BIOLOGY AS RELIGION: Genetic Code as Bible, Scientist as Priest, and Genetic Counseling as the Confessional

By Dean Bavington

Today technical rationales have very much the force and authority of religious doctrine, including the notion that the laity is unfit to question doctrinal content and practice (Franklin, 1990:44).

I recently attended a lecture at Acadia University given by a biologist from McGill University who had been sitting on the Canadian panel looking into reproductive technologies. During the lecture, he continually downplayed the risks associated with reproductive technologies and dismissed all critics of the new technology as bio-luddites. It was his belief that many Canadians were afraid of biotechnology because they had not been properly trained in the field. He repeatedly stated the need for early education in genetics for the Canadian population so that they would be better prepared to make decisions around the emerging biotechnologies. He called for "basic genetic principles" to be taught to children in grade four, ensuring that they would grow up with realistic notions of what the technology could accomplish.

Afterwards, I was stunned by the inability of people in the room (all trained biologists), including myself, to question his perspective. His presentation was delivered in a way which stifled debate and claimed a totalizing objective truth. He was the modern priest, and we were gathered at his feet to express our (blind) faith in human progress as defined by science and technology.

This paper is an attempt to make sense of that presentation and illuminate some of the similarities between biology (specifically biochemistry, genetics, and biotechnology) and religion. In an effort to map the similarities between religion and the biological sciences I will focus on biotechnology and its claims, draw comparisons between the Bible and the Human Genetic Code, the scientist and the priest, and the confessional and the genetic counselor.

The Genetic Code as The Bible

The U.S. Human Genome Project (HGP) officially began in 1988, under the management of the Department of Energy and the National Institutes of Health (Haraway, 1995). The project's aim was to sequence and record all of the nucleotide base pairs located in the DNA molecules of the human genome. The project also aimed to discover the functions of all of the genes (this involved discovering the proteins the genes code for) so that a complete code and functional document of the human genome could be created. This knowledge is compelling at this particular stage of history due to the assumption that the genes are the basic unit of life and that harnessing their information gives humans power over life.

From the information which the HGP produced, scientists claimed that we would know what constitutes human life, what makes us different from other living things, and what causes many disabilities, diseases and illnesses. In many ways the HGP was presented as the Bible of life, the code for describing what makes us human and a final scientific answer to the age old philosophical question, "What is life?"

The code contains many parallels with the Bible as far as what it claims to produce and how its information is presented. For example, literal interpretations of both the genetic code and the Bible claim absolute universal truth about life, nature and humanity. The scientists who are "discovering" the nucleotide sequences present the information they gather as pure truth that emanates from nature, just as literal interpretations of the Bible were presented as truth emanating from God which was recorded by humans inspired directly from divine presence.

However, while both the literalist adherents of the Bible and the genetic code claim universal absolute knowledge, they both contain information that requires interpretation to have meaning. In the case of the Bible, various interpretations have sparked huge controversies and lead to the creation of multiple religious denominations. From this it seems that multiple meanings can be ascribed to the Bible and lead to a variety of different conclusions about nature, life, and humans, and result in a drastically different grounding for moral action.

Similary, the genetic code does not generate truth because it is *syntactic*, meaning that it refers only to relations between signs. It is not *semantic* in that it does not designate something directly or refer directly to something other than another sign (Kay, 1996). In other words, the nucleotide bases that make up the code are self-referential and do not contain meaning in and of themselves. Neither the Bible nor the genetic code operate like an absolute dictionary that can tell us what the world is made of, what it means to be human, or instruct us how to relate to each other or the world.

Derrida has shown us that the production of representations in the lab is a form of text production. Through inventions we produce representations; in other words "We are writing the book of life as we are reading it" (Lily Kay, 1996). According to Derrida words derive meaning from their context. Thus, the context of the HGP will infer meaning onto the "words" of the genetic code. "We cannot simply [objectively] read the book of life, it has no meaning" (Kay, 1996). We are always inscribing a subjective interpretation onto it.

What does life look like when viewed from the perspective of the genetic code? The code shifts our view of reality from a materialist based model to an information/text based view of nature and life. No longer is the cell (a material object) the most important component of life, now the DNA, and more specifically, the information coded in it is the most important part of life and nature. This shift from material based biology to information based biology fits well with Derrida's notion that there is nothing beyond the text. According to the new information/systems view of the world the fundamental structure of both matter and energy (nature and life) is a text. Therefore, the world becomes, as Katherine Hayles has put it, "quite literally a text," a physical embodiment of information (Zimmerman, 1994: 347). From this perspective, life equals an information processing system that is capable of information storage and retrieval as well as its own reproduction. The DNA represents life under this model and increasingly is described using computer information technology metaphors. *DNA becomes the hard drive of the cell* containing the genetic code (the language) that is seen as the underlying foundation of all life.

This new genetic code is presented to us as a savior, as the answer to our most fundamental questions about life and what it means to be human. However, Baudrillard believes "that current fascination with the genetic code and other sign-systems is preparing the way for the 'neocapitalist cybernetic order that aims now at total control'" (Zimmerman, 1994: 354). He believes that the new move toward seeing the world using the information metaphor creates a world of total control where the distinction between the real and the simulation no longer exists. The world becomes a field of free floating syntactic signs, a *simulacra* (Baudrillard, 1981).

Even though the HGP uses the metaphor of the code as its operating principle and it presents the information contained within the DNA as the book of life, the code and the language from which the book is constructed is neither a code nor a language, it is self-referential. The code is just a model that leads us to assume that we can read objective meaning from the information we are gathering through the HGP. The model has been taken as the real thing, as life and nature itself. Whitehead called this the "fallacy of misplaced concreteness" (Gare, 1995: 116). This would seem to suggest that the information which we are gathering from the HGP is of the order of the simulacra which Baudrillard talks about in Simulations (1983). What gets obscured through the passive acceptance of the model is the fact that meaning is constantly being written into the code as it is being discovered. Therefore, the genetic code produced by the HGP appears to present us with objective, universal knowledge about nature and life in a similar fashion that the Bible was once presented as a text from which truth emanated directly from God, unimpeded by the external subjective meanings being ascribed to it.

In order for all of the information from the genetic code to be applied universally within a diversity of social contexts a dogmatic belief in biological determinism is needed. Biological determinism is structured on the belief that society is the *consequence* not the cause of individual properties. The new doctrine of sociobiology/biological determinism is structured to place the emphasis on the genes. Under this model:

> *Genes Make Individuals -> Individuals make Society -> Therefore Genes make society.* *(Lewontin, 1991: 11)*

This model prevents any meaningful role for society in the structuring of individuals or the gene and fits neatly with the prevailing classical liberal model of an individual-based society. The deterministic quality of the gene is accepted as fact and a system of linear interaction is proposed that elevates and privileges the information being "discovered" by the genetic scientists who are the new high priests of the genetic code, and claim to read objective information about nature and society from the DNA.

The Scientist As Priest:

While the scientist and the priest create qualitatively different forms of individuals (scientists tend to objectify, priests tend to form new subjects) the scientist has assumed many of the roles of the priest in Western societies. The parallels between the scientist and the priest revolve primarily around their mutual claims to universal knowledge and their hegemony over the production of that knowledge through interpretation. Both scientists and priests interpret their respective texts. Like a priest with a "Bible," the genetic scientist interprets the semantic information of the HGP writes the book of life as s/he discovers it. In either case, the information contained within the "book" is interpreted by the priest/scientist in a way that maintains the authority and hegemony over the interpretation.

The hegemony of interpretive power which the scientists and priests hold allows them to present the information as though it is the *only* truth, and a truth that emanates directly from the respective texts. This power is strengthened through the use of language that is inaccessible to the people to whom the information is presented. Scientists speak in a language that is unknown to non-scientists and they interpret their results for the "lay" public in much the same way the "results" of the Bible were guardedly translated from Greek or Latin and given to parishioners by Priests. The language of science allows a select group of people who are "in the know" to distribute information from scientists to non-scientists, and allows them to interpret the results of the HGP without being fundamentally challenged. The "objective results" of the scientific endeavor can then be presented to the "laity" as if the knowledge emanated from nature itself.

Both scientists and priests call for the early and continuing indoctrination of the "laity." This "education" is presented as being in the best interests of the laity, especially the young, to understand the teachings of the knowledge producer. The "laity" believe the information they are being taught precisely because it is presented as information and not as narratives open to alternative interpretations. In the case of the church, religion was part of the school curriculum up until very recently in most Western societies and in many countries it continues to be a major part of the curriculum. Scientists claim that the knowledge they produce must also be taught to help the young and the old adopt to a changing world. The scientist who spoke at Acadia was adamant about the need to educate the young in order to avoid future "problems" which may arise when the "laity," or public, misunderstood the doctrine of DNA. Priests both past and present have argued for the indoctrination of youth in order to allow for the complete understanding of the teachings of the Bible. The church also called for the continuation of religious teaching throughout adult life. Life-long religious learning was indeed a major part of the doctrine of the church. Today, life-long scientific literacy is being emphasized to enable populations to live with, and to be able to operate in, the information age (Logan, 1995).

The Human Genome Diversity Project: A New Missionary Call?

The Human Genome Diversity Project (HGDP) is a project aimed at the collection of human DNA from a diversity of human populations. It has paid specific attention to Aboriginal DNA sampling and has collected samples "from over 700 groups of indigenous peoples on six continents" (Haraway, 1995: 353).

The history of Western influence over Aboriginal people has one of domination and destruction. Missionaries were often sent hand in hand with colonizers to increase control over Aboriginal people, maintain and foster Western presence, aid in the assimilation process, and to "save" the souls of Aboriginal people for the afterlife. The emphasis of the missionaries was on converting Aboriginal people to Christianity before they died.

Currently, Aboriginal communities are being infiltrated by scientists. Collection scientists from the HGDP collect white-blood cell and check-cell samples from Aboriginal groups to "save" and preserve them, in the form of their DNA, from possible extinction. The scientist has replaced the priest as savior and the emphasis has shifted from the soul to the DNA.

The missionaries believed that the aboriginal people would go to hell if they were not saved, and it was their duty to recruit souls for heaven. Scientists now believe that valuable Aboriginal DNA, with possible future uses, may be lost forever when the people go extinct, and it is their duty to preserve it. They argue that if we lose the aboriginal DNA we would have lost something potentially useful. The wise-use and biodiversity arguments that repeatedly surface in sustainable development literature have therefore surfaced in the HGDP. As Haraway suggests, it is a long term utilitarian calculus that is used to justify the genetic sampling of Aboriginal peoples:

> *Like the vanishing of a rainforest fungus or fern before pharmaceutical companies could survey the species for promising drugs, the vanishing of human gene pools is a blow to techno science. Prompt and thorough genetic collection and banking procedures, as well as preservation of the source of the variation, if possible, are the solution (Haraway, 1994: 353).*

FROM POWER OF DEATH TO POWER OF LIFE

The encroachment of genetic scientists into Aboriginal communities illustrates a shift from concern with, and the control and management of, death to the concern and management of life. According to Foucault, the modern period is marked by an increasing control and regulation of bodies. The human genome project extends this notion of control of bodies to the molecular level.

The outcome of the discipline and control of bodies according to Foucault was the creation of "docile bodies" which were managed bodies (Foucault, 1978).

With the shift of the Sovereign's control over death to the production of "docile bodies," the modern period veered away from the control of death toward the control of life. This was achieved through an explosion of professions dealing with techniques to achieve the subjugation of bodies and the control of populations. Foucault called these practices of biopower (Foucault, 1978: 140).

> *Foucault points out that the discovery of the body as object and instrument of power led to a host of control for the efficient operations of these bodies, whether they were the efficiencies of movement, the measured intervals of the organisation of physical activities, or the careful analysis and timing of tasks the body could perform, usually in unison (Franklin 1990: 59).*

The shift to biopower involved a shift to the production of managed forms of living. The state changed from having the legitimacy and power to kill its citizens to focusing on the creation of individual and social control mechanisms which produced "docile bodies" that would regulate themselves. The lessons of the prison (the panopticon) were applied directly to society and various life "choices" were heavily managed. New forms of sexuality were produced through a flowering of prohibitions which, while telling you how, with whom, where, and when you could have sex, opened up new spaces for sexuality (Foucault, 1978). For Foucault power does not only prohibit it produces.

The power to kill that was vested in the King became transformed into the state's control over the production of ways of living. Under the Sovereign's power of death the confession took on added importance at the time of death. The cleansing of the soul required a full confession upon the death bed and special attention was paid to people who were dying (the reading of the last rites). The genetic confessional, the reading of an individuals genetic code, moves the emphasis to life and pre-life management. The most important time for the genetic confession is before a person is born or even conceived. It is here that the genetic confession, and its associated power matrix, produces its genetic subjects. Just as heaven was the promise of the death-bed sin confession, the genetic confession operates at pre-birth when the possibly "disastrous" random gene mixing can be controlled, ordered, and produced. The power of science rests in the prevention of certain genes from entering the world just as the power of the state to take away life rested in the extermination of life. The power of traditional biopower, control over bodies, was in shaping the social actions of the individual; the genetic confession claims to be able to prevent "deviant and sick" social, physical, and emotional actions from occurring at all and produce genetically normalized individuals.

For the religious, the confession before death is of primary importance, for the genetic laity and their genetic counselors the confession, the reading of the possible gene frequencies, before life is the most important.

Foucault discusses how we have moved from a society of blood (death) to a society of sex (life), and with it, a shift from the sovereign's right to kill, to its management of the normalized lives/bodies of its citizens. I would argue that we are presently in a society of increasing life and pre-life management with its power locus in the gene. The world, nature, and life are now all described to us by scientists. The functional approach to the world, nature and life, that is presented to us by science, deligitimizes non-universalizable individual experience in a strive toward global monoculture. A successive narrowing of the way we see the world, nature, life, and each other accompanies a totalizing scientific world view. Science has replaced Religion as the descriptive force in our society and scientists have replaced the clergy as the authoritative voice of that description.

Genetic Counselor as Confessional:

> *One confesses one's crimes, one's sins, one's thoughts and desires, one's illnesses and troubles, one goes about telling, with the greatest precision, whatever is most difficult to tell. One confesses in public and private, to one's parents, one's educators, one's doctor, to those one loves, one admits to one's self in pleasure and pain , things it would be impossible to tell to anyone else, the things people write books about. One confesses, or is forced to confess (Foucault, 1978: 59).*

Foucault describes a culture of confessors and describes how claims of truth in the West are intricately tied to the confession. The new genetic technologies bring the confessional to a new level, allowing the genes to tell the truth about individuals and even predict their sins before they are committed. Sociobiologists implicate genes in a whole host of conditions which once were believed to be socially influenced or created. Alcoholism, criminal behavior, intelligence, and other factors which are heavily influenced by one's environment, or social situation are seen as being inscribed in the DNA. With the new sociobiology argument all present, past, and future "ills" are described as if they are coded in the genes (Lewontin, 1991). Extending the confession to the genome necessitates individuals whose essence is seen at the genetic level. Individually we must confess our genes' contents and compare them to the standard or norm. Therefore, the genetic confessional involves the production of knowledge and is embedded in a multitude of power relations around the production of this knowledge and its comparison to the norm.

Foucault believed that all knowledge production was tied to relations of power. For Foucault, power and knowledge (power/knowledge) were inseparable and effectively one word (Dreyfus et al., 1983). Foucault wrote extensively about the confession as it related to sex and described how power/knowledge was embedded in its production. In The History of Sexuality (1978: 65) he described five key factors which lead to the incitement to confess and produced knowledge, around sex, in a matrix of power. I believe that these five factors can be applied to the genetic confession.

1 **"Through a clinical codification of inducement to speak. Combining confession with examination"** (Foucault, 1978:65). A similar process occurs with the genetic confession. The medical examination is augmented by the need for a confession of the genes. The "patient" (especially pregnant women or women who are wanting to conceive) is told that a trip to the genetic counsellor would be in her best interest and in the best interest of her baby. Also, many individuals for whom a genetic condition is suspected are encouraged to discover what their genes say. While this process can be helpful for many, it takes place within a matrix of power/knowledge relations that induce people to allow their genes to be read and interpreted in a universal normalizing fashion.

2 **"Through the postulate of a general and diffuse causality"** (Foucault, 1978:65). Having to tell everything and being able to question everything. A huge causal power around sex was created for all kinds of conditions. The genes have replaced sex "with an inexhaustible and polymorphous causal power" (Foucault, 1978: 65) through being presented as the source of all "natural" conditions and human actions.

3 **"Through the principle of latency intrinsic to sexuality"** (Foucault, 1978: 66). The truth about sex needed to be extracted through confession. This was not just because it was difficult to explain or disclose but "because the ways of sex were obscure; it was elusive by nature; its energies and its mechanisms escaped observation, and its causal power was particularly clandestine" (Foucault, 1978:66). All of these properties are now attached to the genetic confessional. The genes require special scientific attention to be read, like sex the information in the genes is "elusive by nature," its information and mechanisms escape observation. You need to run DNA samples out on gel and use electrophoresis, do complicated sequencing and replicating, and analyse the results so that they can

be interpreted and the information understood. In essence, the information which forms the basis of genetic confession is partially clandestine.

4 **"Through the method of interpretation"** (Foucault, 1978: 66). Truth production not only needed a confessing subject but also an interpreter. In order for truth to be illuminated it must go through the relationship of the confessor and the expert. The genetic counsellor must interpret the results of the patient's DNA in order for the real truth to emerge. It is not enough for the patient just to donate a DNA sample and read the results him/herself, the results would make no sense to him/her. The expert is needed for the truth to emerge and for it to have meaning. A similar situation existed with the priest. Confession had to involve the bringing into discourse all that the person was hiding and needed to say but also included all that the person could not understand without explanation or help. The important point is not that the person does not have the power to understand or prescribe treatment but that truth as produced through the confession needs the relationship between the confessor and the expert.

5 **"Through the medicalisation of the effects of confession"** (Foucault, 1978:67). Confession was seen as therapeutic. The confession cleared you of your sins and allowed you to begin anew. In this way it was seen as helpful and therapeutic to the individual. The confessional became part of the medical procedure and an important part of the truth production around sex. This now extends to many fields including genetics. Going to see the genetic counsellor is seen as the responsible and healthy thing to do. The information which is gained from the genetic confession is presented as something which will benefit the person, even if no cure for the particular illness is available. In particular women and their bodies, especially when pregnant or thinking of conceiving, are paid "special" attention. The female's trip to the genetic counsellor is not only seen as therapeutic, but as necessary. Due to the genetic confession it is increasingly being seen and presented as irresponsible, for the mother and the baby, to avoid exposing their DNA to analysis.

Life and nature, through the emergence of the HGP, have been transformed into discourse. This allows for all the diversity and complexity of life to be discussed in reductionist, scientific code-talk of genetics. Foucault claims that the process of sex becoming a discourse affected desire displacing, intensifying, reorienting, and modifying it (Foucault, 1978: 23). Foucault's analysis can be applied to the genetic discourse on life. Life itself has been displaced, intensified, reoriented, and modified due to the HGP. This destroys the multiplicity of ways we have seen life and narrows the orientation of how we see society, individuals, nature, and life itself.

Foucault talks about the special power influences that were devoted to women. He claims that women were medicalized and produced as subjects that were to be keep under surveillance. For example, the creation of the medical condition hysteria in women allowed for increasing surveillance and power over their bodies (Foucault, 1978: 120). Under the new reproductive technologies associated with the HGP these powers and surveillance activities are increasing. Biopower over women's bodies, with respect to biotechnology, focuses attention on the female body (especially the pregnant female body) as the locus of increased surveillance, power and control.

Under the HGP, the gene's contents are mapped and explained; and as people are defined as simply a collection of genes, they are made to confess the contents of their DNA. The panopticon which Foucault describes in Discipline and Punish (1979) as a model for social control has increasingly extended its gaze to the molecular level. The panopticon, and the gaze that accompanies it, now covers the social, physical, and molecular realms.

Discipline and Docile Bodies

Foucault describes how the gaze of the controlling and managing technologies increasingly spreads from its origins in the prisons to all aspects of social and individual life. The internalization of panoptical techniques in the individual resulted in self-control and was substantially more efficient than outright torture and public executions. The panoptical gaze now extends to the genetic level, and the drive to confess and therefore open an individuals genes to control and regulation is gaining strength. Individually this panoptical technique expresses itself as increased anxiety about what may lie hidden in our genes. This anxiety, when tied to personal responsibility for individual health, leads to a self imposed genetic panoptical gaze and strengthens the creation of the need for the genetic confession:

> *The human body was entering a machinery of power that explores it, breaks it down and rearranges it. A 'political anatomy' was being born... it defined how one may have a hold over others' bodies, not only so that they may do what one wishes, but so that they may operate as one wishes, with the techniques, the speed and the efficiency that one determines. Thus discipline produces subjected and practised bodies, 'docile' bodies (Foucault, 1979).*

This is exactly what the HGP produces at the genetic level. The "docile body" is now pre-empted by "docile genes." Neil Evernden has observed that this new control and manipulation of DNA destroys "wildness" and domesticates the gene:

> *With the ability to manipulate DNA the situation [of domestication] changes. This is, in effect, the domestication of the gene, the final assault on the wildness of life. The domestication of the gene exterminates wildness at the source and places all life within the domain of human willing (Evernden, 1992: 120).*

Along with the extermination of wildness, "at its source" and the creation of docile genes, the HGP has implications with respect to economic and global capitalism. The project has been implicated in market forces from the beginning with a strong emphasis on the creation of new drugs and therapies which are patentable by multinational drug companies. The HGP is embedded in what Fredric Jameson has called the "cultural logic of late capitalism" (Jameson, 1991).

Foucault discussed how biopower was an important part of the development of capitalism. Industrial capitalism needed bodies to be thought of as machines to be inserted into machinery production (Foucault 1978: 144). The norm was applied to the body for its management and this norm is now being applied to nature for its management:

> *Such a power has to qualify, measure, appraise, and hierarchize, rather than display itself in its murderous splendour; it does not have to draw the line that separates the enemies of the sovereign from his obedient subjects; it effects distributions around the norm (Foucault, 1978: 144).*

A similar process occurs under the HGP. The norm, defined as the natural genetic code, after it has been totally mapped out will play the role of the social normal distribution and will enforce a further move toward the management of life and pre-life as opposed to death. The focal point of this pre-life management will be exerted on women's bodies and will occur in conjunction with reproductive technologies and their associated services.

With the increase in discipline and its application to all social spheres, the greatest punishments/discipline were reserved for sins against purity (i.e.: for what was seen as social pollution). Under the new genetic order will the greatest punishments (i.e.: the denial of birth) be applied to what society views as the new sins against purity, the genetic mutations and "abnormalities?" Will these abnormalities be denied existence because they are no longer "necessary" and we can prevent them? What will this new notion of genetic pollution do to social relations? What will defining purity in

genetic terms do to how we view nature, life, and difference? Will the new technologies liberate us and provide choice, as many argue (Hughes, 1996), or will the answers to the genetic counselors probing be predefined by the "systems" in which they operate? It is to these questions that I now turn.

FEEDBACK SYSTEMS AND INFORMATION THEORY

The research which went into the genetic code borrowed heavily from information and communications theory originating in military research labs. Both of these areas of study flow from a systems approach to description. Life defined through the gene is defined as an information system.

> *Gene=information... Information=communication. Genetic and cultural diversity discourses are conflated... [Even] new diseases are interpreted as communications and information transfer pathologies (Eg. AIDS)" (Haraway, 329).*

Therefore an information systems approach has accompanied the HGP and influences not only the way we see nature and life but also has implications for the way we conceive of social relations such as freedom.

When talking about liberty and freedom of choice, the promoters of the new technology claim that it will greatly increase both (Hughes, 1996). However, the discourse around the HGP is information discourse and therefore it inherently blocks out legitimate free choice. A systems approach to choice provides an illusion of choice it replaces reciprocity, which forms the backbone of freedom in a democracy, with feedback. Within our everyday language feedback and reciprocity are increasingly interchanged and are used as if they hold the same meaning. Increasingly feedback is considered the term to describe how we interact because it fits with systems theory and is a plastic word (Uwe Poerksen, 1996) that can be applied to a variety of processes. However, when applied to freedom, feedback and reciprocity illuminate radically different perspectives.

When life is referred to as an information system, under the discourse of the HGP the idea of feedback loops is applied to choice. It is assumed that given "informed consent" adults will be able to make rational free choices about what to do with the new biotechnologies. However, I would argue that choice will be restricted to certain narrow parameters which will fit binary predesignated yes/no responses. Legitimate and influential freedom, in practice, comes when individuals can design the questions and not be reduced to giving yes or no answers to them. Information systems language masks the difference between feedback and reciprocity.

> *Reciprocity is not feedback. Feedback is a particular technique of systems adjustment. It is designed to improve a specific performance. The performance need not be mechanical or carried out by devices, but the purpose of feedback is to make the thing work. Feedback exists within a given design, in can improve performance but not alter the thrust or the design (Franklin, 1991: 49).*

Reciprocity, as opposed to feedback, is situationally based. It is a response to a given context, it is neither designed into the system or is it predictable. Reciprocal discussions around choice allow for freedom of choice. The HGP and the description of human systems as feedback mechanisms presupposes a certain design and assumes that it is fixed, it allows for no reciprocity or real choice. Once the "normal" is defined in relation to the human genetic code going against the norm will be seen as an irrational act that is not within the parameters of the system. Due to systems models being applied to human choices, discussions around emerging biotechnologies will be restricted to feedback mechanisms that are implicit in the discourse around the genetic code. These mechanisms run the risk of leading to a restriction of choice while being presented as new technologies of liberation. This is a similar pattern that many technologies follow, claiming to liberate but then enslaving (Franklin, 1990). This is not due to the inherent control intrinsically a part of the technology, but grows out of the necessary discursive framework in which the technology is conceived, designed and presented to the society (Franklin, 1990).

Systems of Production are at the heart of the HGP and its associated new reproductive technologies. This approach carries with it a set of values and assumptions that direct how the technology is utilized and why the technologies were developed in the first place. As Ursula Franklin says:

> *The close monitoring of the fetus and some of the invasive prenatal technologies can only be considered quality control methods with the accompanying rejection of substandard products (Franklin, 1991).*

Systems of production also alter the way we see nature. "Nature is [seen as] a genetic engineer that continually exchanges, modifies, and invents new genes across various barriers" (Haraway, 1995: 331). Once nature is conceived of as an engineer various human engineering interventions can easily be justified. After all, if a beaver creates "dams" that enable forest secession what is to stop humans from mimicking the beavers behavior in the name of nature? A human term, "damming" is projected onto nature and then we utilize the projection as justification for human actions. When engineering metaphors are applied to DNA and nature is seen as the modifier, human impulses to dominate, control, and regulate at the genetic level can be justified through appeals to mimic "mother" nature the engineer.

This circular play with signs negates the possibility of essence, or the real, and becomes what Baudrillard calls the simulacra. The active nature of the systems production model, the fact that "in nature" there is continual modification and invention, fits well with human interventionist managerial approaches to nature.

CALLS FOR GENETIC SERVICE

Accompanying any new technology and/or service are calls for its universal implementation (McKnight, 1995). Ivan Illich and John McKnight have written on the role of the expert manager in communities and how experts and their services tend to undermine and disable communities rather than help them. They also tend to remove autonomy and choice while presenting themselves as liberation tools. When genes become inserted into dominant discourse and implicated in fields of power they become managed. Foucault described how the discourse around sex made it something that was not simply condemned or tolerated but managed, inserted into systems of utility, regulated for the greater good of all, and made to function according to an optimum (Foucault, 1978). Sex was not only something to be judged but also to be administered. The same can be said of nature and life under the human genome project.

Sex became an object for management procedures and analytical discourses and therefore became a political issue (Foucault, 1978: 24). A similar process is occurring with the HGP. The gene/DNA is being inserted into management and analytical discourses. This will lead for calls for the expert, the scientist and genetic counselor, who will administer genetic "services." McKnight talks about the increasing service economy and its increasing reliance on need. In the West, as we shift away from material commodity production toward service production we increasingly ***need*** need to keep the economy growing. The HGP will open up another frontier for needs management and servicing at the pre-zygote, zygote, natal, post-natal, child, and adult stages of life. Life, as defined by the HGP, will therefore becomes a quarry of needs which can be mined to feed the service based economy.

McKnight discusses how services are first presented to communities, second a need is created for them, and finally the people themselves in the community demand the services through the framing of the services as universal human rights. Liberation is seen

as being tied to the expert service that suddenly can not be done without because the structures in the community that existed before have been replaced by the "new" service. In this sense the service based economy is a "sustainable" growth economy that undermines that which is claims to "help," thereby ensuring its future growth.

Foucault describes this process with respect to sexuality saying that the irony of the deployment of sexuality is that it makes us believe that our "liberation" is in the balance. We are told that sexual liberation will free us, and we are urged to get in touch with our sexuality and discuss it more and more. This process of turning sex into discourse and medicalizing it changes it, and adds it to the management sphere of influence. A similar process is happening with respect to life. Through the definition of life as the genetic code and by presenting genetic technology as a form of liberation, from genetic "defects," and the randomness and unpredictability of "genetic" illness, we expose life increasingly to the management realm.

Ironically this process fits a positive feedback-loop where liberation is presented to us as something that is tied to a particular technology which undermines liberty (Foucault, 1978: 159). Real choice, meaning the right to frame the type of questions we want to ask about life and nature, is stifled and we are presented with a binary feedback loop choice, yes or no. Freedom through relationships of reciprocity are replaced by system of feedback. The HGP claims to be freeing us from nature, randomness, danger, and risk and claims to be opening up possibilities when in fact it is limiting our choices and narrowing our experiences of life.

Technologies are not inserted into societies equally and their effects on individuals vary. Foucault describes how the emerging technology of psychoanalysis allowed the urban rich, through confession, to express their incestuous desire in discourse while at the same time, in rural areas, a systemic campaign was organised against incestuous practices. (Foucault, 1978). This campaign legitimised removing "endangered" children who might be exposed to incest. Will the new genetic technologies remove the right of the poor to start a life? Will genetic technology exhibit its power over pre-life, thereby completing the modernist project of complete and total control over life rather than death? In the case of reproductive technologies, it is only the wealthy who have access to them. With increasing infertility rates, there could conceivably be a time where the poor are banned from having children (except as baby factories) simply through financial barriers. This is already evident in certain parts of the world including the United States.

This paints a dismal picture of the future under the genetic code. However, within Foucault and Illich there are glimmers of hope. Foucault's analysis of power relations always leaves room for resistance. Illich hints at one way this resistance can be realized. He points to the fact that all mangers and experts require the compliance of their clients. Without the compliance and the refusal to be labelled as a deficient other, but as a competent and value producing other, the role for the expert is minimised if not eradicated. The challenge in the face of genetic technologies will be to hang on to a diversity of notions of life that debunk the dominant metaphor of life as a code. If this diversity of metaphors can be fostered and encouraged the impact of genetic technologies can be resisted.

Conclusion

It seems to me that with respect to the HGP and it's associated technologies, life and pre-life management delivers control but claims liberation and freedom. The irony is that the increased management of nature and humans is being seen and offered as our liberation, while in the process we are changing ourselves. When we increasingly strip the world down to individual properties, what John Ralston Saul (1995) calls the dictatorship of reason, we reduce the diversity of ways of knowing the world and reduce the possibility for meaning in the world (Lewis, 1943). From the perspective of the modern biological sciences which have long suffered physics envy the HGP seems to offer a final solution and passkey into the physics club. Under this model of the world Dawkin's "selfish gene" would seem to represent an unstoppable challenge to biological science and a ground to prove the management capabilities of the new biotechnologies. The domestication of "the selfish gene" will, as Neil Evernden has pointed out, exterminate wildness at its source.

I began this essay to try to make sense of the presentation I attended at Acadia. The use of the analogy of science to religion was used to illuminate some of the major similarities in the way knowledge is presented, produced, and implicated. My hope is to raise questions concerning the emerging genetic technologies, and debunk the myth that all critics of the new technologies are simply bio-luddites.

Management claims freedom and liberation but delivers increased control over humans and nature. If we can avoid the temptation to domesticate Richard Dawkin's strawman "the selfish gene" perhaps we can resist the destruction of the diversity of meanings of, and ways of seeing, life.

References

Baudrillard, J. (1981) For a Critique of the Political Economy of the Sign. St. Louis: Telos Press.

Baudrillard, J. (1983) Simulations. New York: Semiotext(e).

Evernden, N. (1992) The Social Creation of Nature. Baltimore: The Johns Hopkins University Press.

Foucault, M. (1978). The History of Sexuality: An Introduction, Vol. I. New York: Vintage Books.

Foucault, M. (1979) Discipline and Punish: The Birth of the Prison. New York: Vintage Books.

Gare, A. (1995) Postmodernism and the Environmental Crisis. New York: Routledge.

Franklin, U. 1990. The Real World of Technology. Concord, Ontario: Anansi Press Ltd.

Haraway, D. (1995) "Universal Donors in a Vampire Culture: It's All in the Family: Biological Kinship Categories in the Twentieth-Century United States" Uncommon Ground: Toward Reinventing Nature. Ed. William Cronon. New York: W.W Natan and Co.

Dreyfus, H. and Rabinow, P. (1983) Michel Foucault: Beyond Structuralism and Hermenutics. Chicago: University of Chicago Press.

Hughes, J. (1996) Embracing Change with All Four Arms: A Post-Humanist Defense of Genetic Engineering. Chicago: McLean Center for Clinical Medical Ethics, Department of Medicine, University of Chicago.

Illich, I. (1977) Toward a History of Needs. Berkely: Heyday Books.

Jameson, F. (1991) Postmodernism and the Cultural Logic of Late Capitalism. London: VERSO.

Lewis, C.S. (1978) The Abolition of Man. London: Fount Paperbacks.

Kay, L. (1996) A Book of Life? How a Genetic Code Became a Language. Toronto: Seminar Series on Knowledge in the Age of Information. York University.

Lewontin, R.C. (1991) Biology as Ideology: The Doctrine of DNA. Concord, Ontario: Anansi Press Ltd.

Logan, B. (1995) The Fifth Language. Toronto: Stoddart.

McKnight, J. (1995) Careless Society: Community and It's Counterfeits. New York: BasicBooks Ltd

Poerksen, Uwe (1996) "Plastic Words," Toronto: On Ideas Program hosted by CBC Radio.

Zimmerman, M. (1994) Contesting the Earth's Future: Radical Ecology and Postmodernity. Berkely: University of California Press.

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