveness and ingenuity. Being open to new kinds of invention was crucial in securing the historical destiny of the nation, precisely because it responded to human ingenuity *in the future*. In this line of reasoning the Patent Act was not subject to a specific human calculus of the present because it was always open to the reinvention of human nature. Burger could then insist that the ambiguous language of the act provides for the widest possible claims:

> In 1952, when the patent laws were recodified, Congress replaced the word "art" with "process," but otherwise left Jefferson's language intact. The Committee Reports accompanying the 1952 Act inform us that Congress intended statutory subject matter to "include anything under the sun that is made by man."

Burger's testament thus linked the Law of the Founding Fathers with the *destiny* of "man" [sic] through the metaphor, or movement, of the planets. Burger concluded by suggesting that it was Congress that should debate the risks of both genetic engineering and patents on human-made living things, while the Court should attend to the letter of the law and allow ingenuity to fulfill its destiny.

Here, we need to ask, how and why did Burger structure the Court's decision according to the open letter of the law? And what are the implications of this for how the culture of biotechnology comes to be defined? To answer these questions, I want first to return to the objects of the claim. Perhaps there was a rhetorical strategy in pursuing the first patent on a genetically engineered *pseudomonas*. But the judges were without doubt aware of the metonymic import of the plasmids as standing for "living things." As we have seen, considerable debate occurred around the question of whether the plasmids were living, with the Court ultimately leaving that up to Congress to decide. What is important to understand is that the rhetorical effect of the use of *pseudomonas* by Chakrabarty's legal team was not limited to leading the Court to believe that the case had to do with a technical object as opposed to a living form. Their use of the ambiguous *pseudomonas*, in effect, staged the *impossibility* of according full living status on a genetically engineered entity. In a sense their claim theatricalized the spectral effects of biotechnological culture.

Chakrabarty claimed to have invented devouring plasmids for the specified purpose of cleaning up industrial capitalism's spills and destruction of the ecobiome. The claim was that he had invented a novel form *for* eating. That is, in the figure of the flotilla of *pseudomonas,* Chakrabarty conjured a metabolic mass. In effect, Chakrabarty's claim represented the ecobiome in much the same way as Foucault understood biopolitics in relation to the governance of metabolism in general. As argued above in Chapter Two, for Foucault, the modern state coordinates biological mass and data that charts such elements as the population's health, sanitation, birthrate, and longevity. What the modern state does, then, is track and channel metabolic activity.

In order to extend Foucault's analysis of biopolitics to "contemporary biotechnology," Eugene Thacker turns to Marx's definition of species being as the metabolic relation between Man and nature by which Man changes his own nature. Essentially, for Marx, Man's metabolic relation to nature is bio*technological*—or in Marx's phrase, "inorganic"—because Man changes nature—including his own. Thacker's reading of Marx is basically an expansion of Foucault's concept of "biopower," so that it is no longer restricted to "the human race" but can now be thought of as applying to a collective body that is environmental and even global in its expanse:

> The environmental milieu of the species being is as defining a characteristic as its anatomy, physiology, or biology. The "inorganic body" Marx speaks of is also a nonhuman body, a collective body that is, despite its collective character, highly differentiated. (35)

Thacker's reading of Foucault's *The History of Sexuality* through Marx leads him to the argument that the way biotechnology works is through "living dead labor":

> This kind of labor, as already noted, is fully biological and yet is inseparable from political and economic effects. It is strangely nonhuman, at work in the molecular spaces of cells, enzymes, and DNA, and it never stops working, whether or not we as individuals pay attention. It is fully informatic, constituted by genetic codes, protein-folding motifs, and biopathways, but it never completely relinquishes its affiliation with the material, messy "stuff" of biology. It is something that we can perhaps call *biomaterial labor*, or even *living dead labor*. (40)

In effect, Thacker envisions a global genome (fully integrated genomic databases) with channels and switches that help regulate the teeming metabolism of

biology. In other words, following Foucault's *The History of Sexuality* and staying within some of the limits of that text, Thacker invests genomic sequences with a libidinal drive without attending to their sacrificial structure.

For their part the dissenting opinion for *Diamond v. Chakrabarty* did not understand that biology was starting to be archived differently. The sequencing of genomes had just begun in the late 1970s, but the spectre of genetic engineering and the threat of mechanized life were clearly described in the *amicus brief* written by Ted Howard. From our perspective now it is perhaps easier to see that the transformation of biology's archives changed the conditions of what could be understood as a biological event. Biotechnological, biology operates by a different spatialization, anticipatory temporality, and logic whose modality, as evidenced by the form of the *pseudomonas*, is a devouring metabolism.

Chakrabarty's *pseudomonas*, like Thacker's argument, invested the field of biotechnology with a metabolic libidinal drive. As their stage name suggests, the *pseudomonas* operated in the Court as placeholders for the channeled metabolic drive of genomic sequences and archives. They were the novel result of a corrective switch—metabolism diverted in the form of oil eaters to clean up the spills and leaks of industrial capitalism. As living-dead placeholders, Chakrabarty's patent claim was not made on a living being. Instead, it was being made on an open, lettered arrangement of genomic sequences. Such an act, the Court's decision suggested, was in accord with the letter and the spirit of Patent Law.

Intellectual Property Rights as Ethnography

For all its planetary breadth (everything under the sun), however, the cohering of biology, genomics and the law took place in a decidedly narrow fashion. The nature of this coherence and its restraining effects on how we are to think about life itself become clearer when we ask, what model of the proper and righteous intellect was given the force of law when Chakrabarty and GE were granted intellectual property rights in relation to the *pseudomonas*?

As we have already seen, for Walter Gilbert, the sequencing of genomes in electronic databases marks a "paradigm shift" in biology. No longer restricted to studying experiments designed to understand a gene's function, biologists will now engage with theories of what is possible, and then test their hypotheses through experimentation. To repeat Gilbert's declaration: "The new biology will be dominated by 'theoretical conjecture' and 'interpretation of sequences'" (22-23). Ian Wilmut (1999) has also suggested that once genomics has the sequences of living things online, we will see the real power of the "age of biological control." Genomic sequences provide the basis for the discourse of biotechnology. These sequences are composed of nucleotide bases (adenine, cytosine, guanine, and thymine) and they are often over a billion bases long. Genomes are stored in databases, where they are represented as sequences of four letters: ACGT. The dream of storing all the genomes of all living things as a standing-reserve for genetic engineers is thus structured by, and concentrated within, ways of thinking about the alphabet.

How do we read these sequences of alphabetic signs? They are sites of passage. For Gilbert and Wilmut, genomic sequences are that through which biology must pass in order to reinvent itself and the biological world as one that

is theoretically reborn through technological speculation. Thus when Doyle reads, "Molecular biology is dead—Long live molecular biology!" in the header of Gilbert's manifesto, he draws our attention to the em-dash as distinguishing two eras of molecular biology. As a mark of transition that does not entirely belong to either era, the em-dash accords with Doyle's description of the cryogenic, postvital biotech body maintained between its demise and the sublime horizon of its reincarnation. More accurately, the em-dash marks the field of genomics. Molecular biology must pass through its letters to reinvent itself. This is a classic metaphysical structure that would understand Being, or in this case Life, as presence (in an object as a force, or as self-presence under a schema of becoming self-conscious). Once Life is equated with presence, metaphysics can only treat sequences of signs as transitional because they represent life and are therefore different from it. Within metaphysics, signs are ways of marking life's passage.

If the discourse of biotechnology is premised on a metaphysical understanding of the sign, it is important to understand which approach to semiotics is being privileged. The decision in *Diamond v. Chakrabarty* makes this clear, because it grants the force of law to Hegelian semiotics as the proper way to intellectually read the bases and basis of the discourse of biotechnology. I am arguing that a massive reduction is taking place: if living-in-general is being concentrated within arrangements of four letters of the alphabet—and not other writing scripts—these letters are being read through a single approach to semiotics.

Derrida has meticulously and concisely articulated Hegel's theory of the sign (1982). He describes how Hegel begins with intuition, which interiorizes

what is sensibly immediate. The intellect takes up this intuition, and forges an image of it. Intelligence stores these images in reserve. Stored as such, images of the intuitively received are the property of the intellect. Through the process of passively receiving intuitions of the immediately sensible world and later, imaginatively producing images, the intellect intuits itself—its own working. Through the imagination of images, the intellect becomes a being that is no longer a stranger to itself. And the intellect objectively externalizes itself through its images, or what Hegel called signs.

Derrida points out that Hegel's theory of the sign would have it harbour an intellect that is "*both* interior and exterior, spontaneous and receptive, intelligible, the same and the other" (79). Regardless, the sign is something other than these contradictions: it is a formal placeholder for the contradictory stirrings of imaginative being. Hegel described the sign as a tomb for the animate workings, however conflicted, of the psyche. The tomb is analogical with the body when understood as bodily flesh that is a sign of death nonetheless housing the spirit. Hegel, in fact, specifically refers to the sign-as-tomb as a pyramid: "[The sign] is the *pyramid* [Hegel's emphasis] into which a foreign soul...has been conveyed...and where it is conserved" (cited in Derrida, 83-84). The sign as pyramid is also analogic with the em-dash in the discourse of biotechnology in that it is a site of passage marking that life continues elsewhere. The genomic standing-reserves thus maintain the spirit of the animate psyche by exposing it to death. Alphabetic standing-reserves challenge forth through the death of thought not simply Man, but a Man with specific intellectual properties. Genomic sequences are not symbolic representations of organisms. They operate conceptually as signs. For Hegel, symbols retain to some extent that externality

which is intuitively given as their meaning. His examples include a lion, which is magnanimous, and a fox, which is cunning. The symbol is therefore not purely arbitrary. The sign marks the imaginative *production* of the animate psyche, and its ability to create ideal concepts about, not simply from, the world. Signs are not tied to the external, sensory world; they are arbitrary. The mind's movement in and between the arbitrary signs, or open letters, of the alphabet allow for it to become self-conscious of itself and aware of its freedom. Free from both the sensory world and the sign, intellectual life is conflated with the spirit. Once again, we see in the arbitrary sign, the institution of an architecture of fire, one in which the fiery spirit takes in the external world which it incinerates, or negates, while becoming self-conscious of its own reconceptualizing of, in this case, a universal order; in the case of biotechnology, a second creation.

For Hegel the arbitrary nature of alphabetic signs was superior to what he misunderstood to be the largely symbolic nature of hieroglyphs and ideograms. The arbitrariness of the alphabetic sign that allowed for more freedom, a prerequisite for avoiding what Hegel perceived to be the consignment to antiquity of cultures with so-called symbolic scripts. The alphabet, for Hegel, was *the* script that best promised a future: the destiny of Western Man. As Derrida points out, Hegel's understanding of signs is not only architectural, but it also has a temporal dimension. The contradictions of the alphabetic sign challenge Man forth and make possible the becoming self-conscious of his intellectual *work*, which is his essential and defining spirit. As Man rises through the incinerating negativity of intelligence, he intuits the workings of his spiritual being as the experience of time. We can now read the em-dash of Gilbert's manifesto again: "Molecular biology is dead—Long live molecular biology." If the dash represents

the reduction of the living-in-general to alphabetic genomic sequences of four letters to be read in a specific way, then there is a further temporal reduction of spatial relations: we will know what the ecobiomes of the world will have meant in time—the time of the West manifesting its destiny.

How was this manifest destiny articulated in the decision of *Diamond v. Chakrabarty*? In its deconstruction of biology's lexicon, the archives of biotechnology have no outside. They are unthinkable and mark ontology with the stutter of catachresis. As such, they challenged the authority of the Court. For whom or what would they decide? In order to better understand the decision, we must once again return to Hegel.

If for Hegel the alphabet allows for the objectified expression of the free, individual subject, the state determines the permissibility of these expressions. In *The Philosophy of Right* (1821, 1964) Hegel argues that if we think of ourselves as individuals, with desires, prejudices, specific goals and projects, then we demand of others that they be recognized as the will of person, and not an animal, child or slave. The state therefore regulates, legislates and rationalizes the discourse of personality. It validates and legitimates some claims of personhood over others. One of the challenges for the U.S. Supreme Court in *Diamond v. Chakrabarty*, therefore, was to defend the discourse of personality—which authorized its judicial power—against the ontological challenges of biotechnology. In effect, the Court had to summon an order of personas to take on the challenge of an order of *pseudomonas*. To understand how this challenge was taken on, we need to read further into *The Philosophy of Right*.

Early on in *The Philosophy of Right*, Hegel distinguishes the difference between a subject and a person:

> The person is essentially different from the subject, for the subject is only the possibility of personality, since any living thing whatever is a subject. A person is therefore a subject which is aware of this subjectivity, for as a person, I am completely for myself: the person is the individuality of freedom in pure being-for-itself. (§35A)

For Hegel, personhood is, before all else, the capacity to be the free, self-conscious author of one's actions.

The claim of personality has an abstract socio-political dimension. First, personality is itself an abstract claim because it is distinguished from any specific subject or substantiation of the will. In fact, the person is necessarily conceptually prior to any substantive, positive social constructs of identity; one must first be able to make choices in order for there to be such a thing as a social construct. The discourse of personality therefore asserts that the righteousness and goodness of a subject's actions should be measured abstractly in relation to the essential nature of Man—his ability or abstract potential to act self-consciously. And since this essential nature is separate from the subject's actions, it is the nature of all persons, so the rights an individual claims must also be granted to others. In effect, the category of a "person" operates as an abstract, universal ideal that equates subjects, and it is the figure of the "person" around which the legislation of rights pivots. As Hegel asserts: "The commandment of right is therefore: *be a person and respect others as persons*" (§36).

Hegel then argues that the person is one who expresses themselves through things. I have already suggested how the mind becomes self-conscious of itself at work through the alphabet. A person expresses his self-conscious will through property—as a right. A person, says Hegel, has more than simply the biological capacity for life; he has the right to life and physical integrity so he can

fulfill his goals (§48). A person is the spirit that runs through a territory or proprietary field. His property is the objective substrate through which a personality experiences and expresses itself. Others validate a person's claim to property—a process by which a communal sense of "personhood" is achieved, if somewhat abstractly. The essential being of ownership is that, in property rights, persons recognize each other as persons, thereby manifesting personhood as a spirit or being moving towards its freedom. The state ultimately defends and enforces this mutually accepted universal conception of personhood through property rights, that is, through contracts that mediate the will to seize, use and distribute property.

If Locke's justification of property tells us it is a natural right, we might here think of Hegel's justification of property as a technical right—the right to bring forth (*techne*) life (*bios*), understood as the experience of moving towards the freedom to write one's destiny. If the destiny of the person is that of Man, challenged forth by his proprietary relation to what in effect become the standing-reserves of the world, the decision of the Court was more circumscribed in its ethnography. Burger staged the ruling within a dramaturgy that theatricalized a work in Progress that begins with the conjuring of the dead, or more specifically, the spirits of the Founding Fathers of the United States. The decision and the rousing of the Founding Fathers responded to the planetary scale of the epistemological crisis marked by the *pseudomonas* by suggesting the crisis challenged forth the persons recognized as belonging within the topography of the United States.

The granting to Chakrabarty of Intellectual Property Rights responded to the injunction of the cultural predicament of a genomic archive with no outside

referent by restoring one. This restoration was staged as the spirits of the Founding Fathers desiring a phenomenological engagement with biological things and a Hegelian encounter with the open letters of genomic sequences. It is these spirits that ensured, through patent law, the institution of a free mind on the outside of the ontologically troubling standing-reserve of living-in-general. The generality of the standing-reserve was converted into a proper archive (with an outside) by means of this *patri*archic act. The decision thus staged a prosthetic of "us" (U.S.) on the outside of everything under the sun. It is this staged figure that must be allowed the freedom to reinvent the world—and this has been his right, and the essence of his spirit, since the founding of the nation. It is this spirit, the Court defended, as that which constitutes the U.S.

The conjoining of this spirit with that of the United States simply managed the two normative aspirations identified by Butler: the desire for autonomy before the law and the vulnerable, always already secreted socio-political body. This management is anticipatory, and accords with a policy of manifest destiny. It is as if in the devouring *pseudomonas* the Court pitted the spirit of the United States and the will to manifest destiny against the spilling of the ecobiome—and in that sense the decision was in concert with Chakrabarty's project. Faced with the genetic screen of biotechnology's sacrificial structure, all the judges were haunted by the spectres of the living-dead. And all the judges spoke with the ghosts of the Founding Fathers to help justify—make clear—their decision and biology. The split decision suggests that one does not always know with whom one communicates when addressing a ghost. Hierarchies come into play.

When one reads the decision of the Court as an ethnography, the ethico-political dimension of the case begins to open in relation to the question of

hierarchies. Can one take seriously the dependence of the science of biotechnology on something like the body politic of the United States? I say "something like" to designate the problematic of space between the figure and literalness, between ATCG and US. The biopolitical management of spilling oil by the United States does not bode well when we consider that the largest oil spill of all time was the deliberate release of oil from various sources during the first American attack on Iraq in 1990, and that Chakrabarty's plasmids never worked in the first place. As an American frame of mind begins to be asserted globally through the institution of IPR, are there other ghosts of the biopolitical living-dead to whom we should respond? Who will manage the fossilized remains and fossil fuels of the dead—and their fiery energetics? Ancestral experience, it seems, is at once psychic and biological. We need to be open to other decisions.

The Aftermath

True to GE's hypothesis the marketplace ignored the Court's insistence that its decision be construed narrowly. On October 14, 1980, four months after the decision, Genentech, a privately held genetic engineering firm, went public, offering over one million shares of stock at $35 per share. Jeremy Rifkin describes the response:

> In the first twenty minutes of trading, the stock climbed to $89 a share. By the time the trading bell had rung in [the] late afternoon, the fledgling biotechnology firm had raised $36 million and was valued at $532 million. The astounding thing was that Genentech had yet to introduce a single product into the marketplace. (43)

In the meantime other companies soon followed Genentech's lead. California-based Cetus set a new record by raising $115 million in its initial public offering (Kimbrell 196).

Both Congress and the PTO opened the floodgates for patents. In 1980 Congress passed the Patent and Trademarks Ammendment Act which made it possible for universities to profit commercially from tax-supported research on campus. In the same year the United States Patent and Trademark Office issued a patent to Stanford University and the University of California at San Francisco for an invention developed in 1973 by Stanley N. Cohen and Herbert Boyer.[11] The patent was issued for a "process for producing biologically functional molecular chimeras"—or rather, gene splicing, the process fundamental to genetic engineering.[12] In 1984 and 1988 two other, similar patents were awarded to the universities based on the work of Cohen and Boyer.[13] By 1996, some 350 gene-splicing licenses had been granted, and in 1995 alone, the two universities shared $27 million in royalties.[14]

Patents were also granted on things that previously might not have been considered within the realm of U.S. Patent Law. PNG-1 refers to the first human,

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[11] Cohen and Boyer cut the gene for resistance to an antibiotic from bacterial plasmids (a circular DNA molecule that multiplies together with bacteria and is capable of passing from cell to cell) and spliced them with DNA from an African clawed toad to produce bacterial cells whose genes included those of the toad (Cohen et al 1973). A description of the experiment is included in the patent award.

[12] For discussions of the commercialization of publicly funded research, see Haraway 1997: 87-94. Boyer and Cohen are discussed on p.90.

[13] US4,468,464 "Biologically functional molecular chimeras" was awarded on August 28, 1984 (disclaimed on December 22, 1998) and US4,740,470 "Biologically functional molecular chimeras" was awarded on April 26, 1988 (disclaimed on December 2, 1997).

[14] See http://web.mit.edu/invent/www/96winners.html

a Papua New Guinea (PNG) cell line, to be patented. Its "inventors" were Dr. Carol Jenkins and four U.S. government researchers and its "assignees" the U.S. Department of Health and Human Services. The granting of U.S. Patent 5,397,696 patenting the cell line of an anonymous "donor," a 21 year-old Papua New Guinea male, was made on March 14, 1995, without his consent or knowledge (Hanley 1996; Mooney 1993). In a structure of thought that displays its sacrificial nature, the cell line, PNG-1, was to be "immortalized." The anonymous 21 year-old had become a member of the living-dead, marked, as was his entire way of life, for extinction and death within the relentless advance of modernity. Legally, the donor's DNA was "assigned" to the U.S. government. The way some saw it, the U.S. awarded itself a patent on a foreign citizen. The patent was, however, withdrawn under international pressure.[15]

In 1997 the U.S. PTO accepted an application from Rice Tec Corporation of Alvin, Texas for a patent on a strain of basmati rice sold under the trade name, "Texmati." The strain of rice, "basmati 867," was produced by cross-breeding varieties of basmati with semi-dwarf varieties. Activists, such as Vandana Shiva and the Vancouver-based Basmati Action Group (BAG), protested against the patent and called for a consumer boycott of Rice Tec products. In their call for a boycott BAG pointed out that basmati rice was a subsistence crop and important source of income that had been bred in the Punjab region of India and Pakistan for years, as farmers carefully developed its fragrant aroma and unique taste. Historically, who generated the strain of rice, potato or wheat in question? What

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[15] See, for example, the "Declaration of Indigenous Peoples of the Western Hemisphere" (1996).

effect will granting patents on major crops have on future generations, of bacteria, of fungi, seeds and of communities, but also of farming practices, public breeding programs and seed exchanges, land use, and of the genetic diversity of entire ecologies? Do IPR stage a scene in which, what a multinational agribusiness corporation experiences as a right to patent seed germplasm, "Third World" farmers experience as a fee, a threat to traditional seed exchanges and breeding practices, the loss of a way of life, or death by starvation? For the discourse of justice, IPR and biotechnology raise questions concerning a responsibility to others who are here or not yet here or no longer present: to the victims of the colonial adventure and its biotechnological movement of germplasm and peoples; to the victims of biocolonialism and biopiracy; to the victims of capitalist imperialism and its attendant ecological destruction; and to the victims of Western democracy and its attendant eugenics movements.

It is not surprising that the promises of biotechnology have been charged with unleashing a biocolonialism based on a reductionist science in the service of capital. As Vandana Shiva notes,

> It seems that the Western powers are still driven by the colonizing impulse to discover, conquer, own, and possess everything, every society, every culture. The colonies have now been extended to the interior spaces, the "genetic codes" of life-forms from microbes and plants to animals, including humans. (1997, 3)[16]

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[16] Shiva is the Director of the Research Foundation for Science, Technology, and Natural Resource Policy and the scholar most often cited in discussions of biocolonization. For discussions of the opposition from indigenous peoples to IPR, see Harry 1995 and Armstrong 1997.

In acts that Shiva has described aptly as "biocolonialism" and "biopiracy," capitalist interests in the North have attempted to patent and thus gain control over the biodiversity of the earth, almost all of which is located in the South. Agribusiness and the pharmaceutical industry have much to gain from patenting the genetic codes of food crops and plants known to have medicinal properties. The award of patents to American companies for strains of basmati rice and the neem tree are two recent examples.

The politics of opposition to the authority of Intellectual Property Rights contests not only the mnemonics inscribed by IPR into both the bio-archives and social order, but also the political economy of the entitlements and royalties made possible by the institution of a certain open frame of mind that privileges U.S. regulatory practices. This paradoxically open *frame* of mind would be decisive. It would inhere within and generate socio-biological order amidst bio-archival uncertainty. Such an open frame of mind has both limits and a history—a history of phenomenal violence. More than ever there is a need to contest this violence that strikes me as the violence of an increasingly phenomenological culture, one obsessed with the relentless bio-political interrogation of things and the living in general—from microbes to citizenry. The uncertain borders between things have given license to intense bio-political interrogation, occurring *seemingly* outside the law within a discourse structured by the terror-security axis. Such a phenomenal violence is totalitarian in its scope; it engages with biodiversity on a global scale, interrogates both the living and the dead, and anticipates those to come. The solution to these problems will not come from Man. An ethics of corporeal vulnerability laces startling, previously improbable histories together, creating the possibility for a broadly based, radical politics of

opposition. This politics of opposition must challenge the interrogative and totalitarian modes, as well as the political economy of biotechnology's sacrificial structure that would both constitute a "knowledge-based economy" and assume the skulk of a certain *intellectual* propriety as the proper form of governance for the delirious living in general. The madness and violence enforced by this open frame of mind produces the stirring need and growing desire to live differently.

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Dear D__,

The lamp-lit snow outside my window drifts and swirls across the street, defying the grid-like dreams of the lumbering ploughs. The outlines of the city are shifting and these fluid demarcations have become, themselves, animal-like—rushing up trees and bushes, burying cars, fleeing to the corners of parking lots, they scale the window as I type. I am staring blankly at the passages of ideograms.

My research into the discourse of biotechnology has led me to the outer edge of a series of letters, and more precisely, four alphabetic letters: ACGT. Billions of variations of these letters continue to be sequenced and organized into the elaborate bioinformatic databases that are ontologically unthinkable while at the same time instituting the pre-originary spectre of the U.S.—as a spectre of its systemic, militarized biopower, the paradoxical concentration of its "sublime" force. The string of all those alphabetic letters harbouring within their cyogenic death drive the accents, dialect, languages and scripts of so many others, not all

of which are human, deemed human or identify themselves before all else as human. These comprise, to use Ronell's phrase again, the "rhetoritics" that make up a legally unassimilable idiom.

It is by definition impossible to articulate an unassimilable idiom, but one can offer impressions of its contours. Paul K. Saint-Amour has used the term "nuclear uncanny" to translate the Japanese term *bukimi*, which describes the trauma that people in Hiroshima experienced as they realized the city was being spared from fire bombing, and thus saved for other purposes:

> The binary future [*bukimi*] constructs will deliver either a nonevent that exposes the anticipatory symptom as a needless phantasm, or a limit-event that obliterates the symptom, the activity of interpretation, and, one could even say, the symbolic order itself. Because it offers the possibility of a future without symptoms, without a symbolic order—in other words, no future at all—the nuclear condition can, in a sense, *only* cause anticipatory symptoms. (64)

The singular anticipatory drive of *bukimi* marks the experience of the death of thought within the *polis*. It is the experience of post-traumatic stress syndrome through the anticipation of symbolic obliteration. That is, *bukimi* is the impossibility of successfully mourning in advance of loss (65). *Bukimi* can thus easily be accorded "the status of the sublime or sacred, categories that share with trauma the quality of incommensurability with the quotidian" (69). *Bukimi* anticipates the sheer expanse of thought onto the horizon of its death, a horizon marked by the specks of planes with absolute firebombs under their messianic wings; the event of the vertical plane interrupting the horizontal expanse of Man.

This traumatic experience of the nuclear uncanny, Saint-Amour argues, rippled through the entire urban staging of the Cold War:

> In the period of eerie suspension before the explosion, those who registered the nuclear uncanny in Hiroshima were also the first to experience a condition that, in a far more explicit incarnation, would become familiar to everyone living in a targeted city during the Cold War: the sense that the present survival and flourishing of the city were simultaneously underwritten and radically threatened by its identity as a nuclear target. (60)

The heightened Cold War experience of the nuclear uncanny—the experience of the non-symbolic that opens the field of absolute corporeal vulnerability—was expressed by people building bomb shelters in American suburbs, while understanding both their kitchens and "push-button" appliances as the stoking final line of defence on the homefront—the uncanny suburban home.[17] We have incorporated this history of historical trauma, or at least marked it, through the etymology of "biotechnology." We see the Cold War incorporated again in Doyle's reading of vast genomic sequences as a cryogenic sublime. Frozen or cold-blooded, the uncanny living-dead of biotechnology anticipate a fire bomb that would be planetary in scope, or what the Supreme Court described as everything under the fiery sun.

How do we understand better the troubling history of biotechnological architectures of fire? And how do we articulate at the same time their troubling of history and unthinkability? To be targeted for a non-symbolic future is to experience what it means to have no sacrificial value, to be, as were those

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[17] For discussions of "push-button appliances," suburban homes and the Cold War see Colomina (2004), Miller (2004) and May (1988).

designated by the category *homo sacer*, vulnerable to a killing without impunity. How do we articulate our ethical relation to the spectres of the living-in-general in a way that engages a politics of biotechnology not afraid to give up the fantasy of Man's privilege?

Derrida has made an important point in this regard. Addressing the threat of a nuclear war, Derrida reminds readers that it has never happened on a global scale. Its ultimate threat occurs in discourse—which is not to say that the stories of an ultimate nuclear war fail to influence global politics. The point is that the deadly politics that capitalize on the discursive experience of the symbolic order's death are played out in literary acts. Derrida's argument applies as well to the discourse of biotechnology and the experience of what amounts to the death of the biological archive, the order that can only be restored by instituting pre-originary phantasms through military force, the force of law, or other spectral dramaturgies. Here is what Derrida says regarding the relation between the threat of nuclear war and literature:

> Now what allows us perhaps to think the uniqueness of nuclear war, its being-for-the-first-time-and-perhaps-for-the-last-time, its absolute inventiveness, what it prompts us to think even if it remains a decoy, a belief, a phantasmatic projection, is obviously the possibility of an irreversible destruction, leaving no traces, of the juridicio-literary archive—that is, total destruction of the basis of literature and criticism. (1984: 26)

Derrida is here thinking of "Literature" in two ways:

> (1) a project of stockpiling, of building up an objective archive over and above any traditional oral base; (2) ...the [co]-development of a positive law implying authors' rights, the identification of the signatory, of the corpus, names, titles, the distinction between the

> original and the copy, the original and the plagiarized version, and so forth. Literature is not reduced to this form of archivizing and this form of law, but it could not outlive them and still be called literature. (26)

Literature needs property rights because its archive, like that of genomics, does not have "reference to a real referent external to the archive itself" (26). The "outside" of a literary archive is "a fictive or fabulous referent, which [is] constituted in itself by the archivizing act" (26-27). That is, the "fabulous referent" of literature is shaped by what is archived under the name "literature." We see the "fabulous" aspect of biotechnology's sacrificial structure at work through its dramaturgies. I have tried, therefore, to stage others.

Here is at least one other: It begins in a landscape of snow and ice, and relays the symptoms of biotechnology's unthinkability by marking a self-incinerating architecture of fire. The scene opens in St. Petersburg, that lavish architectural city often described as a "window on the West," and it is in a state of emergency because food is not entering the city.

The siege of Leningrad (as St. Petersburg was then known) began on September 8, 1941 with the German army's blockade of the city. During the first two months of 1942 over two hundred thousand of the city's inhabitants died of cold and starvation. Testimonies of survivors describe broth being made from tree bark and the desperate eating of pets, pigeons and rats (Skrjabina 1971). By the time the blockade was completely lifted on January 27, 1944, well over six hundred thousand people had perished, primarily of famine.

During the siege, scientists at the All-Union Research Institute of Plant Industry, one of the largest plant germplasm archives in the world, starved to

death rather then consume the seeds, tubers and plants comprising their collection. In their seminal text, *Shattering: Food, Politics and the Loss of Genetic Diversity* (1990), Cary Fowler and Pat Mooney describe how the Institute's potato collection was especially vulnerable, as they were not preserved as seeds but rather, as starter potatoes. This made the tubers susceptible to both freezing and the rats skittering through the hallways and into the sewers of St. Isaacs' Square. And then, during the first spring of the siege they began to germinate. Scientists scrambled to plant the potatoes in front of the Institute, even building shelters to protect a blight-resistant strain bred from plants originally collected in Chile that required shortened days to mature. According to Fowler and Mooney,

> By August, with the invaders near and the city in flames, institute staff began digging up the potatoes as shells hit the fields. Amazingly, they retrieved all the samples. During the winter as scientists were evacuated, they smuggled out potatoes sewn into pockets next to their bodies, so that the potatoes wouldn't freeze. All blight-resistant potatoes in the USSR (sic) today are descended from these potatoes. (Fowler and Mooney, 1990)

In the meantime the rats inside the institute had learned how to knock metal boxes full of seeds off the shelves in order to break them open. Guards were posted to protect the seeds from rats, and on the roof scientists took turns watching for fires caused by the shelling (Nilsen 1990).

The Institute was the central hub of a series of experimental agricultural stations located throughout Russia. During the siege's first winter, the scientists had to move the valuable germplasm at the National Scientific Institute of Plant Growing experiment station, as it was known then, to an alternative site in the basement of a building on Gertzen Street in Leningrad. The collection shared its

quarters with a hospital. A small wood stove that kept the cultivars warm in the face of frigid temperatures demanded constant replenishment. Soldiers, orderlies, and even wounded patients from the hospital floors above broke up chairs, tables, buffets and other furniture to feed the stove, keeping the collection warm. The starving staff also used sheet metal to cover the street-level windows, protecting the edible archive from ravenous intruders. Nighttime at the institute was especially dangerous, because as it was then that famished townsfolk would try to steal from the collection. One researcher's fate points to the tragic irony of the decision to defend, rather than share a plant repository whose central purpose was the development of the nation's food security: a woman who stayed every night to guard the potato stocks eventually died from famine (Johnston 1998).

Outside the city, in Saratov, Nikolai Vavilov, the Institute's leader and most significant collector, was in prison. His use of genetics had been associated with Nazi eugenics and later condemned as anti-Bolshevik by no less than Stalin. By 1941, at the end of a trial marked by numerous false testimonies, Vavilov was found guilty of, among other charges, agricultural sabotage, conspiracy, and spying for England. He was sentenced to death. Helen Sheehan (1978) has argued that half of the eighty colleagues arrested alongside Vavilov were either executed or died in prison. Vavilov's own sentence was commuted, but one of the great collectors of plant germplasm nonetheless died in prison of, ironically, complications related to malnutrition.

What is to be made of this scene marked by radical violence and absolute sacrifice? And what is to be made of the All-Union Research Institute's decision during the siege to, above all, defend the archive? The German army, promising

its own sociobiological future had barricaded the city. Those trapped and defending the city starved to death by the thousands. Surrounded by the forces of Stalinist Russia and Hitler's Germany, by *the* two totalitarian trajectories of modern democracy, the staff at the All-Union Research Institute safeguarded the gene bank to the point of death. For what visions did the staff, feverish and starving, save the archive, sacrifice the people of the city and their own lives? For the future of the Soviet Union and its food security? Perhaps, but the staff would almost certainly not desire the maintenance of the Stalinist state that was persecuting them. For what future Soviet Union was the plant repository preserved? For a future Marxism? Or, as scientists, did the staff protect the collection for the future of genetics and science? Or did they die for the future of Man in general? Between the totalitarian forces of communism and fascism, what species of *res publica* was defended? For what group, people or hungry horde did the guardians of the gene bank starve to death, and to what filial masses do their ghosts belong?

A politics of biotechnology must learn to speak with these ghosts, whose passing marks the external borders of modern democracy and its violence. We also need to learn to speak with these ghosts because the collection was gathered by Vavilov from around the world:

> Vavilov visited Afghanistan in 1924, toured the countries surrounding the Mediterranean in 1926, went to China, Japan and Korea in 1929 and the following year visited North and South America. (Gaglioti 1996).

During his expeditions Vavilov accumulated over 350, 000 cultivated plants, but he also mapped what are now referred to as the "Vavilov Centres of Crop

Diversity." He argued that most domesticated foods come from these regions, and that chief among them was what is now referred to as the Middle East Centre of Crop Diversity. Vavilov himself made repeated trips to Asia Minor, Turkestan, Persia, Afghanistan and North Western India (Vavilov 1931). Talking with the spectres of the Vavilov Institute begins with the mapping of the history of eating and the Middle East. At a time when "terrorists" are being defined as "unlawful combatants" and thus constructed outside the laws of citizenry and subject to non-criminalized violence, and at a time when the people of Afghanistan see both bombs and food packages dropping from the sky, when, as Zizek has pointed out, "We no longer have an opposition between war and humanitarian aid" (2002), the need to speak with the specters of what is now called "The Vavilov Institute," seem more urgent.

With affection,

Your younger brother

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