NORTH-HOLLAND

Gene Discourses: Politics, Culture, Law, and Futures

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ABSTRACT

In this article, we locate the future of genetic science in a variety of discourses, ranging from those that perceive science as part of the linear march of progress to those that see science as fundamentally violent with regard to its relationship to nature, gender, knowledge, and culture.

We articulate how current and future law might deal with potential developments in gene therapy, arguing that for some current law can adequately deal with the genetic revolution, whereas for others law must become more ethically and participant grounded.

We describe likely sociopolitical scenarios, from gene acceptance to violent attacks on genetic doctors. We conclude with more speculative scenarios—among them, one in which humans will be remembered less for themselves and more for the new species that will emerge from them.

Genetics and the Natural

"A characteristic of human nature, perhaps the one that makes us most human, is our capacity to do the unnatural, to transcend and hence transform our own nature," writes Scott Peck (page 53 [1]).

Scott Peck's observations on human nature are pointed descriptors of the driving force behind humanity's current uncoverings in genetic engineering. We are at present redefining the "natural" at a pace that most of us find difficult to comprehend. The natural is no more (if indeed ever it was) (page 1087 [2]) a concrete substance, but rather a collection of shifting sands upon which we are desperately trying to find a foothold. "Man" as the natural is about to disappear, "like a face drawn in sand at the edge of the sea" (page 387 [3]).

The redefinition of the natural—perhaps extinction of the natural—is part of the emerging condition of postmodernity [4]. Postmodernity is primarily characterized as standing in opposition to the traditional moral as well as the rationalistic modern worldview. Reality, once considered stable, is now virtual and situational, transformed by technology and subjectivized by culture. Truth, once considered objective, eternal,

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and universal, is now fleeting and local. Previously upheld in ethics and religion, truth has been made trivial by casino capitalism and relative by multiculturalism. The grand stories of who we are and where we have come from have been attacked, not as being false, but as denying difference, as not being authentic to the many people that we now are. Both reality and truth are now considered socially constructed, culturally defined. The natural once defined by evolution and nature is now technologically constructed; it is the simulation of the natural that has now become the natural, leaving language and artifact groundless. Sovereignty contoured by civilization and culture is now porous with global capitalism ubiquitous. Once bound in the nation-state, sovereignty is now under threat from above and below, from world governance and localism, from the global commons and tribalism. Finally, the self, once certain of its mission in life, is now merely a collage of impressions, created and recreated by the desire for hypertime and hyperspace, cyber love and cyborg sex [5].

Clearly these are not minor changes, far more than merely the passing of industrial to postindustrial society and more than merely the rearranging of social institutions. It is fundamentally about how "we" are and how we constitute our "nature" ontologically and epistemologically.

Technology, in particular, is creating (and will continue to create) worlds that re-represent the world such that we are no longer certain what stands for what—the rootedness of territory and history are now problematic. However, it is genetics that, if current trends continued unabated, will be the main driver (indeed if one can make a distinction between source and the consequence), creating the postmodern world, ending millions of years of evolution as we have come to know it. From having the power to extinguish life on the planet, humankind now has the power to create life, with the "very course of evolution coming under more and more control" (page 283 [6]). Moreover, Los Alamos physicist Doyne Farmer of the Sante Fe Institute in one of his speculations asserts that, with the advent of artificial life, we may be the first creatures to create our own successors" (page 284 [6]) to participate in emergence, creating the complex (the future) from the simple (us).

Death, Life, and Creation

For French philosopher Michel Foucault, this is a longer term process where instead of the state taking the role of a calculus of death—indeed the power of the state, of the sovereign, was characterized by its ability to kill—the state's role has been transformed into one of regulating life [7]. Administration, management, and statistical accounting have been characteristics of our modern times.

The law's role has changed as well, from one of the power of violence, of death, to that of regulation, of control. Indeed, that regulation and control is even stripping death of its dramatic power by sanitizing the process of death with such "control" (for example, through euthanasia, life support systems, etc.) that we can barely recognize it.

However, this next process, which Foucault glimpsed when he talked of biopower, is not just the management of life, but the creation of life, the final death of death, a bureaucrat's nightmare. Law, we can assume, will change as well—less concerned with the management of life and more with the issue of the creation of life and the many life forms that will follow. What is life—a computer program, a cyborg, a human, an animal, a genetic clone? Where is life—inside, us, in our minds, in the cosmos? And the intricate boundaries these issues raise (between the normal and the abnormal, the beautiful and the ugly) will become the arena of jurisprudence. Owning life, killing a computer program,

deciding on the rights of our genetic futurecestors will become the issues that plague the future, particularly if we use the models of current legal thought.

The death of death (or at least its dramatic retreat, its removal from our gaze) is not particularly new. The essence of Indic civilization—in Tantric, Vedic, and Buddhist varieties—has been about the end of death. However, this was achieved through belief that with enlightenment, the soul realized its true nature and thus became eternal, everlasting, uniting with the cosmos as a whole. One thus was never born (and thus re-died). It is only in the West, where death retreats not through mental and spiritual reconceptualization but through technological innovation. We should not be surprised, since being itself has been made contentious by technology. In Indic thought, as well as in other ancient civilizations, Islamic or Sinic, there was/is a natural life cycle. The task is to live better, more harmoniously (in accordance with the dictates of God, community, and family) within that life cycle. Understanding suffering has been more of a project than eliminating suffering through medical intervention. Death and life have been seen as complementary, but it is in the West where that binary relationship is now under threat.

Technology thus is redesigning evolution itself. Susantha Goonatilake's [8] metaphor of technology bypassing culture to recreate the lineage of evolution is fitting. Imagine a hand, he asserts, wearing a glove, writing with a pen. The hand represents the stability of evolution, our body constant over time; the glove represents culture, our meaning systems, our protection, our method of creating shared spaces and creating a difference between us and nature; and the pen, technology, representing our effort to create, to improve, to change culture and nature. Whereas the traditional tension was between technology and culture with evolution "stable," now the pen (technology) has the potential to turn back on the hand and redesign it, making culture but a technique, a product of technology. Thus, the traditional feedback loop of culture and technology with biology as the stable given is about to be transformed [9].

Efforts then to find stability in law or in law and order, in sovereignty, in text-based rules of behavior, and in ethics seem to be deeply problematic. Law has been successful, because we have been active in print, in cool media. As we enter hot, interactive, transforming channels of communication like genetics, telematics, and robotics, it appears that print-based fundamentalist law will be less able to negotiate the many meanings that are creating the future.

It is in this climate of where what is possible is imperative, that new questions are being asked by scientists, humanists, and critical theorists. Are our genes still ours or are they to be owned by the global good, nested in the global commons? Will our personal genetics space be corporatized and patented so that research can continue unabated? Will I still be me? Will you still be you? The legal issue is to define whether genes are private, public, or whether perhaps they have their own "rights" and their own special place in legal discourse. Does this mean that we should remove unhealthy genes (disabilities) or that all genes have a basic right to exist even if their continuation causes ill health to humans? Will genetics support not the creation of a broader human communicative community, but the elimination of those that are foreign, different, weaker than us, the most vulnerable? Will gene technology further the divide between rich and poor, powerful and weak, making the latter now genetically disadvantaged as well?

The Question of the Self

The "who I am" question is no longer just philosophical but is also technological. The sovereignty of the self, as it left the boundaries of tribe and civilization, is now defined by exchange—wherein sovereignty is the problem—relationships such that one

is by one's circulation. But even this movement and liminality of identify [10], where boundaries of who I am and who you are and who technology is and who animals are, are under threat.

We have lost our historical essential self, becoming impressionistic selves because of global commercialism and hyperurbanization. No, it is not merely that our selves are constantly changing, becoming different impressions, but the distinctions between impression and depth, between surface and authentic, are on the verge of breaking down. This is a much more serious problem: the breakdown of the fundamental binary categories we have historically used to creating meanings within and without ourselves. Even Zen, the disruptive strategy to end disruptive strategies, has maintained a distinction between the natural and the other [11]. And whereas we have clearly always made the world—nature—into our own image, it is now that we are making ourselves based on these images, at a time when our image is breaking down. We exist in metaphors that have no existential relationship, no grounding in particular empirical events [12]. However, while scholars, critical theorists, and scientists debate the future of civilization, asking grand questions, inviting an historic debate on the meaning of the natural, truth, and reality, our discourse has all but been made trivial by new technologies and techniques, creating a postmodern world where the future has arrived.

In recent news, California doctors have allegedly successfully corrected genetically inherited defects at birth, setting the stage for genetic correction of the many disorders found to have a genetic base. Doctors have also allegedly perfected a growth hormone that can now add 5 to 7 centimeters to the final adult height of short children. The worldwide market for this drug is expected to be in the billions (page 52 [13]).

Simultaneously, a recent critique of materialistic developmentalism by Thomas Samaras asserts that the West not only uses all the world's resources because of its consumerist lifestyle, but because their population is taller [14]. Shortness, it is argued, is better because shorter people consume less and use less space [15]. Whereas height has traditionally been a spurious variable in creating social policy, we are suddenly placed in a situation where shortness becomes a desired future. Moreover, if estimations of the future development of genetics are accurate, we should expect calls to engineer shorter people? Whereas most would scoff at this idea, if we can imagine genetic research being used to cure or modify individuals ills, why not for the larger ill of the planet. Holding other things equal, "a six footer may produce 10 tons more carbon dioxide a year than a five footer" (page 104 [14]). Although there appear to be simpler remedies to environmental problems, as we enter a genetic paradigm, we should not be surprised if the genetic altering of height becomes a focus.

We speculate that we will all be strangers in a world that is currently inconceivable. In the meantime, even if the technological imperative appears unstoppable, it behooves us to begin to ask not only what are the consequences of current developments in genetics, but what, if anything, can be done to transform, if we desire, these trends?

We seek to enter a third space that does not reject new technologies in toto. We do not take a humanistic line (one that sees science and technology as neutral, that is both good or bad depending on its outcome), nor, however, are we seduced by the ideology of the geneticization of life, such that the gene becomes the central variable in evolution, with "us" merely continuing its onward and upward march into the future. Both humanistic (by essentializing the natural and seeing the future only in human-centered terms, ignoring future life forms as well as animals and plants) and technocratic lines reduce the richness of the current transformation, opting for simplistic readings and solutions to complex, multilayered, multicultured phenomena. At the same time, we are not naive

enough to believe that technological auditing can somehow dramatically reshape the globalizing forces underway. They have their own logic: technological imperatives, profit, the spirit of inquiry, the reduction of human suffering. There is agency, however. It is the time of many voices, but whether social forecasting can reverse us to an era of one voice, an imperial voice, or a pastoral self, or whether our scenarios can somehow transform the future, well, we are suspicious. This is the time of grand drama, when as Goonatilake describes, history changes itself [8]. Our hope is to provide some maps, understanding that we have entered a space where maps themselves are being undone, making the debate between map and terrain trite. That earthly metaphor has had its day.

Genetics, Science, and Civilization: Contesting the Terrain

Certainly then, genetics and science, even as they claim objectivity, are a contested field. Even while genetics and other technologies "scientize" the world, creating a new global project as adventuresome as development has been in this century, the ground for such universalizing is being culturally and politically contested. The image of the scientist working for the benefit of humanity, outside of economic, personal, political, or cultural motives has been dethroned. As Ashis Nandy writes: "The image of the scientist as a slightly seedy natural philosopher and practitioner of an esoteric discipline, and that of the technologist as a humble craftsman or artisan, gradually underwent a change. Both became partners in a new high paying, heady enterprise called modern science" (page 78 [16]).

That heady enterprise has broken down. Although Marx sowed the seeds arguing for a sociology—class base—of knowledge, the still thought that his was a science. It is merely the mask of ideology that prevented others from joining him. Khun took the next step, showing science to be paradigmatic, based on conventions of truth. Foucault went a step further suggesting that it was the larger boundaries of knowledge that framed what could be science, echoing Heidegger who argued that "science always encounters only what its kind of representation has admitted beforehand as an object possible for science" (page 216 [17]). With feminists, ecologists, and third world postcolonial critics continuing this barrage, the dramatic days of science appear to be numbered.

Science is now considered one way of knowing among many—useful in having transformed medieval theology but no longer adequate to represent the indigenous, non-Western, and feminist ways of knowing. Science is thus seen as part of the fatigue of the West. The limits of rationality, objectivity, and instrumentality have been realized. Again as Nandy writes: "Modern science has . . . built a structure of near total isolation where human beings themselves—including all their suffering and moral experience—have been objectified as things and processes to be vivisected, manipulated, and corrected" (page 106 [16]). Nature must be improved upon, indeed, undone.

However, as critics contest, the massive Human Genome Project, to map the human gene system, to find the causes of disease, to lay the groundwork for science as a reason not only for state but for life itself, is being set into place.

The Ethical Environs

Thus, the new genetic technology is being born into an ethical space dominated by instrumental rationality, by predatory capitalism. As our scientific knowledge multiplies exponentially, our ethical evolution grinds painfully slowly as we seek to develop the subtlety of ethical thought, which new technologies demand of us in the context of a material-based social environment. Material-based scientific expansion is outstripping our ethical evolution at an alarming rate. Technology and culture are moving in different

directions, either eliminating culture or perhaps forever transforming the category "culture" in itself, the feedback mechanism being so overwhelmed by new signals that one of the systems must either revolt, collapse, or transform. It is unlikely that it will be technology that will do so.

However, the warnings are there, from West and East. The late Indian philosopher, Shrii Prabhat Ranjan Sarkar, warns of the dangers of scientific advancement taking place in a social climate devoid of developed discriminative human judgment (page 13 [18]), of undeveloped culture. According to Shrii Sarkar, a civilized society—one in which discriminative judgment is highly developed—is essential for the appropriate utilization of scientific endeavor. Where the development of civilization is utterly negligible and science gradually attains the apogee of development, science only paves the way for destruction instead of doing any good to humanity. And so, study and practice of science, though unavoidable, should not be given a higher place than civilization (page 13 [18]).

According to Sarkar, it is not just the technology per se that is the problem requiring resolution, rather it is our lack of ethical wisdom to evolve constructive and appropriate solutions to the dilemmas with which new technology presents us. It is not just the newness of genetic technology at issue; rather, it is what we tend to do with "the new." For the new genetic technologies are being developed within a modern society in which the material prevails over the spiritual, in which "the new" carries irresistible charm to the modern mind, and in which the temptation to use rather than to utilize technology cannot easily be resisted. Thus, new technologies create cycles of fetishism, appealing to our basic selves, or creating impressionistic, quick, fractured selves.

Science and the Light of Life

However, not all conceive science and technology as contested realm. They seek to continue to make a distinction between religion and science, myth and science, the other and science. In the magazine, *Today's Technology*, we learn that physicists such as Paul Davies have helped science take over from religion as the dominant way of knowing about our world and our place in it. The editor, Peter McGregor, quoting Paul Davies, believes that Davies's work tells us the "story of the gradual triumph of science over myth, of light over darkness" (page 3 [19]). Two points should be obvious. First, science is placed alongside progress, with tradition, culture and religion as backward or superstitious. It is they that are to be blamed for the faults of science, the politicians, the obscurants, the funding agencies; the project itself is sane. Thus, science is not seen as a reason for the state, as a tool of epistemological violence against nature, against the self, against knowledge, and against the other, as Vandana Shiva argues [20, 21]. Science remains part of the ascent of the West, of development. That development has meant that local people have been robbed of meaning systems, of local science, of their own economies, is lost in this argument. But we should not be surprised. Where can one find *Today's Technology*? Where else but beside a range of other free magazines of religious groups, ad-hoc associations, movie schedules, advertisements for units for rent and local campus squabbles, that is to say, on campus newsstands, as campus propaganda. And as we might expect, the language used is typical of efforts to escape myth; it merely reinscribes myth. Even as science claims it is outside of values and history, of religion, it uses religious metaphors (from darkness to light) to make its points.

Thus, we should from the beginning, as we ponder the future of genetics, ensure that the discourse we use is sensitive to the politics of science and genetics.

Body and Politics

Feminists such as Sandra Harding [22] and Bonnie Spanier [23] very clearly tell us that gene research is just the latest in reductive, atomistic, violent, patriarchal science. Whereas previously all diseases were medicalized (instead of the more complex interplay of meaning, belief, environment, and civilization), they are now geneticized. If we can only find the gene to x, everything will be solved.

It is the body that has become the site of invention. The iron cage of modernity, the grid of bureaucracy, of the surveillance state, has found its natural home in the body of women. Her body has now been minutely divided with geneticists getting the womb. Foucault describes this as biopower. As mentioned earlier, beginning as the retreat of death, it emerges as the bureaucratization of life, concluding as the creation of life (pages 142-143 [7]).

Gene technology is being developed not in neutral terrain, but in a politicized terrain where instrumentality is the ordering ideology of the day. Behind instrumentality is materialism, an insistence on rational and material factors to reality. Behind this is the behemoth of the West, where only reality produced there has meaning. Thus, it is not an accident that the U.S. government and other parties have attempted to copyright the genetic material of indigenous tribes—these peoples do not exist except for the expansion of state and capital. Furthermore, Western material science is not only monopolistic on the selves of others but insists that only it can do science. It rejects indigenous science, Islamic science, or Indian science, because the norms of logic, the worldview behind them is different. They did not have the same enlightenment as Europe did, the individual did not appear, nor was liberalism paramount. We belabor these points not to enter a debate into the philosophy of science but to assert that there are many sites within which the future of genetics can be located. And that all sites are politically contested arenas in which a range of values inheres themselves. Neither technology nor science should be seen as outside of meaning, history, and culture; they themselves are that!

Gene Sites: Locating Genetics in Discourse Revolution

The first site is genetics as the next global revolution, continuing the science and technology revolution, bringing new food and environmental products, beating death back, perhaps even solving the problem of aging, solving numerous terrible diseases such as cancers and hepatitis B. As John Stocker writes, "Creation did not stop on the seventh day. It is not a static state. The whole evolutionary process is one of constant ferment and that is the wonder, the beauty of it. That's the mechanism which has allowed the selection of species with advantages. All we're doing as scientists is using the tools of creation to continue that process."[1]

In this discourse, genetics is merely helping individuals, reducing poverty and illnesses. Scientists are not political actors; they are merely impartial researchers. The work is not subjective because it is repeatable at different sites; it is universal, as it is based on reason, on rationality.

Hubris

The second site is the myth of hubris. Humanity has limits; among them is not interfering with nature. As David Suzuki writes: "Once again scientists have become

[1] J. Stockar quoted in Peter McGregor, Genes and Technology, *Today's Technology: Gene Technology at Work* 3, 4-5 (1995).

intoxicated with their discoveries."[2] The dangers of biotechnology have not been considered. Munawar Ahmad Anees, author of *Biological Futures*, writes on cloning: "Cloning reinforces the values of genetic determinism because it poses a threat to individuality and diversity. It forecloses genetic variability. Nay, it betrays the double-edged sword of genetic determinism by showing that it can act first at the state of conception and then be in hot pursuit of deterministic nurturing. Here the good old nature-nurture debate is in for a real shock! In no small measure, genetic determinism is an antithesis of moral and ethical choice" (page 36 [24]).

Underlying this critique is a sense that there is something fundamentally wrong with Western science, it is but an Hellenic tragedy. Instead of attempting to change behavior, it searches for a technical solution. Instead of accepting that humans die, that there is a natural lifespan, humans try and prolong it, seeing death as an enemy, to be defeated. Instead of living with Nature or with other cultures, they are to be tamed, the secrets of Nature to be tortured out of her, to use the famous words of Bacon. Finally, central to this critique is that genetics attempts to reduce behavior and meaning to mere genetic causes—it is the geneticization of everything. The result can only be eugenics, the loss of diversity, and eventually total civilizational collapse. A theory of everything is impossible, as it is chaos, difference, that which we repress or are unable to include in our conceptual or genome mapping, that creates the future, that are the residuals that can by definition never be accounted for. Being is always more than knowing. This, then, is an essentialist view, which believes that there are certain boundaries we should not deconstruct or bypass.

Bureaucratization

The third is bureaucratization. Concerned more with the rationality of technology and the ability of law to monitor, control, observe, manage new technologies, genetics is seen as an arena of the unknown for law, as an arena in which laws must be quickly developed. The state must rapidly enter this field to control it, safeguard it, reduce danger, avoid exploitation, and avoid unscrupulous individuals. In every case, it is the state through lawyers and law that will determine the future of genetics. What is patentable? What can be owned? These are less technological issues and more legal issues. They are not even ethical issues, as the debate is not so much an appeal to philosophy but an attempt to decide what is best from a range of competing interests: the needs of genetic corporations, the privacy of individuals, the wills of nations, the pull of the global commons, for example.

Postmodern

The fourth is the postmodern. This was touched upon in the beginning of the essay. That combined with virtual reality, telematics, genetics promises to transform the natural and the real such that not only will indigenous people, women, and the non-West be unprepared but so will the technically rich West. No culture can be prepared for the fundamental transformation that is ahead. No meaning system can survive, even if science makes a claim for a theory of everything; in fact, tall grand narratives, global truth claims will be made problematic. Any sense of essential self or identify will be made problematic. The idea of "woman" or "man" will possibly seem strange, as they can be

[2] D. Suzuki, quoted in Peter McGregor, Understanding Science and Technology, *Today's Technology: Gene Technology at Work* 3, 14 (1995).

recreated. This is about the total "artificial" world, where identity can be technologically transformed. One can choose one's "features" and thus futures [25].

Hybrid

The last is a hybrid image. It is concerned with the technical dangers that gene technology poses. It is sensitive to the issue of commodification of the genes of other cultures, that is, it respects their right to their own cultural and genetic history and resists efforts to market them. It is also sensitive to simplistic theories of agency, seeing genetic history as one among many other variables: behavior, civilization, worldview, diet, environment, and even previous life entanglements. However, it does not take an essentialist view of identify, believing that the natural is not fixed; rather, it is co-created in a complex evolutionary interaction of civilization, individual and the collective consciousness. The task is to wisely govern evolution [26]. Understanding that the genie of creation is already out of the bottle, the task now is to steer evolution, respecting the histories and categories of other civilizations and creating a new science that uses the paradigms of other civilizations including nonmaterial worldviews that cannot be easily refuted or accepted by conventional materialistic science. Wisely governing evolution means accepting the centrality of chaos and complexity in systems, accepting that they are self-organizing and that consciousness is active, either through a collective field of awareness or through some interaction with a global mind (perhaps engineered by global telematics or through a more spiritual noosphere).

These discourses summarize the sites in which gene technology is constituted. The most common scientific view is that the Human Genome Project may help us to understand and eventually treat many of the 4,000 or so single gene defects. Writers also assert that when we know the complete human genome, we will know what it means to be human. Critical of this is the view that we will define ourselves from the genetic discourse itself, that we will be able to understand meaning, consciousness, and cultural diversity from mapping the human genome. The class critique is that this way of seeing the world allows human nature to be owned. Of course, those convinced that the technology will transform class relations as well as identity relations argue that human nature will be impossible to own or patent since it will slip by us, always more than our technologies. Moreover, we will be creating new life, new forms of life that problematize "us."

Grounding Genetics in Law and Ethics

Whereas these discourses develop the multiplicity of sites to locate the futures of genetics, they do not ground genetic engineering at any particular site. However, as we gather more knowledge of the human genome and the potentials of genetic engineering, we, as a society, are being asked to create some solid ground upon which to beach this new technology. That solid ground is ethics. And the practical expression of ethics is very often law, a site in which a particular discourse must be victorious, in which truth claims must be made.

New technologies ask of us new questions. They demand new answers. They demand that we set for ourselves new limits, new rules, new regulations of do's and don'ts. They demand new laws. However, can law manage these new technologies, or now that the genie is out of the bottle, must we merely watch and be enchanted by the new worlds being created before us? Or, are there enough analogous cases in common law such that no new legislation need be created, wherein we can go back to the wisdom of the ancients and use it to steer ourselves clear of the dangers ahead. Certainly, law is used as a way

to make gains for the powerful, as with copyright law, favoring the individual over the collective, the short-term over the long-term.

Legal Scenarios for the Future

Just as genetics itself can be viewed through a number of different lenses – or situated within specific discourses – our legal responses will by fashioned by the discourse that dominates our development of the technology itself, which provides the philosophical justification for the technology.

At present, the law is wedded to the discourse of bureaucracy. Law is about regulation and control, about protecting power structures. It has little to do with ethics or justice. And certainly, in the short-term, with the persuasive influence that comes from a long history, from precedent, from being the status quo, we can expect nothing other than bureaucratic responses as the legal system grapples with the ethical dilemmas of genetics.

The material-based, ethicocultural context into which the new genetic technology is being born, shapes both the nature of the ethical dilemmas that the new technology creates and the solutions proposed. Given that the solutions come from the same value base as the dilemmas and given that this value base remains unchanged, we can simply expect "more of the same" but in an amplified form.

But, in the longer term comes the possibility for the law to reflect other discourses and ways of seeing and knowing. The technology itself and the ethical dilemmas it creates may strip bare our existing value base and cause us to reevaluate and shift our own ethical position and responses, away from the material-based value structures toward something new, located in one of the other discourses we visited earlier.

Scenario 1: Law as Bureaucracy and Supporter of the Genetic Revolution

In this scenario, the two discourses of bureaucracy and technological revolution (outlined above) join forces – the discourse of revolution providing the philosophical justification for the development of genetic technology as the solution for the future, and bureaucratization providing the legal framework of regulation needed to support the mechanics of the genetic technological revolution. In this way, the law as bureaucracy acts as humble servant to the technological revolution, providing the appearance of measured control, when in fact, the law, which embraces essential capitalist ethics of individual autonomy, ownership, personal enterprise and freedom of choice, is facilitating the playing out of the technological revolution according to market forces.

Currently, our society, being matter-centered (instrumental in its rationality, short-term in its outlook, reductionist in its science, with profit as its defining project), is deeply afflicted by the forces of accumulation, exploitation, differentiation, and discrimination. The new ethical dilemmas faced as a result of new technology tend to arise out of the confluence of these forces of maleficence with the new technologies. Our responses to these dilemmas are presently, and may continue to be, shaped by the same value stucture that created for us the dilemmas in the first instance. Thus, our first scenario is that our legal responses to the new genetic technology will simply be more of the same, i.e., they will continue to be reflective of the bureaucratic discourse in which law is presently based.

Contemporary legal responses to the new genetic technology have tended to fall into three categories. First, existing common law principles have been reinterpreted to cover the dilemmas raised by new technology. For example, the U.S. Supreme Court in the case of *Diamond v. Chakrabarty* 447 US 303 interpreted U.S. patent laws to extend to the patenting of humanmade microorganisms [27].

Second, new legislation has been specifically drafted and enacted to dealt with the ethical dilemmas raised by new technology. For example, many European countries have enacted legislation to determine the boundaries of biotechnology in medicine.

Third, ethics committees have been empowered to determine the appropriate boundaries for genetic research. These boundaries often then become the precedents for determining the regulatory framework when applying research results in practice. For example, many countries have modeled their review systems on the U.S. two-tier system of review under which research applications are approved at a local level by Institutional Biosafety and Ethics Committees on the basis of guidelines developed by the Human Gene Therapy Subcommittee of the Recombinant DNA Advisory Committee (RAC) [28].

The common thread of these legal responses is that they are steeped in our current legal value structure, which emphasizes, personal autonomy and private ownership as its core value base, which strives to regulate rather than to resolve, which is based on rights discourse, and which is based on precedent and thus upon looking back as much as forward. These threads can be seen running through most of our legal responses to the new genetic technology. Let us look at examples.

SELECTIVE ABORTION

The Human Genome Project is rapidly expanding our knowledge of the role that various genes play in predisposing some of us to certain diseases or impairments. Whereas there are many ways in which this knowledge could be used beneficially, in our modern society, which has great difficulty assimilating difference and imperfection, it is currently being used to devise prenatal tests, which can identify fetuses likely to be born with impairments and predisposition to certain diseases. Once those fetuses are identified, they are then selectively aborted. The practice of selective abortion differs little from the practices that we have used for centuries in dealing with difference – children with disability have, historically, been left on the mountainside at birth or later segregated through institutionalization. The practice of selective abortion is actually a predictable, though regrettable, social response to difference in our current value structure – technocratic material scientism.

Where legislatures have been called upon to deal with the practice of selective abortion, which is growing as a result of genetic technology, legislators have proven themselves willing to express the same values that have allowed institutionalization and infanticide to occur. In the United Kingdom, the Abortion Act (1967) UK, Section 1(1)(b), specifically provides that suspected impairment of the newborn is a ground for abortion. In some jurisdictions, this is a justification for late abortions, which would not otherwise be allowed. In China, under their new eugenics laws, doctors are obliged to "advise" mothers to abort, if it is suspected that the child will be born with an impairment [29]. According to this scenario, the new technology is not creating new abuses; rather, it provides us with more opportunity to practice the abuses we currently practice.

INSURANCE

In a similar manner, genetic information is being used by insurance companies to obtain more accurate risk assessments of persons seeking insurance cover, which allows them to either deny insurance or require higher premiums from individuals whose genetic make-up makes them a higher insurance risk (page 141 [30]).

There has been unwillingness to place limits on the use of economic information in insurance [31][3] and, accordingly, the existing common law principle of the "utmost good

[3] The National Institute of Health/DOE Working Group, Genetic Information and Health Insurance: Report of the Task Force on Genetic Information and Insurance (May 1993) cited in Kirby M., Legal Problems: Human Genome Project, *Australian Law Journal* 67 (December 1993), 901.

faith" requirement of full disclosure in general insurance law [32] has been applied to the new information that genetic testing is making available. Accordingly, people are being advised to take out any insurance policies they want before taking any genetic tests (page 319 [33]).

The insurance industry, being privately owned and based on profit, is necessarily in the business of discrimination. Therefore, existing legislative measures to deal with discrimination have been specifically drafted to protect the right of insurers to discriminate. Anti-discrimination legislation, therefore, generally offers no assistance in overcoming genetic discrimination in insurance law as it specifically exempts insurance companies from liability for discrimination on the grounds of disability in the provision of insurance.

Thus, the value system that supports the privatization of personal misfortune (user pays) is being reaffirmed in our responses to the potential uses and abuses of genetic technology in the insurance industry. Insurance companies are being given greater opportunity to avoid risk through genetic testing and, increasingly, the individual must bear the financial burden of his or her genetic predisposition to illness.

PATENTING

The very act of uncovering genetic knowledge itself is creating for us new ethical dilemmas requiring legal responses. Who owns the knowledge uncovered? Indeed should we be able to own knowledge of the basic functioning of the human body? Research has become closely linked with economic imperatives. Increasingly, research funding must be justified by economic returns, often to pharmaceutical companies who can translate the knowledge acquired into commercial viability (pages 118–124 [30]).

With research increasingly driven by the economic imperative, researchers have felt a growing need to monopolize the knowledge they have uncovered, even if they do not yet know to what use it can be put. In the United States alone, more than 35,000 patent applications for biological material have already been made (page 35 [28]).

As yet, there is no consensus on how to deal with the question of patenting biological material. There has been a great deal of dissension within the scientific community on this question (page 11 [34]), and a uniform approach has not been adopted. The most common legal response to this need has been to use the existing legal concepts of property law, in particular intellectual property law, and reinterpret it to cover the patenting of genetic technology [27].

In general, there has been a greater willingness in the United States than in European countries to embrace the concept of patenting biological material. For example, in France legislation has been drafted to prevent the patenting of human genes or genetic sequences [28]. Without consensus on the patent question, however, attempts by some legislatures to outlaw patenting of genetic material will fail as scientists can simply obtain patents in other more sympathetic jurisdictions. At least in the short-term, it appears that the principles of private property will be our source of reference for resolving issues around the ownership of knowledge uncovered by genetic research.

"MORE OF THE SAME" TRANSLATES "EVEN WORSE"

If we continue to tread the path of applying old legal concepts and principles to new ethical dilemmas, we run the risk of further intensifying and exacerbating our collective negative tendencies—of accumulation, exploitation, differentiation, and discrimination. The law has never done a very good job at resolving dilemmas. According to Schneider, "One of the great truths about law is that with unnerving frequency, it fails to achieve the effects intended for it, and sometimes quite fails to have any effect at all" (page 19 [35]). For, "the law is essentially a device for social regulation"; it is "the art of the

possible and the necessary" (page 19 [35]). It is not, as we have evolved it to be, a subtle instrument for dealing with the just resolution of complex human interrelationship.

Legal theory is borne of a culture of looking back (precedent), of seeking to resolve current dilemmas by reference to the past rather than to the future. If we choose to apply the legal principles that we know already, then we are likely not just to end up with more of the same, but actually with something "even worse." For the new technology provides more sophisticated methods to amplify the abuses that we are already wont to make of "the new."

Scenario 2: The Law as Preserver of the Natural—The Hubris Scenario

In this scenario, the law takes on the role of guardian of social welfare by keeping us away from that which we simply ought not to touch. The old saying, "Leave well enough alone," will be the philosophical justification for the law's banning of all genetic research and services. The outcomes of this scenario, for society, would be the emergence of a black market in genetic technology where people would go to backyard genetic clinics for illegal genetic testing, gene therapy, etc.

Given the considerable vested interests of certain key players—such as the pharmaceutical companies—in genetic research, and given their power and influence, this approach is not likely in the short-term. But, in the longer term, should we see a resurgence of more traditional values, the law may be used in this way to protect society from the dangers of uncovering "that which should not be uncovered." This approach has been taken in a number of countries to the practice of germ line gene therapy (page 25 [28]).

Scenario 3: Fast Law—The Postmodern Discourse

In this scenario, meaning and truth are changing rapidly. The old legal system, based on precedent, developed over hundreds of years will be meaningless and outdated. The paper-base of the legal system will be replaced by fast law. Along with that paper-base will go many of the "solid" value structures of our present bureaucratic legal system, which have bound the law tightly with power structures. The law will be less owned by lawyers, with larger pieces of it, particularly the more standardized legal practices, being taken over by technology [36].

Laws will change more rapidly, using more informal mechanisms. In this scenario, there will be less reliance upon legislatures to make laws and more upon more informal committees, such as ethics committees, invested with the power of the legislatures to make quick, but binding, decisions. These committees will grapple with new legal issues arising from the changing identifies within our society. The legal concept of "the natural person" will come under increasing attack from genetics, so that a large part of the law's role will be to determine who has legal standing. Thus, not only will appropriate (legal) ways of interacting by redefined by changing identities, but also the (legally) relevant players in the interaction will have to be identified [37, 38]. Just as postmodernity takes society into cyberspace with nano-time, law too will be forced to enter hypertime, to become part of the attention economy (where gaining the attention of consumer or citizen becomes the main practice.)

Scenario 4: The Law in the Wisdom Tradition—the Hybrid Scenario

The rapid advances in genetic technology that we are currently witnessing form part of the race to understand deeply and comprehensively how this physical universe works. Kirby quotes nobel laureate Steven Weinberg from his book *Dreams of a Final Theory* as saying that we are in sight of a solution describe as a "theory of everything" (page 3

[34]). For some, this desire to accumulate knowledge of the physical world is borne of a desire to control it. This tendency of mind is an arrogance that shapes our legal responses into the form outlined in scenario 1 – based upon an adversarial, bureaucratic, rights-based discourse.

For others, however, the reductionist methods of positivist scientific endeavor fail to provide satisfying answers and, to the contrary, only seem to uncover deep mysteries of cosmology and existence. They give birth to a humbly inquiring mind, rather than an arrogantly knowing mind. From this place comes the scope for new legal solutions, expressive of a more holistic vision of the world and our place in it – a legal system that moves with technological change but also frames that change within values and boundaries other than private ownership and individualism, which acknowledges and respects other ways of knowing.

The ethical dilemmas that the new technology is currently forcing before our eyes are uncovering, in a sometimes painfully raw way, some of the basic assumptions upon which our society operates. These are values that have long existed but have now been forced into the open by the intensity of speed and force that the new technology is applying to our individual and collective propensities for exploitation, differentiation, discrimination, and acquisition. This public baring of our worst tendencies is also bringing responses. It may bring an increase in ethical discourse aroused by the complexity of these dilemmas. Already this discourse is causing new voices to speak out as they observe – and then wish to change.

At the BBV Foundation Conference convened in Bilbao, Spain in 1993 to consider the legal aspects of the Human Genome Project, Salvador Bergel, opposing the patenting of human genetic material, stated forcefully that the species and its genes did not belong to American corporations. Bergel argued that market laws should not override the basic needs of humanity. Others present described the moves toward patenting as a new form of legal "neocolonialism" (pages 900–911 [34]).

Two hundred religious leaders from a variety of faiths used their voices to petition the U.S. Patents and Trademark Office to end the patenting of life forms for profit on the basis that God's creations cannot and should not be owned as human inventions [28].

Again as mentioned earlier, indigenous people are speaking out to challenge the methods of conducting research and the cultural insensitivity of the value base of the Human Genome Diversity Project, which seeks to map the genetic differences of groups that differ from the monotype genome that will be identified by the Human Genome Project. To achieve this end, scientists are visiting indigenous communities and taking blood, tissue samples, and hair roots form "endangered" indigenous communities for testing. Disputes have already arisen over the patenting of cell lines discovered through these collected samples. Debra Harry writes [39]:

> While the Human Genome Diversity Project is looking for answers about human evolution, indigenous peoples already possess strong beliefs and knowledge regarding their creation and histories. The cosmologies of indigenous people are environmentally and culturally specific . . . [A]ssumptions . . . that the origins and/or migrations of indigenous populations can be "discovered" and scientifically "answered" is insulting to groups who already have strong cultural beliefs regarding their origins (p. 1).

According to this scenario, these different voices from a melting pot of ethical responses in which the existing material-based value structure will be challenged and significantly reduced. In seeking to find a way through the ethical maze of technological change, we will turn to the ancient and new art of wisdom. This wisdom tradition forms a gentle framework for placing technology in perspective. This wisdom will come from those who

tread lightly on the earth and listen to, and feel the pains, cries, and tears that emanate from her—most probably, from those who live on the peripheries of society, the most vulnerable.

This wisdom tradition will tell of some of the nonphysical forces of which we must take account as we find ethical pathways through the technological change we encounter. The understanding of these nonphysical forces assists in the development of threads of thought or principle to guide our genetic interactions. For example, Black Elk, a holy man of the Native American Sioux Indians, says that ". . . the truth comes into this world with two faces. One is sad with suffering, and the other laughs; but it is the same face, laughing or weeping" (page 188–189 [40]). His wisdom counsels us to recognize the nonphysical laws of the universe, certain deep forces operating that are simply nonnegotiable and cannot be changed by technology. For example, Rosaleen Love argues that plastic incubation wombs (used to grow children as the traditional 9 months in the mother's womb practice becomes passe) will just raise new problems—such as allergies to plastic. This understanding is that all technologies create negative outcomes (the specific outcome based on the type of technology used and the civilization that produces it). In this way, technology will have a place, but a more modest place, in the world.

Out of this may arise a new ethical discourse, based on a non-matter-centered value structure. And through this discourse we may come to seek different solutions. We may come to seek legal solutions borne out of looking forward, rather than back. We may abandon some of the old legal concepts which caused Schneider to write: "Law is the language of social regulation, and hence obeys systemic imperatives that are irrelevant and may even conflict with genuine understanding and wise resolution formal issues . . ." (page 22 [35]). We may develop a legal structure sensitive to the essence of a dispute and to the complexity of interconnected relationships. A legal system that does not dissect in terms of legal issues, but in terms of human and environmental issues—which does not seek to structure "all possible human relations into the form of claims and counterclaims under established rules" (page 10 [41]).

But the presence of the voice of dissent does not guarantee a changed ethos, nor does it guarantee new legal solutions unless the social structures themselves are transformed to act as vehicles for the carriage of this dissent. In fact, in some democratic systems, the voice of dissent is purposely allowed measured expression as a means of supporting the status quo.

For ethical discourse to encourage the development of new legal responses, we require legal, political, and economic instruments to translate that discourse into reality. We require an expanded vision of law, a new model of legal theory—less steeped in rules and more in wisdom.

Hopefully, new technologies will challenge current legal theories, changing their basis and application, in order that transformed values gain social expression. It may well be that the key to a different future lies in the law's ability to discover and embrace flexibility, to honestly examine and restructure its own value biases, to redefine for itself a new role—as social activist and as guardian for future generations. We may gain this voice form the periphery. By including them in this debate, our vision of the futures of genetics and gene therapy dramatically expands.

Toward Cultural Rights

The current debate on genetic diversity admits that the views of the periphery must be included. Central is the issue of the other. We need to ensure that those who are not part of official, center culture are included in the development of genetics.

To begin with, traditional rights of local communities to be the keepers of their biodiversity and to benefit from its replenishment and utilization ought not to be allowed to be eroded. Scientists involved in the international Human Genome Diversity Project are currently collecting human blood samples from individuals belonging to a large cross-section of the world's ethnic populations, establishing human cell lines, storing them, and analyzing their genetic make-up for future reference. We must for the short-term ensure that future research based on this material does not slip through the ethical and legal safety net.

Already, concerned with this issue, various non-governmental organizations (NGOs) have asked the United Nations to halt this project until the ethical concerns of indigenous cultures have been addressed. What these cultures fear is the precedent set by the U.S. biotechnology company, Incyte, which has filed claims to patent 40,000 human genes, in effect seeking control over 40% of the human body. Already, John Moore, a leukemia patient, has lost a case in which his cells were patented by a pharmaceutical company (page 18 [42]). Given this case where the U.S. courts ruled in favor of the company as they had added labor to his cells, just as genetics will be seen as an improvement over the "natural," what protection is there for groups, who, through sustainable spiritual, cultural, and environmental practices, have contributed to humanity, from having their contributions owned by others (as their legacy is seen as culture not as technological innovation)? As in other cases the terms of trade do not favor the periphery over the center; the center, as it adds onto and improves nature, violently changing it, benefits. The periphery, as it works with nature, now will have its cooperative cultural legacy owned by the center.

However, the periphery does fight back with the help of NGOs. For instance, U.S. researchers established a cell line and intended to patent the genetic make-up of a young woman from the Gwayami Indian tribe of Panama. In doing so, they offended the tribe's view of nature and their place in it, as well as the tribe's sense of morality. The Gwayami President reflected: "I never imagined people would patent plants and animals. It's fundamentally immoral, contrary to the Gwayami view of nature, and our place in it. To patent human material . . . to take human DNA and patent its products . . . that violates the integrity of life itself, and our deepest morality."[4]

When the patent application became public in the United States, human rights groups forced a withdrawal of the patent application. However, since then two other patent applications on human cell lines of indigenous peoples from the Solomon Islands and Papua New Guinea have been taken out [see footnote 1].

At issue here is not only whether genetic material can be patented, but also how to define the rights of the various parties: for local people whose gene it is, for corporations who want to profit from it, and for the global good, who might benefit from it, and the gene itself, if we can move to that level of agency. Officials at the National Institutes of Health (NIH) in Bethesda, Maryland are currently developing a draft agreement for collecting material to ensure that countries, local authorities, and individuals will obtain benefits and financial rewards for their contributions "in return for commitments from that country to maintain the source material in a sustainable fashion" (page 545 [43]).

At another level of this issue, Anwar Naseem writes that in Pakistan geneticists will have many job opportunities instructing, monitoring, and advising cousin-cousin marriages about the risks they undertake [44]. Cousin-cousin marriages are part of a

[4] P. Bereano, More Patent Nonsense, email transmission from Hawaii Research Center for Futures Studies (contact: halbert@hawaii.edu), August, 1995.

cultural history in which it was essential that land remain with the family. Gene therapy could help retain this traditional practice. For some, this practice of cousin-cousin marriage represents a deep ethical dilemma. In the West, marriage of close blood relations is illegal, partly because of deep social taboos and partly because of the desire to avoid the conception of children with impairment. Genetics can only control the "quality" of children born in cousin-cousin marriages by disposing of them (through selective abortion). This means that the desire to avoid disability becomes so great that one is willing to take life in order to meet that end. Here two strategies—prevention and cure—are at loggerheads as two ethical principles—the sanctity of human life and respect for cultural traditions—clash.

The Site of the Women

In addition to cultural rights and gender rights, especially as the site of genetics, is the body of women. As feminists argue the redoing of the body by male scientists is typical of patriarchal society. But while previous intrusions related to abortion, now the entire genetic structure is under scrutiny.

As this process develops, whether from testing related to the genetic status of the entire family—the doctor as part of the surveillance society—issues of privacy will become paramount. Clearly, power over one's own body will be given increasingly to the genetic doctor, to the medical-technological discourse. Ultimately, we fear that not only the health of the body will cease to be a personal responsibility, but its ownership, privacy, and regulation will pass over to the state, forever changing the idea of civil society, of the relationship between individual and state. Although genetic education is a short-term solution, the deeper problem is a technology that cannot be easily understood by others, that is fundamentally transformative at global levels. It is not always appropriate, small-scale, or convivial. Genetics continues the long-term process of the technologization of the body and the loss of self-autonomy.

However, Vuokko Jarva [45] believes that genetics will end the relationship between women and reproduction such that women will be finally freed from the burden of giving birth, allowing them to aid in societal development, in art, politics, in the public sphere of societal life. In this view, women can finally be women, that is, focus on relationships, peace, nurturing. Over time, gender will be less important, because gender will slowly disappear as a category. The natural in terms of men/women will be finally transformed as will be the natural in terms of work/home and even sex for pleasure/for birth (making some religions at a total loss as to what to do).

As Ivana Milojevic writes, "Cutting this responsibility could be by some seen as liberating for women's destiny but what is worrisome is that it could further decrease women's say in what would be our common future" (page 51 [46]). This becomes the key: will genetics help create a common future in this sense of shared visions or will it create a homogeneous future of no vision, of a multitude of life forms with no agreement?

We thus anticipate many groups, even those who can afford genetic counseling and engineering, not to use the technology because of moral and political commitments. Like nuclear energy, it might be the grand solution but only used and available for the few (because of side-effects and popular aversion).

Disability and "Imperfections"

The periphery is not just a geographical place; it is also a power site. At present, science teaches us that we all harbor "imperfections" in our genetic make-up. Will we thus become more accepting of disability and more freely giving of our support? Or, as

we become more aware of our imperfections and our ability to "control" them, will we become all the more determined to eradicate disability?

For some people with disability, genetic engineering is just an extension of the medical model that presently defines their existence by reference only to their physical identity. Rosaleen Love cites Nelkin and Lindee who describe the growth of "genetic essentialism, the notion that the gene marks the essence of human identity" (page 25 [47]). Thus, Love argues that "knowing your genes according to genetic essentialism means knowing your biological constraints, means accepting a certain biologically allocated place in society" (page 25 [47]).

Genetic technology then becomes a tool, not for promoting community health (as is often espoused by gene researchers), but a mechanism of social control for avoiding the appearance of difference. Newell argues that if we, as a society, were really committed to improving public health, we could more easily (and cheaply) look toward promoting a clean physical environment, improved maternal health, and the provision of basics such as clean drinking water [48]. But, instead genetic technology is a fast solution aimed more at controlling and wiping out difference than generally improving health. The current state of the genetic engineering art allows us only to dispose of imperfect fetuses, not to improve their health.

The apparent ability to control disability, then makes disability itself a form of civil disobedience. Thus placing the onus back on the individual who has "chosen" disability (either for themselves or their children) to provide their own supports – the privatization of human misfortune.

Many people with disability regard disability as much a social construction as it is organic (page 79 [51]). The disability arises because people with disability are physically, mentally, and emotionally denied access to society. They seek to change the relative constructs of what is socially agreed upon as normal, rather than seeking to alter their own identify. Some people with disability could not, and would not, imagine themselves without their disability. The disability has become an essential part of their identity, and genetic engineering thus challenges the worth of their own sense of self.

Gene Scenarios

From a discussion of the sites and discourses of gene technology as well as the legal futures that result from them, we move to sociopolitical futures. Robert Bohrer provides with some excellent points of departure [49].

PROHIBITION

Faced with pressures from religious fundamentalists, feminists, greens, humanists, and indigenous peoples, there is a global ban on gene therapy other than that used to cure fatal childhood diseases. However, secret garage therapy continues, growing all over the world, especially in difficult to access third world areas for those from the West and South anxious to ensure their own health and that of their children.

FIGHTING THE GENE DOCTORS

In this scenario, genetic engineering labs are violently attacked as are abortion centers. The state steps in to forcibly intervene on behalf of Down syndrome children against the wishes of parents. Governmental compulsion forces some level of genetic enhancement of children who would otherwise be below normal.

GOVERNMENT SUPPORTS GENE THERAPY

Gene therapy is paid for by the state and universally used, when access is possible. Access to size, mental health, and illness-free futures are guaranteed. Those who fall out

of the state insurance safety net find that they and their children's futures will continue to descend. Rising out of poverty becomes nearly impossible and they are disadvantaged genetically and economically.

SOCIAL MONITORING THROUGH PREDICTION

Our ability to detect genetic susceptibility to disease outpaces our ability to remedy it. Young people with positive diagnosis for various diseases are denied employment and health insurance. Even if at the present time, the person is unimpaired by the disease, the strength of the genetic paradigm makes him or her an outcast. Weber's iron cage of bureaucracy enters the medical establishment.

THE END OF THE NATURAL

Efforts are made to control genetics through prohibition or violence against gene doctors or the genetic anthropologists, but market forces and parent self-interest is too strong. The technology rapidly recreates the natural, making sexual reproduction all but obsolete. There are two real divisions in society, those that are born through genetics (the urban) and those born sexually (the rural). The latter are seen as quaint, are often of lower intelligence, and are more disease prone. Genetic birth becomes a crucial sociological category even for sociologists genetically born.

FEMINIST GENETICS

Feminists, afraid that merely arguing about the issues will allow the technology to pass them by, proactively enter the technology. Women scientists spearhead research finding ways in which the trauma of childbirth, of pregnancy, of genetic illnesses are eliminated and women retain control of their bodies. Women organize care rooms for test-tube babies, creating the memory of natural childbirth. Womb centers have soft rooms where couples can visit their growing child. Those with less advanced technology have sophisticated consulting rooms if mothers wish to abort or have the life potentially genetically modified. The entire process is designed and run by women.

DISABILITY GENE THERAPY

Gene therapy continues, but people with disability advise scientists on crucial differences such as between the intention to enhance health and to eliminate disability. The voices of people with disability are central in this scenario. As Fitzgerald writes in her book *Include Me In*, what are needed are not only policies but value transformation that include their ways of knowing in creating gene futures [50].

The Longer Term

But let us take step further than these scenarios. As M. Strathern writes [51]:

> Europeans in the late 20th century know that they do not want human-animal hybrids, that spare-part surgery should be kept within medical limits, and that even if there is no real confusion of kin relations to have sisters donate eggs to one another, there is certainly something awry about mother-daughter substitutions. But they cannot count on future generations not wishing for these things (page 433).

It could well be that genetics is not just about disease prevention or even about capacity enhancement but about the right to sexually reproduce [see footnote 3]. Again quoting Strathern "The prospects of future enterprise lead to as much fear as hope—not that the artificial might be less than the real thing but for the real things the artificial might make" (page 433 [51]).

However, as we have been arguing, the future of genetics is based on current value systems. "Technological innovation invites us to think . . . about how persons are born

and the relatives to whom they are born. Yet instead of the potential of unexpected combinations, the creation of unique individuals and unplanned effects, the future seems increasingly trapped by present choices" (page 434 [51]).

Strathern concludes her essay with these words, "Europeans can look to future kinship to provide them neither with metaphors for the natural givens of human existence nor with metaphors for regeneration through the spontaneous effects of procreation" (pages 13–14 [52]).

P. R. Sarkar [52] takes an equally long-term view. In a stunning article subtitled "Laboratory Babes," he forecasts that test-tubies (the future term for test-tube babies we posit) or the artificial creation of life will create a new type of human being, evolving from us in much the same way as humans evolved from Australopithecus (pages 13–14 [52]). As humans, Sarkar believes, we will lose our reproductive powers. However as with Jarva, he does not see this is as a negative consequence. Whereas Jarva writes from the feminist position, Sarkar speaks from Tantra, an Indian way of knowing [53]. For him, the surplus energy can be used for creating new technologies and better pursuit of happiness. Sarkar, as with other Indian philosophers, makes the distinction between kama (pleasure) and prema (love). The former will be reduced and the latter increased.

For Sarkar, the new laboratory babes will be of two types. The first will be mechanical, silent servants. The second will be our genetic-biological creations, they will be less attached to family and kin, indeed, the whole notion of the family will transform. But for Sarkar, whereas the brain and body can be created, mind is a different matter, one that is created at a different level of consciousness.

How will this come about we might ask?

The Right to Genetic Birth and the End of Sexual Reproduction

While the first step for many will be genetic prevention, it will be a quick and slippery slope to genetic advancement [54]. Parents will follow their natural self-interest, opting for disease-free deliveries, using genetic counselors and doctors to maximize the health of the children that are produced. The next stage will be genetic enhancement. Why, if one adopts the genetic model of life, not increase genes that increase the possibility of one's life chances? If one family does, other families and societies will follow suit, in this competitive system that is the world capitalist economy. Concerned for not only the views of environmentalists and social movements concerned with genetic accidents, there will be a social justice concern of urban/rural, West/South, rich/poor. It is not too difficult to imagine the state stepping in to monitor our genetic blueprints, controlling where and when we can wander. State intervention can only reaffirm the value of big science. Thus, whereas genetic prevention will reduce diseases, but under the mantle of an objective, universal, theory of everything science, a mantle that claims perfect knowledge, perfection will be defined by conventional materialistic, fetish definitions. In this scenario, we will terminate life based on the possibility of future diseases with the state eventually stepping in to ensure equal access to genetic intervention. Equal access will lead to state control of reproduction. Conception and birth will occur in hospitals. But rest assured, we will be able to watch the baby grow in one's very own family birth cubicle, a womb of sorts. Instead of a thin layer of skin separating the fetus from parents, it will be an even thinner more sensitive layer of organic plastic.

Developments in genetics when linked with virtual reality and artificial intelligence will make it possible to enter these hospital turned design factories and visualize our baby's future extrapolated through holography. We will be able to watch him, her, or it, traverse various life states seeing crucial life-points where certain diseases might de-

velop. But it will be a particular model of the life cycle that will be given to us. That is, the programmer who gives us the virtual life cycle will base it on his or her definition of the human life cycle. Will it be Western – childhood, teenager, student, work and then retirement – or Hindu – student, family life, social service, and sanyassi (monkhood)?

All technology embeds the values of the designer and the cultural frames in which it operates. The virtual programs of our future will not be any different, as we have argued earlier, genetics is not a neutral space. By state-run, this does not necessarily mean a Nazi-type eugenics system. Rather, as with Medicare and other government-run systems, it will be subsidized, controlled, and monitored by the state. Genetic doctors who prefer to avoid the rigors of private practice will join state birthing centers. Most likely it will be third world and other peripheral people who will enter the state system. Innovation will be in the private sector where the boundaries of the natural will constantly be tested, with many successes and many failures. For attorneys, the failures will mean billions of dollars in lawsuits. If anything, the new technologies promise a growth in lawyers (unless artificial intelligence/robotic judges take over) or science courts become commonplace.

Can anything be done to avoid the baby-factory future, or is the conflation among big science, big business, state, and our own materialistic urges so strong that the future will be one where we exist in not an ecology of types of life, but one where "we" as natural humans will be circumspect. Doyne Farmer describes it in these apocalyptic terms: If we fail in our task as creators (creating our successors), they may indeed be cold and malevolent. However, if we succeed, they may be glorious, enlightened creatures that far surpass us in their intelligence and wisdom. It is quite possible that, when the conscious beings of the future look back on this earth, we will be most noteworthy, not in and of ourselves, but rather for what we gave rise to. Artificial life is potentially the most beautiful creation of humanity (page 284 [6]).

Certainly, this is the long-term future that goes beyond the earlier legal issues we have raised. Our vision for the future is one guided by a more ethically oriented science and economy; a future in which science has clarified its allegiances, becoming the servant of cultural and biological diversity, and severing its ties with the capitalist ethos. At the same time, we fear not the changing nature of the natural. That the face of "man" is about to be removed from the sands of history is not a fear for us; we embrace the new species ahead of us and welcome.

At the same time, although we argue that we need more ethical futures, that genetics must be located in the spiritual discourse, that genes should not be seen as drivers of history themselves, in fact, life has been geneticized. Ethicists, humanists, and religious authorities might complain, but the natural is no longer natural, and genes are slowly becoming public.

Genes for tea anyone?

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