Black Magic, Biotech & Dark Markets

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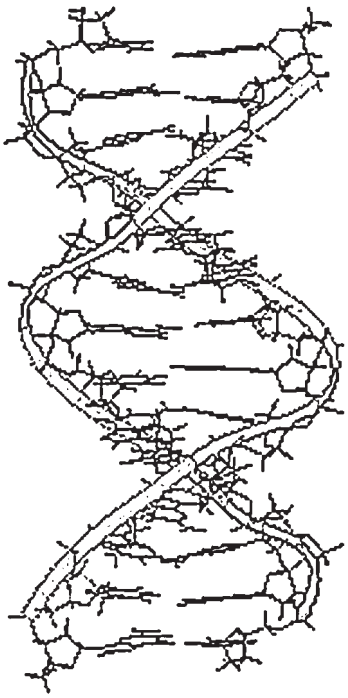
"On some islands mana *[magic] is the word for money"*
Marcel Mauss
"…death is only a state of black magic which did not exist so long ago"
Antonin Artaud



The proposition here is that biotechnology is a unique mode of generating value. This value is simultaneously economic, ethical and medical. Biotech is in this sense a creative endeavor; it creates a context in which biological 'life' can be assessed, and it creates the terms through which negotiations on biological life can take place.

A number of well known examples are worth mentioning in this context: US Patent #4237224: the patent for the techniques for working with recombinant DNA, filed by Stanley Cohen and Herbert Boyer, the researchers who conducted the first genetic engineering experiments in the early 1970s. This patent showed that techniques for manipu-

lating biological life at the molecular level could be open to the criteria of property and patent law.[1]

Diamond vs. Chakravarty: the first case in which the question of "patenting life" was raised. In 1980, researchers sought a patent for a genetically modified microbe which would clean up oil spills in the ocean. The ruling declared that the microorganism was patentable since it had been modified, and was therefore a human-made technology rather than naturally occurring. When anxieties concerning genetically mutated bacteria arose, Congress and the US Environmental Protection Agency intervened, temporarily limiting such organisms to the lab.[2]

Human Genome Diversity: in 1995, a US patent was granted to the National Institute of Health (NIH) for the unmodified cell line extracted from a New Guinea tribesman, the first patent on human biological materials. NIH-funded researchers collected genetic samples from indigenous populations as part of an effort to establish a genetics database (Human Diversity Genome Project). The individuals whose cell lines were patented were not aware of the economic consequences of the patent, nor of the patent itself. The case attracted much criticism by the Rural Advancement Foundation International (RAFI), and led, in part, to stricter protocols of informed consent for scientists.[3]

IHD (Icelandic Health Database): in the late 1990s the biotech start-up DeCode Genetics announced its intention to create a comprehensive health database of the Icelandic population, including genomic data, genealogical records and selected medical records. The IHD would be enabled by new computer-based genome sequencing technologies, and would in part be licensed to pharmaceutical corporations for in-house drug development. Similar projects have been initiated for genetically-isolated populations around the world (including Tonga, Newfoundland, Mormon and even African-American population genome projects).[4]

On the one hand the issues which such examples raise are quite evident. But the economic component of the biotech industry is also highly diversified: the financial markets of biotech start-ups, product pipelines of drug development in the pharmaceutical industry, technology development geared specifically towards niche markets in biotech research, and the expansion of patent laws and notions of property in relation to biological materials. In addition, biotechnology companies and pharmaceutical corporations spend a great deal of money and resources on advertising campaigns, public outreach programmes, TV commercials and even web site design, in order to convey a set of complex messages concerning biotech research and its potential medical applications. Whether the message conveyed is one of technological progress ("delivering on the promise of biotechnology") or of humanitarian missions ("science for life"), there are various features of the biotech industry that one cannot ignore.

First, biotech is as much an economic endeavour as it is a medical one. This is, to be sure, undeniable, although too often the economic face of biotech becomes the mythologised, anonymous corporation invading natural resources and violating human rights. The problem is not that this is exaggeration; the problem is that this is accurate. The examples above all illustrate the economic bottom line of the biotech industry. Recent debates often centre around the nexus between biotechnology and information technologies (genetic privacy, population-specific genomes, privatised databases, knowledge economies).[5]

Second, biotech is as much a technoscientific endeavor as it as medical one. The human genome is an exemplary case of 'big science' precisely because its main focus was not biology or medicine but technological development (in particular, the advancement of information technologies via biotech research). The most recent example of this mobilisation of biopolitics was in the post-9/11 Anthrax scare, in which the notion of "terror networks" took on a decisively viral meaning. Months after the events, there was news of research into the Anthrax genome and of biotech-IT companies working on advanced biochips for biological detection.[6]

Third, biotech has never been a medical endeavor. Or, to put it differently, biotech can be defined by the manner in which it constantly holds medical application at bay. For the biotech industry, application is always potential, and this potentiality is both economic and ideological surplus-value. Constantly postponing application is akin to what Critical Art Ensemble call the "promissory rhetoric" of biotechnology.[7] The biotech industry's social contract is made like a physician's drug prescription, a prescription which is always temporary.

To be sure, the current debates concerning the nexus of biotech and business are crucial to the possibility of any collective voice, be it through activism, awareness-building, education or lobbying for policy change. But, along with this, there are a number of changes affecting biotechnologies which may shift the terms of the debate in the future. One of these is the increasingly important role that computer and information technologies play in biotech research and medical genetic diagnostics.[8] Virtually every field in the biotech industry has been radically enabled by developments in infotech, the human genome project being the most noteworthy example. However, it is one thing to use the metaphor of 'information' to describe DNA (as post-war molecular biology had done), but it is quite another to take that metaphor literally and construct genome databases, gene-finding software and protein structure simulations. The situation becomes more complicated when these instances of computational biology are then decoded, potentially affecting 'real' bodies through gene therapies, genetically-designed drugs, or even GM foods. It appears that the aim of technology development in biotech research is to facilitate a fluid passage between DNA in the living organism (*in vivo*), in the lab (*in vitro*) and in the computer (*in silico*).

The question which this confluence of computers and biology – or bioinformatics – raises is this: how is the correlation of biological life and economic value transformed by new computer and information technologies?

II

We can begin addressing this question with the following statement: an economic critique of biotech would need to consider not only the economic activities of biotech, but biotech as an economic activity. In other words, we need to understand not only the multiple economic activities which constitute the biotech 'industry', but also the generative value network which 'informs' biotechnologies. From one perspective, we can consider biotech first as a science, which then separately negotiates potential application, clinical trials, patents and investment capital. The problem with this position is that it not only assumes the division between science and economics, but it configures economics as coming after science.

From another perspective, science does not precede economics, nor is it completely

separate from it either. To borrow from sociology, we can say that the technology of biotech is 'socially shaped' by a range of factors which are only indirectly economic, but which pertain directly to the structuring of generative value networks.[9] The question is not how the biotech industry commodifies the knowledge and artefacts produced by scientific research; the question is how an economy of valuation is immanent to all biotech practices. In this sense, valuation is simply modes of thinking and acting in asserting values and meanings – it is the efficiency of what 'matters'. In conjunction with the biotech industry, valuation operates via an economic logic (we could say axiomatically) that must be linked constantly to notions of biological life (even if this life is conceived of as information). The wager of the biotech industry lies in the ability to establish a transparent link between biological life and economic value.

A given artefact – a biochip, or stem cells, or a database – materially expresses sets of values concerning specialist and non-specialist notions of biological health, disease and technological development. In a sense biotechnology manufactures novel artefacts which act as "corporealisations" of value, nodes which condense often ambivalent attitudes regarding biological 'life' and high technology.[10] Again, the space which biotech's economy of valuation must traverse is that between biological life and economic value.

How do we characterise such valuations and linkages between biology and economics? A number of researchers studying complex networks have suggested that economic relationships display characteristics of decentralised or 'scale-free' networks, in which control is spread throughout the network in distributed, though uneven ways. For instance, Walter Powell has suggested that the traditional models of economic systems – the vertical hierarchy of the firm and the horizontal ephemerality of the market – gloss over a more fundamental structure, that of the network.[11] In a series of papers which looked at the pharmaceutical industry as a case study, Powell has suggested that economic networks are common in certain conditions (unstable resources, rapid technological change, need for long-term sustainability). Powell shifts his analysis from the units of economic transaction to the dynamic relationships which those transactions enable. In doing so, he suggests that factors of co-dependence, mutual benefit and strategic cooperation characterise economic networks in a way that is significantly different from either firms (which operate by governance) or markets (which function according to fluctuations). Networks work towards establishing both indebtedness and reliance over the long term, and in this sense networks affect even vertical structures such as corporations (e.g. strategic partnerships in the biotech industry with academia or government). In other words, Powell suggests that between the centralised topology of firms/corporations and the distributed topology of markets, there is a more universal topology of decentralised interaction.

Similarly, Albert-László Barabási's group, studying networks as diverse as protein networks in the yeast cell, web site traffic and the networks between corporations, has suggested that there are general, universal laws that complex networks exhibit.[12] These include a 'scale-free' or decentralised topology, composed of a certain number of hubs that are significantly more connected than others (the "power law"), which produce a "small world" effect, in which the path between any two nodes on the network is relatively short (the six degrees of an enzyme...). For Barabási, the significance of this model of scale-free net-

works is that it produces an image of control-without-control, a "web without a spider" as he terms it. Like the work of Powell and other network scientists, this view of complex networks reiterates one of the central ideas of complexity: multiple agents + local interactions = self-organising global effects.[13]

But there is something amiss with this picture. If network science portrays economic networks as "neither a market nor hierarchy", as a "web without a spider", then how do we account for the blatant inequalities in economic networks such as the biotech industry? If the research of network science is correct then, presumably, the controversies surrounding the patenting of biological materials, bio-IPRs and genetically-modified organisms would be regulated by the factors of dependency, reciprocity and flexibility. Clearly this is not the case, as the recent examples of GM foods and population genomics indicate.

III

The answer we can give to the question of control-without-control is both ironic and serious. How can a network such as the biotech industry display control-without-control? Through a particular type of magical practice – a black magic indissociable from technology.

The characterisation of biotech as black magic is primarily meant to indicate the ambivalence of instrumentality in biotech, an ambivalence which actually enables the connection between biological life and economic value. Traditionally, black magic refers to the use of magical actions for maleficent purposes (spells, witchcraft, demonology). The idea of black magic took a particularly strong hold in Renaissance Europe, where it coincided with trends in Jewish and Christian mysticism. The infamous black magicians of the period and after – from Cornelius Agrippa to Eliphas Levi – were often seen as instrumentalists, manipulating the forces of the natural world (in the Hermetic tradition) or of the traditions of 'white magic' (occultism, cabala, alchemy).[14] At the root of black magic was the fear induced by an instrumentalisation of the natural world, in order to gain 'unnatural' control.

Curiously enough, the tropes of black magic specifically, and magic generally, are not uncommon in popular accounts of the biotech industry. For instance, Cynthia Robbins-Roth's book *From Alchemy to IPO* provides a hero-narrative of the biotech industry, recounting the development of recombinant DNA techniques and the formation of Genentech, the first biotech start-up.[15] For Robbins-Roth, the biotech industry realises the dream of alchemy, not only through its ability to control matter, but in its ability to generate value through this transformation of matter. Robbins-Roth does not mention black magic, because this alchemical biotech activity is seen as the ultimate in humanistic endeavor. But neither does she explore in depth the controversies genetic engineering experiments prompted in the 1970s.

In contrast is Jeremy Rifkin's *Algeny*, a precursor to his more popular *The Biotech Century*.[16] Rifkin is known as a sometimes conservative activist who heads the Foundation for Economic Trends. Rifkin's approach to biotech is highly cautious, if not technophobic. His picture is the exact opposite of Robbins-Roth's: the problem is precisely the over-emphasis on economics in the biotech industry, resulting in privatised knowledge and the commodification of life. While the problems Rifkin raises are incontestable, his alarmism often amounts to a wholesale rejection of biotechnology. In contrast to the economically-driven

alchemy of the biotech industry, Rifkin proposes a more environment friendly "algeny", in which scientific research can take place without the intrusion of economic imperatives.

Certainly both Robbins-Roth and Rifkin use the term 'alchemy' quite broadly, but both are concerned with the issue of control vis-à-vis biological life. For Robbins-Roth the promise of the biotech industry is in its ability to control the mysteries of natural life for humanistic purposes; for Rifkin the very life which biotech controls is the living body of people and the environment. Both agree, however, that biological life is essentially a mystery, and that the task which bioscience sets itself is the understanding and control of this mystery. Out of convenience both make reference to magic in relation to the biotech industry.

But what if we take this trope of biotech as magic seriously? We would, first of all, have to point to a definition of 'magic' that would warrant the connection to biotech. A number of historians of religion, including James Frasier, have positioned magic as incommensurate with technology (for Frasier magic is situated between religion and technology, for it has a logic, but that logic is not rational or 'scientific'). Indeed the division persists to this day, along the lines of the rational/irrational.

In this context, Marcel Mauss' famous study, *A General Theory of Magic*, is useful, for it attempts to conceive of magic as deeply connected to both the social and the technological.[17] Mauss provides three phenomena which explain the efficacy of magic in any given social formation: first, the laws of similarity (like produces like) and contiguity (acting at a distance); second, the transfer of magic properties (manifestation of magical force in phenomena); and third, the practice of demonology and possession (association with the taboos of death and necromancy). Mauss' examples are wide-ranging, from Aboriginal agricultural rites, to Melanesian healing practices, to numerous examples of 'private magic' in the everyday. In any magical practice, efficacy will be judged by a combination of tradition, belief, and 'common sense' reasoning according to these three manifestations.

However, for Mauss these do not fully explain the specific 'magical' element of magic, but only provide external sociological criteria for verifying that a magical phenomenon has taken place. Mauss contends that in any magical phenomenon there is always a "residue" or an excess portion which cannot be incorporated into logical thought, and which forms the core of magical practice. In particular, the combination of a world-view of interacting "forces" and the particular "milieu" or context of the magical phenomenon combine to give the sense of a something other that is happening. That is, the notion of magical force and the milieu of magic combine in a concept Mauss calls *mana*. Taken from magical practices in indigenous Melanesian cultures, the term *mana* designates a number of things simultaneously – magician, magical act, magical rite, magical force, magical objects, even more common notions such as luck and fortune. Indeed Mauss suggests that *mana* just as easily refers to a more intense spiritual character as it does to one who is wealthy – both individuals are said to 'have' *mana*.[18]

Mauss' study suggests that a number of cultures have a term like *mana* to designate the intractable in magical phenomenon. Mauss even makes the point that the notion of *mana* operates in a manner akin to the notion of the sacred (though magical acts can be composed of everyday activities and can include secretive or personal actions). For Mauss magic is a social phenomenon, even when magic is understood as illicit, or as

black magic. *Mana* is the expression of magic in the social (even when in a forest). The social is therefore a collective expression via *mana* through belief, valuation and instrumental efficaciousness.

Mauss' study, though not without its problematics (including an exclusive focus on 'primitive' cultures), is noteworthy in that it redefines magic according to social and technological criteria. It suggests that magic is not transcendental (above and beyond social reality), but immanent to collective and individual practices in daily life. Mauss' theory of magic also points to the implicitly pragmatic and instrumental character of magic in society; magic rites associated with healing and medicine are among his most common examples. To this we can add several more qualifiers, for we want to suggest that biotech is a form of black magic, and not just magic generally speaking. If magic is both immanent (social) and instrumental (technological), then black magic is an instrumental use of the immanent qualities of magic. That is, black magic folds the instrumental back upon the immanent, it folds technology back upon the social. When this happens, the object of the magical action becomes the social body itself. Instead of magical practice constituting or contributing to the social (as in Mauss' theory), in black magic it practices on the social. (This is biopolitics with smoke and mirrors.) In this folding back of the instrumental upon the immanent, the social body is 'shaped' according to the hermetic dictates of the technological (the technological becomes synonymous with its efficaciousness). This can be said to constitute the maleficent character of black magic. It results less from a desire for world domination and more from a confusion specific to black magic, a confusion of the interrelation of the immanent (social) and the instrumental (technological).

What does this have to do with biotechnology? On one level all of this is perhaps too abstract. But, if we keep in mind our notion of black magic (aided by Mauss' theory), then it is hard to deny certain analogies in the biotech industry. For instance, consider the pharmaceutical industry. The manufacture of drugs has long been the single most lucrative output for bioscience research. Even when discussions of 'post-genomic complexity' abound, the output for such research is first and foremost in drug discovery. Drugs operate not only by sympathy (vaccines), antipathy (anti-virals) and contiguity (GM foods), but the integration of the pharmaceutical industry with health care systems means that a network for regulating "biovalue" operates in the long term (health insurance, drug prescriptions and subscriptions).[19] Likewise, any computer based laboratory technology achieves a magical transfer of properties, simply by encoding and decoding DNA into a computer. Finally, the biological database can be seen as a means of 'capturing' or possessing biological life via the various property and patenting structures and health care systems.

Recall our initial question: how does biotech create a link between biological life and economic value? And how does it do this as a network which displays control-without-control? In short, biotech as a form of black magic mediates between 'life' and 'property' via the use of information technologies. Information is the 'medium' – in both senses of the term. The space in which black magic biotech operates is the space which separates and connects biological life and economic value, matter and property. 'Information' has become the equivalent of *mana* in the biotech industry. The notion of information – genetic codes, computer data, stock quotes – covers a wide range of meanings, and in doing so it func-

tions as the means by which biotech establishes and regulates the interactions and transactions between life and property. For contemporary biotech, 'information' is *mana*.

IV

The challenge with any consideration of biotechnologies – cultural, political, sociological, philosophical – is to assert the problematic of economics in the biotech industry, while also asserting the moral irreducibility of biotechnologies. Yes, there are deep, fundamental problems with the biotech industry, especially in terms of economic issues. But these issues and these problems should not automatically reduce biotech into a debate between pro and contra-biotech positions. Clearly there are positions between these, or indeed outside of them altogether. As Geert Lovink has commented, dark markets are problematic precisely because they configure technology as use rather than critique (don't think, click...).[20] The challenge is therefore not that biotech is too 'big' an evil – a position of political apathy which ends up reinforcing the characterisation of biotech as a "dark market". Rather, the challenge is how to create new positions which refuse the moral binarisms into which public debates often descend.

NOTES

1. For more on the scientific and social issues in genetic engineering see Aldridge, Susan *The Thread of Life: The Story of Genes and Genetic Engineering* (Cambridge University Press, 1998, Cambridge) and Ho, Mae-Wan *Genetic Engineering Dream or Nightmare?: The Brave New World of Science and Business* (Continuum, 2000, New York).
2. For more on biological patents see Belcher, Brian and Geoffrey Hawtin *A Patent on Life: Ownership of Plant and Animal Research* (IDRC, 1991, Canada) and Kimbrell, Andrew *The Human Body Shop: The Cloning, Engineering, and Marketing of Life* (Gateway, 1997, Washington, D.C.).
3. For more on biodiversity see Shiva, Vandana *Biopiracy: The Plunder of Nature and Knowledge* (Between the Lines, 1997, Toronto) and Harry, Debra "Biocolonialism: A New Threat to Indigenous Peoples" (Indigenous Peoples Council on Biocolonialism web site, http://www.foel.org/LINK/LINK93/biocolonialism.html, 1998).
4. See Brower, Vicki "Mining the genetic riches of human populations" (*Nature Biotechnology* Vol. 16, April 1998) p. 337-340.
5. See the *Scientific American* special issue on "The Human Genome Business" (July 2000).
6. See Hollon, Tom "The Biodefenders" (*Signals Magazine* http://www.signalsmag.com, June 2001).
7. See Critical Art Ensemble "The Promissory Rhetoric of Biotechnology in the Public Sphere" (*Digital Resistance* Autonomedia, 2000, Brooklyn).
8. See Howard, Ken "The Bioinformatics Gold Rush" (*Scientific American* July 2000) p. 58-63 and Persidis, Aris "Bioinformatics" (*Nature Biotechnology* August 1999) p. 828-830.
9. On social shaping approaches see MacKenzie, D. and J. Wajcman *The Social Shaping of Technology* (Open University Press, 1999, Buckingham, UK). While not generally included under SST, the work of Bruno Latour (on germ theory) and Donna Haraway (on technoscience) can be said to have similar interests, if not general theoretical commitments.
10. On "corporealisation" see Haraway, Donna *Modest_Witness...* (Routledge, 1997, New York) p. 141-48.
11. See Powell, Walter, "Inter-Organisational Collaboration in the Biotechnology Industry" (*Journal of Institutional and Theoretical Economics* Vol. 512, 1996) p. 197-215 and "Neither Market Nor Hierarchy: Network

Forms of Organisation" (*Research in Organisational Behaviour* Vol. 12, 1990) p. 295-336. Powell's work has recently been extended by quantitative analysis in network science.

12. See Jeong, Hawoong, and Albert-László, Barabási "The Global Organisation of Cellular Networks" (Department of Physics homepage, University of Notre Dame, http://www. nd.edu/~networks/cell, 2001) and Jeong, Hawoong *et al* "The Large-Scale Organisation of Metabolic Networks" (*Nature* Vol. 407, 5 October 2000) p. 651-54. For a popular treatment see Barabási's *Linked: The New Science of Networks* (Perseus, 2002, Cambridge). In a related vein, see the work of Alan Kirman, such as his article "The Economy as an Evolving Network" (*Journal of Evolutionary Economics* Vol. 7, 1997) p. 339-53.

13. The research on economic networks is wide and varied, with a great deal of it growing out of complexity research at the Santa Fe Institute. For information on other research related to network science, see Arthur, W. Brian *et al* (eds) *The Economy as a Complex Evolving System* (Santa Fe Institute Studies in the Science of Complexity, Perseus, 1997, New York) and Rauch, Jonathan "Seeing Around Corners" (*The Atlantic Monthly* http:// www.theatlantic.com, April 2002). For a broad sociological analysis, see Castells, Manuel *The Rise of the Network Society* (Blackwell, 1996, New York).

14. For a classic historical treatment of the occult see Yates, Frances *The Occult Philosophy in the Elizabethan Age* (Routledge, 2001, London). For a popular treatment of black magic see Cavendish, Richard *The Black Arts* (Capricorn, 1968, New York).

15. See Robbins-Roth, Cynthia *From Alchemy to IPO: The Business of Biotechnology* (Perseus, 2000, New York).

16. See Rifkin, Jeremy *Algeny* (Viking, 1984, New York) and *The Biotech Century: Harnessing the Gene and Remaking the World* (Tarcher/Putnam, 1998, New York).

17. See Mauss, Marcel *A General Theory of Magic* (trans. Robert Brain, Routledge, 2001, orig. 1902, London). Though more recent books have explicitly addressed the relationship between technology and magic, Mauss' study was key in asserting the coexistence of magic, the social and technique. For recent examples see Davis, Erik *Techgnosis: Myth, Magic and Mysticism in the Age of Information* (Three Rivers, 1999, New York) and Stivers, Richard *Technology as Magic* (Continuum, 2001, New York).

18. As Mauss states, "Mana is not simply a force, a being, it is also an action, a quality, a state... One the whole, the word covers a host of ideas which we would designate by phrases such as sorcerer's power, the magical quality of an object, a magical object, to be magical, to possess magical powers, to be under a spell, to act magically... It reveals to us what has seemed to be a fundamental feature of magic – the confusion between actor, rite and object" (p. 133-34).

19. On the concept of "biovalue" see Waldby, Cathy *The Visible Human Project: Informatic Bodies and Posthuman Medicine* (Routledge, 2000, New York) p. 33-34.

20. See the web site for the *Dark Markets* conference (http://darkmarkets.t0.or.at). As suggested by Lovink, the notion of dark markets (and a new media dark age) is more impressionistic than historical. It is meant to describe the current condition in which total technological enablement (net rhetoric) is accompanied by total political inactivity (apathy, agonism, confusion). Dark markets denote the black boxing of technopolitics, while technology itself becomes increasingly diversified and even open source (inasmuch as open source and development are seen as new niche markets). From this perspective, the strategy is to get people to use the technology, and divert attention from political inquiry and pragmatics.

REGSIRATIONS