

❖ **Life as Metamorphosis: Exchanges between Biotechnology and Science Fiction**

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Abstract

The process of transforming science into technology at an ever-increasing rate has industrialised and commodified life itself. A new political economy of nature is emerging that establishes life sciences at the core of neoliberal production (Prigogine & Stengers, 1984; Cooper, 2008), adding a new dimension to the utopian project of improving the human condition.

In its most elegantly ideological manifestations, science fiction sheds its superficial façade of cyborgs, cybernetics and space stations to examine the impact the biotech future will have on our supply-and-demand games of production and progress. This article will provide an overview of the emergent bio-economy and science fiction's role in interpreting the biotechnology revolution that writers such as Margaret Atwood anticipate will take over production and drive the creation of forceful markets controlled by a handful of transnationals.

Introduction

When the travelling salesman awoke from troubled dreams he found himself transformed into a monstrous insect.

His body turned to shell encasing, his limbs to six foreshortened legs, his voice to intolerable chittering. Abhorred by his family, he died alone in a dark room, insufferable and incomprehensible to any other human.

Although Gregor Samsa did not choose his fate in Kafka's commentary on an absurd modernity, his metamorphosis is perhaps, an apt metaphor for the rapidly evolving processes of artificial biological change we are currently experiencing. The human-animal dualism of Kafka is mimicked in the human-machine dichotomy of the post-human future towards which biotechnology seems to accelerate us.

The transformation of science into technology at an ever-increasing rate has industrialised and commodified life itself. A new economy of nature is emerging that has established the life sciences at the very core of neoliberal production, adding a new dimension to the utopian project of improving the human condition, creating – in turn – post-nature environments, systems and people.

Science fiction is perhaps, the genre best suited to investigating the relationship between

neoliberal democracy and the science industries, with writers such as Margaret Atwood, Neal Stephenson and Marge Piercy focusing on the bio and nanotech revolutions that have the potential to dominate production and reproduction, driving the creation of forceful markets controlled by a handful of powerful corporations. Contemporary science fiction probes the potential relationships between life science industries, political economy, utopianism and post-humanism, speculating on how western democratic nations may deal with contemporary apocalyptic currents of change. Writers such as Atwood and Stephenson seek to represent a different future, one of cognitive estrangement (Suvin, 1972), exploring human potential and shifting perceptions of human nature within a rapidly developing economy and environment radically different to those of the 20th century, in a world where the entire pace of life seems to be permanently set to 'fast forward'.

Speculating on financial futures

While self-regulating markets are thought to be the best model for achieving growth and balance between competing interests (this is what is commonly known as the neoliberal economy), in an age where biology is now available as a product in the marketplace, a new economy of nature is emerging. The 'economy of nature', or the 'life science industries' 1 revolve around private organisations' development of an interest in the manipulation of life and its base elements to create de-standardised products for human consumption. The biotechnological manipulation of life and its potentialities has altered the landscape of economics, politics and culture. Late capitalism has mobilised biology, turning debt into surplus and promise into futures, underpinned by the process of speculation (Cooper, 2008). The predominant approaches towards production have begun to change with the new, commercially viable commodity of life which appeals to a vast range of people, especially in the areas of assisted reproductive technologies and stem cell research.

What will happen when technologies such as life extension and gene therapy become standard products for purchase over-the-counter? The utopian possibilities of science are counterbalanced by dystopian literature that warns against the potentially dehumanising impact of technology. The idea of whether a biotech future would be utopian or dystopian raises the question of whether it could be both. For some, the prospect of youth, health and security, of designing children, of engineering environments, is vastly appealing, while to others, the idea of messing with life's building blocks, of desecrating God's creation, is horrifying, unnatural and sacrilegious.

Melinda Cooper (2008) identifies a post-Fordist production shift based on the emergent American bio-economy. Whereas the old Fordist model of the production line was based on exploiting the human body and natural resources to meet a demand for a standardised product, post-Fordist production is preoccupied with something much less tangible, based on an economy of innovation, potential and change. Biotechnology companies have undergone a dramatic destandardisation in terms of their profit models. Financial liberalisation in America has seen the dawn of a regime dominated by speculation – the promise of future profits, where a combination of venture capital funding and stock market initial public offerings (IPOs) have become the standard business model for most biotech companies. This 'promise', this speculative investment, is arguably one of the fundamentals of post-Fordist production where promise is what enables production and ongoing growth.

Biotechnology companies do not produce one standard product to meet a demand: they provide life itself by owning and developing organisms' principles of generation and reproduction. What counts here is what Cooper terms the "variable source code from which innumerable life forms can be generated" (2008: 24). Therefore, when you invest in a biotech company, you are essentially betting that it will be able to come up with new forms of life. And

by participating in that investment, you are participating in a generative economy that no longer aims to just produce the standard T-Model Ford, but to financialise the production of life. Henceforth, profits will depend on the accumulation of biological futures rather than on the production of tangible artefacts.

Bioproduction can also be conceptualised within a Marxist framework. According to Marx (1857), overcoming limits and relocating growth in the speculative future is the defining movement of capital. However, Marx identifies a certain paradox in this movement: that the sporadic reformulation of capitalist structures simultaneously highlights and reinforces capitalism's limits. This means that the promise of life is necessarily counterbalanced by a deficit. So even when our neoliberal economy promises superb profits and a dazzling economic and biological future, it will need to subtract from the very surplus it seeks to create.

Cooper, perhaps, states it best when she writes that:

the wilful production of waste is a capitalist imperative common to the industrial and postindustrial eras. The difference lies merely in their temporalities: while industrial production depletes the earth's reserves of past organic life ... postindustrial bioproduction needs to depotentialise the future possibilities of life, even when it puts them to work (2008: 25).

Cooper then goes on to give the example of patented sterilisation technologies, where a plant's ability to reproduce itself is both mobilised as a source of labour and deliberately inhibited, thus ensuring it can no longer produce for free. That is what defines capitalism, according to Marx – the acceleration towards unbounded growth accompanied by the decelerating force of imposed scarcity.

Here it is worth noting that America is perhaps uniquely situated to control life and exploit developing countries with their superior access to education, resources and technology, as well as their history of medical ethics which places emphasis on the importance of individual life, and individual autonomy over one's body.

The American case of *Diamond v Chakrabarty* (1980) was a turning point in American case law and saw the power of ownership over living organisms turned over to scientists and big corporations. Chakrabarty was a biochemist working for General Electric who created a genetically engineered bacterium capable of consuming crude oil. He filed 36 different patent claims that fell within three broad categories: process claims for the method of engineering the bacterium; claims for a device to clean up oil spills which involved the bacterium – and the bacterium itself. At first, the US Patent and Trademark Office denied his claim, stating that natural things were not patentable. However, when Chakrabarty appealed to the Supreme Court, he successfully had the rejection reversed. The court ruled 5-to-4 that the bacterium was human-made, a new composition of matter, and therefore not strictly natural. But most importantly the court said that whether an invention is alive or dead is irrelevant to its patentability. And with that, living organisms became a new target for intellectual property.

On a larger corporate scale, agricultural biotech company Monsanto is infamous for its 'revolving door' tactics, used to push approval of genetically engineered food and crops through the US Food and Drug Administration without valid testing procedures. Monsanto has ignored claims by US Food and Drug Agency scientists that genetically engineered seeds can cause negative health effects and has now bought approximately 50 seed companies worldwide, thus controlling a huge amount of food, and life. Monsanto was named company of the year by Forbes Magazine in 2009.

Without strict regulation of biotechnology, exploitation of developing countries by

technologically advanced countries such as America may be inevitable. This was perhaps most evident in negotiations over the Trade-Related Aspects of Intellectual Property Rights (TRIPS), which were dominated by north Americans (Alford, 1995), and which saw the United States argue for the ability to trademark life. During the TRIPS talks, several African nations argued it was unethical to essentially own life forms (Adede, 2003), while other Asian nations argued that their cultural beliefs clashed with US patent law. While the US made its decisions in line with the interests of capital, many other nations, including India and Korea, believed that intellectual works are communal property, intended for the education and wellbeing of all, which is why patents often don't cover pharmaceutical products, or in the case of India, only exist for a period of five years (Kuanpoth, 2003). 2

The patentability of life in America may be due to the weight that scientific and medical discourse is afforded in the US. According to Decker (2008), science's privileged place in making knowledge is due to its powerful presence in the political economy. And by appealing to the one objective and correct science, developed countries such as the US are able to "maintain their position as the model for ideal development and are able to retain political and economic control over developing countries" (Hellsten, 2008: 76).

To take just one example, the Hagahai people of Papua New Guinea were the subject of study by an American scientist, Dr Carol Jenkins, in 1994. The US National Institute of Health was granted a patent based on the Hagahai cell line, containing unmodified DNA, which was to be used in a study into retroviruses. The Hagahai were entitled to 50 per cent royalties in any profits accrued by the researcher, however, the patent itself offered no compensation for essentially becoming the biological property of the US government. The patent was actually disclaimed in 1996, however in 2008 the Hagahai cell line was still available in the public domain – you could buy it from the American Type Culture Collections for \$US 216.

Political, economic and cultural structures that form around biotechnology indicate the metamorphosis of the human into something new – biologically and theoretically. The convergence of the organic and the technologic may supersede traditional notions of humanism. Hassan (1977) states that post-humanism is more than just a slogan. It indicates a new period of human experience, an interaction with the birth of consumer-driven biotechnology.

Adapting to the future: The post-human perplex

Discussion of biotechnology and bioethics cannot take place without reflecting on the changes to our notion of 'humanity'. How will the individual respond to the de-naturalisation of the body and its environment, a process already underway? How will we adapt collectively to biotechnological change?

Descartes' philosophy of reason as the distinguishing characteristic of man has historically been a fundamental factor in discerning the human and non-human, however, it has become irrelevant in the face of social fragmentation which has seen a rise in a theoretical anti-humanism (Badmington, 2000). Meanwhile, the advent of novel scientific experiments in cloning and genetic modification has raised questions of what impact techno-science has on our inherent human nature, if such a thing exists, within the grander context of an ecological crisis that has seen nature disintegrate under the crushing force of relentless industrial development.

Althusser and Balibar claim that the Cartesian view of man, endowed with natural reason, has been superseded in an "immense theoretical revolution" (2009: 182) by the theories of Marx, which opened up space for post-humanism. Marx and Engels sought to re-think Descartes' theories and insisted that consciousness does not dictate an individual's social life; rather, social life directly influences the individual's consciousness. We are the product of our

environments, our culture and our politics. In a post-nature economy, what impact will this have on our ideas of humanity?

Fukuyama (1992, 2002) advocates for tighter control of biotechnology due to its dehumanising potential. Referring to the lack of legislative measures around the life science industries, Fukuyama argues that biotechnology endangers the diversity of human traits; that genetic modification makes human nature ambivalent, if not irrelevant. Similarly, Virilio views biotechnology as "counter nature" (2003: 55) and draws on the example of the Holocaust to demonstrate how it may be used as a tool of control, oppression and discrimination. Both Fukuyama and Virilio argue for the establishment of boundaries to ensure human dignity is maintained and the sanctity of life protected.

In contrast, Donna Haraway argues that the post-human cyborg is our ontology – that we are all chimeras, part machine and part organism, which is why cyborgs are as hard to see theoretically as materially. "They are floating signifiers" (1990: 152), she writes, that straddle nature and culture, and their lack of boundaries or definitions should be celebrated. However, Haraway acknowledges the concerns of biological determinists such as Virilio by asserting that transgenic "vampires" polarise attitudes, with revulsion towards the monstrously modified human on one hand, and intense curiosity in the novel potential techno-science on the other. But ultimately Haraway approves of the "world building alliances of humans and non-humans" (1991: 210), seeing it as an escape from the traditional dichotomies posited by Cartesian thinking.

Rose is more explicitly a technological determinist, promoting "technologies of hope" (2007: 149) through which people will be able to forge strong, individual identities. According to Rose, blurring the lines between the natural and the artificial allows for an "optimisation" of human experience, reshaping social processes to maximise functionality, improve outcomes and ultimately expand potential (p. 18).

What is important about Rose's argument, aside from providing a voice of dissent amongst the less liberal discussion, is his identification of the "economics of vitality", encompassing "the consolidation of a new market of bio-value" (Bhuiyan, 2009: 835) – the bio-economy. Rose identifies the potential for biotechnology to shape a new economy of production and reproduction, which will, in turn, shape our view on 'humanity' and its relevance to our bodies and our environments. He sees this as liberating, as the very definition of the neoliberal free market economy in all its democratising potential.

The seminal work of Hayles comes down somewhere in between the biological and the technological determinists. For her, the post-human subject is "an amalgam, a collection of interchangeable components, a material information entity whose bodies undergo continuous construction and reconstruction" (1999: 3). Science has the potential to change humanity, but humanity is an ephemeral term, subject to an uncontrollable and complex world (1999: 288). According to Coyle, this world is characterised by "emergence, reflexivity, embodiment, and a dynamic partnership between human and non-human nature" (2006: 507). The humanism we once embraced as 'rational' beings has, therefore, become irrelevant in the face of post-industrial society, with the individual free to determine their identity and their nature within the boundaries of scientific possibility. Whether this is positive or negative is perceived as an individual problem, with both utopian and dystopian potential.

Within 50 years, according to Broderick (1997; 1999), Moravec (1988) and Kurzweil (2005), we can expect a range of computers that far outstrip the capacity of the human brain, nanotechnology that will look after labour, and a whole gamut of biotechnological products and procedures to modify our bodies. The possibilities of genetic modification alone are almost endless – designer babies, human clones, human-animal hybrids ... Is there a role for the

human in such a future? Are we capable of adapting? Or will our Promethean egoism result in the engineering of our own disappearance (Murphie & Potts on Virilio, 2003: 37)?

Speculating on the fictional future

Speculation is not just at the heart of the biotechnology economy, it is at the heart of the literature driven by that technology as well. Waldby (2000) has coined the term 'biomedical imaginary' in reference to what she calls the myths and fantasies within science's supposed logical systems. Given the shifting landscape of life science industries, it may be useful to stretch this definition of the 'biomedical imaginary' across cultural studies as well, to encompass fiction informed by science, which ultimately enables us to acknowledge fiction's central role in identifying the motivations, processes and consequences of biotechnology.

Taken in this sense, the biomedical imaginary can be framed in utopian and dystopian terms, distinguishing between the two main forms of science fiction:

1. those that see science as a salvation-type discourse, for example J.D. Bernal's *The World, The Flesh and the Devil* (1929) and the critical work of Hans Moravec and Ray Kurzweil, actively promoting technology. And
2. others pointing out the dangers of the misapplication of science and its potential to supersede human emotion and cognition. This genre stems from Shelley's *Frankenstein* (1818), with its themes of the Promethean scientist-creator, but is best typified in works such as *Brave New World* (1949), *The Matrix* (1999) and *Blade Runner* (1994). This genre may be dubbed 'techno-fiction', insofar as it is interested in the dehumanising impact of industrialised and/or bureaucratised control over life, and not necessarily in scientific principles.

From this clear dichotomy between the utopian and dystopian adaptations of the biomedical imaginary, a new kind of fiction is emerging that is best embodied in the writings of Margaret Atwood, Marge Piercy and Neal Stephenson. This new work focuses on the political economy of biotechnological change, and is both utopian and dystopian. While still concerned with the processes of developing new technologies, its emphasis is on the impacts of biotechnology on our social constructs – how and why changes occur and what impact they have on the currently accepted modes of social practice, and on individual autonomy and self-determinism.

Margaret Atwood is perhaps the most prominent writer of fiction to speak on these topics thus far. She explores the post-human biotech future in *Oryx and Crake* (2003) and *The Year of the Flood* (2009), describing a North American state in which biotechnological experimentations driven by market demand has created two worlds – the safe compounds of the transnational biotech organisations, the "Life Corporations" or "LifeCorps", where executives, other employees and their family abide and the "pleeblands", slum-like urban landscapes where everyone else lives. At the Watson-Crick Institute, a college for talented future LifeCorps scientists, genius Crake shows arts student Jimmy the brainless chicken spine used to grow food for human consumption due to the lack of animal meat available. In a significant discussion on morality, Jimmy sees the object as an atrocious blaspheme upon nature, a shocking "animal-protein tuber" (p. 202). To Jimmy, knowing whether something is real or fake is essential – is the chicken still a chicken? – while to Crake, the distinction is unimportant, a species simply is what it is, in the here and now. Nature is whatever we are capable of engineering. 3

Drawing on streams of thought elucidated by Fukuyama and Virilio, Atwood speculates on what will happen if the complete privatisation of life sciences occurs in the future, warning readers of the potential impact of biotechnological change on our bodies, our political economy, our culture and our very existence. Atwood fears that the masses may sit in ignorance or helplessness beneath the "scientific maverks" (Bouson, 2004: 154) playing God, irreverent and irresponsible.

Grounded in critical theories ranging from the philosophy of science to cyber-terrorism, contemporary science fiction writers have promoted human imagination and exploration of the multi-faceted human experience through demoting the significance of science and technology within the narrative. This move towards "metascience fiction" (Ebert, 1980) involves self-reflexive discourse and subverts the thematic and structural norms of traditional science fiction to demonstrate awareness of an emerging postmodern aesthetic that elevates the subject over the object.

Metascience fiction is dedicated to repudiating the totalisation of human experience, seeing the impacts of biotechnology on humanism as highly individual, highly permeable and highly changeable. This is a rejection of Habermas' theory that the postmodern aesthetic can act as a catalyst for change in its ability to open the way for a "unity of experience", but may establish the groundwork for new epistemologies acting as *petits recits* ("little narratives") in the sense of local stories with local truths, as suggested by Lyotard (1992: 4). Postmodern fiction is therefore, an essential mode of reflective thought capable of inspiring meditation on the social body. For the reflective practitioner, "materialising ideas" comes from this transdisciplinary exploration of the human condition. Drawing upon what Parrinder (1980) identifies as anti-positivist, anti-essentialist rumblings within the public conversation for a neo-humanist assault on science, the reflective practitioner of science fiction crafts visions of the future which draw from divergent public discourse to inform new ways of thinking through theory.

Metascience fiction provides a flexible, accessible platform from which the neoliberal economy of life can be analysed. By drawing upon discussions of bioeconomy, biotechnology, bioethics, post-humanism, technological determinism and utopianism, I hope to posit a narrative within metascience fiction that renegotiates human subjectivity and examines the transformative social structures that have begun to fling us into frighteningly speculative futures.

What now?

The mantle of salvation has now been placed on scientists. Henceforth, the "megatechnics" of industrialised life sciences may have the potential to stimulate the complete privatisation of production and reproduction. What regulations will be imposed? What impact will biotechnological developments have on our view of 'humanity'? Are we becoming post-human? Or are we already something more than mere minds encased in flesh? Indeed, is the hyper-externalisation of our minds something we should strive for, as extropians suggest?

What will happen to all of us Gregor Samsas if we turn into giant bugs overnight, how will our families and friends adapt, and what will happen to our political and economic structures if we voluntarily take on alien bodies or even minds? Perhaps this shift is irrelevant, as Atwood's Crake says, since the process isn't important, a species is just what it is, in the here and now. Nature with a capital 'N' no longer exists. As the boundaries crumble, raising questions about our bodies, environments and their biological potential, it's time to start rigorously investigating that muddy middle ground between fully accepting or rejecting genetically modified futures.

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Footnotes

1 Life sciences broadly include:

- in medicine – IVF, tissue engineering, gene therapy, pharmacogenomics and cloning;
- and in agriculture – crop yield, increased food nutrition, reduced crop or seed vulnerability to environmental stressors and decreased dependence on agrochemicals.

2 Similarly, the Convention on Biological Diversity dictates that any individuals or groups participating in medical or scientific trials be compensated for any resources supplied, e.g. blood, DNA, etc. Compensation is supposed to be granted in three stages: a small, short-term initial fee, a medium-term payment for support/training, and a long-term fee for royalties (Parry, 2004). However, Carolan (2007) points out that up-front benefits are minimal because they are merely intended to encourage further collection of biological samples in the hope that some will become patentable materials, from which lucrative royalty payments may develop. But in reality, long-term payments turn out to be fictitious, as it is assumed that firms will return to source countries for materials. However, with the technology to synthesis and replicate genetic and chemical material, such an assumption is unfounded (Carolan, 2007, p. 132-133).

3 If Crake's perspective is evidence of what Bouson calls the "postmodern mindset" determinedly defying the laws of nature posited by modern science and technology (2004, p. 145), then Jimmy is the powerless voice of resistance, afraid to speak up, unknowing, afraid, deliberately making himself numb with the women, drugs and entertainment all too available in the technofuture.

About the author

Lisa Dowdall recently completed a year of research in the UWS School of Communication Arts honours program with a creative writing project and critical exegesis speculating on hyper-real religion in a futuristic crisis culture. She completed her undergraduate degree in journalism at the University of Technology, Sydney and has worked in media and communications within public and private organisations. Her research interests include popular culture, religious apocalypticism, utopianism, biotechnology, bioethics and environmentalism.

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