C4 | THE FUTURE IS NOW: GENETIC PROMISES AND SPECULATIVE FINANCE

This chapter explores the parallels, connections, and disjunctures between the worlds of biotechnology research and development (R&D) and high finance, because 'one can understand emergent biotechnologies such as genomics only by simultaneously analyzing the market frameworks within which they emerge' (Sunder Rajan 2006: 33).

The promissory future of biotechnology

'The future' is key in biotech R&D. Since the 1980s, biotech scientists and their supporters have promoted visions of the future in which disease, hunger, pollution, biodiversity loss, and industrial waste will all have been vanquished by new biotechnology products and processes.

It is predicted that in the future an individual's genome – the particular sequences of DNA molecules in his or her body – will be routinely 'decoded' from a biological sample and the resulting information stored as electronic medical records. New pharmaceutical drugs will be tailored to a patient's individual genome, and illnesses, plants, and animals could be genetically engineered to 'grow' some of these drugs. Analysis of the information before the appearance of symptoms could assess the probability of the individual succumbing to a disease in the future. A diagnostic test could encourage her to change her lifestyle or to take other new pharmaceutical drugs that it was claimed could prevent this particular future from occurring. By using the concept of public health, by speaking the language of prevention, and by suggesting that anyone, no matter how healthy in the present, might fall ill in the future, means that everyone becomes a 'patient-in-waiting' (ibid.: 175) who would presumably benefit from 'predict and prevent' pharmacogenetics.

Another much-publicised research avenue combines genetic information and technology with technology dealing with cell behaviour, development, and manipulation (particularly of stem cells, both embryonic and adult), with the aim of regenerating damaged or failing body parts and treating, if not curing, many diseases.

Umbilical cord blood banking stores the present for the future. Stem cells in cord blood have been used for over a decade as an alternative to bone-marrow transplants. But many parents now opt to freeze umbilical cord blood in case future research finds ways of treating their child with it if the child were to become ill. Such commercial banking 'rests fundamentally on

the future-oriented promissory value of regenerative medicine … embedded largely in future potential rather than present utility' (Martin et al. 2008: 132).

In sum, 'biotech … is today synonymous with the language and imagery of futuristic breakthroughs' (Brown 2003: 4). As a result, discussions and decisions about health and biotechnology tend to be based less on facts and evidence and more on hopeful, future-oriented values and abstractions (Brown 2007: 332). Sociologist Sarah Franklin believes that 'imagining a future yet to be … fundamentally defines the whole issue of the new genetics and society' (Franklin 2001: 349).

Supporters of biotech R&D also depict threatening futures in which more and more people will starve, suffer, and die if the research does not proceed. And it is to gain support – financial, political, and public – that future-oriented abstractions are invariably mobilised. Political support is needed to push through legislative and policy changes, particularly those allowing patents to be awarded on genes and living organisms, and permitting publicly funded scientists to hold such patents on their basic research and to set up private biotech companies spun out of their university work. And public support, albeit tacit or acquiescent, is considered essential, not only for bringing about these legislative and policy changes and for securing financing, but also for supplying human biological material, for participating in clinical trials, and eventually for using any resulting products.

Financial futures on futures

> 'The range of derivatives contracts is limited only by the imagination of man (or sometimes, so it seems, madmen)' Warren Buffett, quoted in Lanchester (2010: 43)

'The future' has also become key to global finance over the past three decades, or rather 'a' future: a legal agreement to buy or sell a specified asset at a specified price on a specified date in the future. The agreement itself – the future – can be bought and sold, and is therefore classed as an asset. Another similar financial instrument is an option, which confers the right, but not the obligation, to buy or sell an asset in the future at an agreed price in return for a small down payment. A third type is a swap, an agreement to exchange assets at agreed prices on some specified date in the future. The three types of agreement, to do something in the future, are collectively known as derivatives because their value is derived from some external variable. Those who buy derivatives are betting on the future direction of the underlying asset's price.

Farmers have long used derivatives to insure themselves against risks and uncertainties, such as bad weather, so as to get a good price for their crops at harvest time. In their current guise, however, derivatives would be unrecognisable to any farmer of yesteryear. Agreements are now made not only on the

future price of commodities, but also on stock market indexes of commodities, on future differences in interest rates, exchange rates, and currency rates, on the prices of stocks, shares, and bonds, and on the creditworthiness of companies and countries. Derivatives have enabled virtually everything to be priced, bought, and sold. They have been cross-linked and embedded within yet more contracts and agreements; assets have been bundled together and the whole portfolio 'sliced and diced' into tranches and sold. Futures on futures can now be bought and sold, 'accumulating promise from promise' (Cooper 2008: 142).

Before the 1970s, financial markets for derivatives were marked out as hazardous and were limited in size, or were simply banned. As with the development of the biotech industry, however, active lobbying enabled financial markets in derivatives to develop, leaving their agrarian insurance origins far behind. Today, they provide extensive opportunities for speculation – the practice of trying to profit from changes in fluctuating prices. The scale on which derivatives have been created and marketed is such that speculative capital far surpasses trading capital. Moreover, 'the rise of speculative capital offers the disquieting spectre of a future emerging as if ex nihilo – held aloft by the mere promise of surplus-value'. Speculation is 'an affective art of promise, expectation and panic where, in a real sense, price is no longer referenced to some fundamental value anchored in the past but surfaces as the emergent effect of "our" collective valuations of the future' (Cooper 2006: 7).[1]

Speculative accumulation of biotech futures

The paths of the promissory futures of biotech and of 'future-looking financescapes' (Helmreich 2008: 465) cross each other through speculative capital in the form of venture capital, which usually engages with young biotech companies until they launch themselves on a stock market, and of hedge funds, which buy the shares.

Venture-capital support for early-stage R&D has been the standard pattern of biotech-company development, particularly in the United States. Some contend that biotech would not have emerged as an industry were it not for 'the willingness of venture capitalists to invest in a technology that had little credibility at the time [1980s] as a successful business model' (Sunder Rajan 2006: 6). Venture capital is money given to a fledgling biotech company in return for a financial stake and (usually) a management role in the company.[2] Venture capitalists hope to make a return on their cash by selling their stakes (usually within 6–10 years), either directly to another buyer or through a stock exchange after the company has issued shares for the first time.

But speculating on biotech firms is precarious. Patents are regarded as providing some guarantee at the point of entry, while a stock market flotation is seen as the assured exit route.

Patents, thus, are at the heart of the logic of the speculative capital deployed

in biotechnology.[3] A biotech company in its early stages often has no new drug, test, or tool in its pipeline, or in clinical trials, let alone on the market; it has no revenue stream, never mind profits; it has no tangible assets. What it does have, however, is a vision of a promised future. If scientists can capture this future by obtaining a patent on their initial research (even if the research has been paid for from the public purse), the company can offer 'a proprietary claim over the future life forms it might give rise to, along with the profits that accrue from them' (Cooper 2008: 28). From the company's perspective, the patent itself is the valuable commodity rather than the subject of the patent. In the entrepreneurial science of biotechnology, 'it is more important to own the speculative value of a cell line, through title to its "intellectual property," than to own the cell line itself' (ibid.: 190). Just as futures and other derivatives allow a speculator to profit from the buying and selling of commodities without actually owning any commodities themselves, so, too, 'the biological patent allows one to own the organism's principle of generation without having to own the actual organism' (ibid.: 24).

Biotech patents mark a 'fundamental rupture' in that history of patents by encompassing not only living organisms but also *future* inventions as well as present ones (ibid.: 189). This rupture is particularly striking when we consider human embryonic stem cells, which have the ability to reproduce themselves indefinitely and to become any one of the 220 or so different kinds of cell in the human body; stem cells tend to be defined speculatively by what they could do rather than what they are (Cooper 2006: 15). Regenerative medicine aims to harness this speculative ability, but there are still substantial doubts as to whether the research will yield any safe therapeutic product. In the context of such fundamental uncertainty, 'the biological patent responds to the unpredictable potentiality of the ES [embryonic stem] cell line by inventing a property right over the uncertain future' (Cooper 2008: 144). A combination of stock market and patent reforms 'transformed the nature of life science research in such a way that the mere hope of a future biological product is enough to sustain investment' (ibid.: 26).

The next phase of risk-taking comes when shares in the biotech company are bought by investors and speculators unknown to the company. In recent years, hedge funds – largely unregulated financial vehicles catering to the super-rich, pension funds, and university endowments – have started to snap them up. These funds are renowned for exploiting swings in share prices. They profit from drops in share prices through the practice of short-selling: a fund borrows shares in the biotech company and sells them; when their price drops, it buys them back – at a lower price. Instead of the usual speculative practice of buying low and selling high, short-selling involves selling high and buying low.

What speculative health for whom?

The tendency to view the future of health care through the prism of genetic determinism has been censured by many biotech researchers as well as public health activists. Privileging the role of genetic anomalies in causing disease downplays the role of the genes' 'environments' and of the social, ecological, epidemiological, and evolutionary context in which disease emerges and spreads. Given life's capricious complexity and its embedded interconnections with various environments, it is not surprising that genetic research (with a few notable exceptions) has delivered so little. Even the UK geneticist turned millionaire venture capitalist entrepreneur Sir Christopher Evans admitted a few years ago that 'nothing in biotech has ever come to anything yet' (Brun-Rovet 2003: 18).

But the involvement of speculative capital in biotech R&D means that *there is no need for it ever to do so*. Whereas investors will abandon biotech companies when they fail to bring products or services to market, the speculative capital underpinning biotech companies and their futures does not need them to deliver anything at all in either the present or the future. All that a biotech company has to do to generate value in the present is to sell a vision of the future, 'even if it is a vision that will never be realized' (Sunder Rajan 2006: 115–16).

When promised futures repeatedly fail to materialise and doubts over the credibility of such promises surface, public relations become critical. In the world of speculative biotech, successful marketing demonstrates itself not in the articulation and promotion of over-hyped futures but in 'the closure of the gap between what is envisioned and what is (inadequately) achieved' (ibid.: 126). Another response has been to draw attention loudly to the handful of clinical applications that have emerged (some of which are undoubtedly of health-giving and life-saving benefit), while quietly abandoning research lines that haven't delivered. Novel biological drugs, particularly those that address cancer, are considered among the most tangible fruits of biotechnology, while far less is heard today about xenotransplantation or gene therapy (Brown 2003: 4, 9).

Another strategy has been to promote products for conditions other than those for which they were originally developed. To expand markets for genetic technologies (as well as for related reproductive and pharmaceutical technologies), regulatory and public approval is obtained for a drug to treat a medical condition; the drug is then promoted for other uses that many more (healthy) people could be expected to take up for social or cosmetic reasons. Injections of stem cells derived from aborted fetuses were developed to treat Parkinson's disease and blood disorders, but are being advertised as anti-wrinkle treatments. The beneficiaries of stem-cell breast implants are described as cancer patients who have had mastectomies, but promoters are eyeing women who would like breast or lip enlargements.

Colonising the future

> What is called for is something like a creative sabotage of the future. (Cooper 2008: 99)

The biotech industry uses the 'future' in a very strategic manner. Instead of relying on practice and evidence grounded in reality to plot a route to the future, research starts from what is speculatively possible in an abstract future. It draws 'an imagined future into the real-time now' (Brown 2003: 17), so that particular technologies seem obvious solutions to which resources must be directed immediately. Decision-making is channelled towards techno-knowledge-based utopian fixes that harness and commodify genetic and bio-molecular science (Birch and Mykhnenko 2010: 2).

Mobilising an imaginary genetic future not only frames health, disease, and medicine in individualised genetic terms, but also thrusts the present structural causes of ill-health into the background, diverting attention away from the social determinants of health. The colonising power of the future also sidesteps questions about how a genetic approach to health may exacerbate structural causes of ill-health. The inaccessibility of existing treatments and health care services in the present, never mind the future, is considered unrelated to this approach in analytical, policy, or funding terms.

As Ruth Hubbard has stressed, although high-tech treatments can turn out to be a 'real boon' to a limited number of individuals, they unfortunately

29 Protest in New Delhi against introduction of Genetically Modified Brinjal (Greenpeace)

'drain resources away from the kinds of public health and medical measures that could improve the health of a much larger number of people' (Hubbard and Wald 1993: 112).

GeneWatch UK's conclusion about the consequences of the speculative approach to health (and agriculture) research is direct:

> It has … exacted a high price in human lives due to wasted opportunity costs by acting as a distraction from more immediate, lower-cost alternatives. This is partly because ensuring that existing treatments and a varied, balanced diet reach everybody would save a lot more lives than any possible technological developments; and partly because the system distorts the research agenda away from human needs as well as from the broader development of scientific knowledge and understanding. The problem is not that commercial interests should not play a role in funding and helping to drive (at least some) R&D investment, or that technology (including biotechnology) has no positive applications, but that the system of policies and incentives created to drive the 'knowledge-based bio-economy' is deeply flawed. (Wallace 2010: 10)

The challenge for public health activists is to contest the futures that are presented as inevitable. It is on the basis of our actions in a grounded present that we must build and realise these visions of the future.

Health for all

> A focus on individual biological differences is … unlikely to deliver significant improvements in public health. (GeneWatch UK 2002)

Before trying to fix the system of biotech R&D that has delivered neither health nor wealth, it might be more productive to ask whether speculative finance is the best way to fund health innovation and whether wealth (rather than health) should be the goal of such innovation. It would be more fruitful to reassess and reclaim what is needed for health, and then to consider what role biotech might play.

Research into the human genome has, in fact, consigned the idea of 'one gene, one condition' to the history books for the vast majority of diseases and conditions. The substantial findings emerging from genetic research are undermining the notion of genetic determinism as it becomes less and less clear how genes 'work'. 'We've made the mistake of equating the gathering of information with a corresponding increase in insight and understanding,' says biologist Jim Collins (Ball 2010: 65).

Even those few conditions clearly linked to single genes often cry out for more attention to be paid to the environment of the sufferers. Consider sickle-cell disease. Chuck Adams, a social worker in a children's hospital in Philadelphia, points out that living in a cold, abandoned building without adequate food deeply affects those with sickle-cell disease. 'They just happen

to have a chronic genetic disorder, but being poor was probably the first disorder that they had to deal with,' he says (Sexton 2002). Helen Wallace of GeneWatch UK concurs: 'The big risks for most diseases are not inside your genes but in the world outside' (GeneWatch UK 2010b).

Genetic research is not necessarily providing what is needed by sick people, including those with 'precarious futures … who are desperate for treatment' (Brown 2003: 8). When the goal is monetary profit from the research process, 'manufactured scarcity' is the result, a situation that is compounded when health care itself is a profit-making centre, determining what tests and treatments are provided to whom (and when and where).

Given the 'absolute scarcity' of treatments for some diseases, how can public health activists judge whether promissory claims of future benefits of biotech research are 'true'? It is widely acknowledged that 'early stage genetic technologies are difficult to analyse, both in terms of the direction of their development and the social and ethical issues they raise' (Hedgecoe and Martin 2003: 355). The task is made harder when these technologies are embedded within 'the knowledge economy of expectations' (Brown 2003: 16) and 'surrounded by too much "hype", speculation and unsubstantiated claims' (Hedgecoe and Martin 2003: 328). A first step would be to engage more with genetic researchers working within 'the privately cautious world of bench science' (Brown 2003: 16) than with their business or PR managers or speculators. Those closer to the research tend to be far more aware of the difficulties, doubts, and uncertainties – past, present, and future – of realising ambitious promises. Many have experienced time and again how unanticipated hurdles have stalled promised innovations (Brown and Michael 2003: 14, 16).

Another step would be to scrutinise the interests behind various genetic findings. GeneWatch UK has documented how the tobacco industry infiltrated top scientific institutions in the United States and the UK to promote the false theory that smokers' risks of lung cancer and the likelihood of their smoking are in their DNA. 'Leading scientists endorsed the hunt for genes that don't exist, creating a vast gravy train of funding for the human genome and a false message about cancer in the press' (GeneWatch UK 2010b; Wallace 2009). The pharmaceutical and food industries have promoted false claims that human genome sequencing will predict killer diseases in an effort to market health care products to healthy people and to create confusion about the role of processed foods in causing hypertension, diabetes, and obesity. The chemical and nuclear industries have also sponsored genetic research (GeneWatch UK 2010a).

Such information, and the knowledge that public health advocates already have, can change the nature and the direction of the conversation. Rather than taking the promised benefits at face value, questions can be asked that turn the spotlight away from utopian future abstractions back to the present

30 Much of Biotech research does not address real needs (Indranil Mukherjee)

realities, messy and complicated as they are. When a South African farmer was asked whether he would welcome crops that were genetically engineered to be drought tolerant, he replied, 'First, we need land reform.' Health for All rather than Genes R Us needs to be placed at the centre of health research, policy, and funding.

Take economics seriously

> Biotechnology is a form of enterprise inextricable from contemporary capitalism. (Sunder Rajan 2006: 3)

It is sometimes claimed that it does not matter whether the public or the private sector pays for 'public goods', or how money has been raised to pay for these goods, or whether some interests profit from them, as long as the goods are delivered in the end. Public health advocates have shown that the financing mechanisms do affect what is provided to whom. But when the life sciences and biological materials are subject to the logic not only of commodification, but also of financialisation, no goods need be delivered at all. If biotech research is to serve public health needs, its core structures need to be reshaped, re-employed, and undistorted away from 'the creation of surplus value' (Tyfield 2009: 498).

Although some Western governments (in the wake of the recent financial crisis) have put failing banks into public ownership, the power dynamics involved suggest that the process is not nationalisation but 'a profound deepening of the reverse takeover of the state by finance' (Tyfield n.d.: 1). Something similar has happened in the world of biotech R&D given that the 'symbiotic relationship between industry, university and governments' has blurred the distinction between 'public' and 'private' in many instances (Lynskey 2006: 134–5). Reclaiming health research and finance requires reclaiming the 'public'

and the 'state'. What form of governance might work best to ensure not simply public control but also the exercise of that control for the public good? What political processes might be nurtured to encourage debate and consensus-building around what constitutes the 'public interest'? Should the public continue to allow their governments to move away from protecting the public's health towards facilitating the speculative economy on the back of public health research? Is the primary function of public health agencies to protect the public, or to stimulate the economy through the commercialisation of biomedical research? Should the function of public sector funding and regulation be to assist the goals of speculative capital, or to defend the public interest against them?

Similar questions need to be asked about genetic research. Is the science of human cells and genes there to fulfil the promise of a better life for all, or to serve the ends of some speculators? Drawing attention to how biotech research is financed is not to suggest that researchers and geneticists are simply financial speculators in disguise. Undoubtedly, the majority are interested in a fascinating science and want to save lives, just as the majority of those working within health care services do. But hard commercial realities do not sit comfortably with researchers' belief that their work will have genuine medical benefits and reduce human suffering (Knowles 1999: 40).

Conclusion

The story of a poor young black tobacco farmer in the United States, Henrietta Lacks, epitomises the promises and pitfalls of bringing biotech futures into the present. In 1951, she developed a vicious type of cervical cancer. Before it advanced, a doctor took a tissue sample (without her knowledge or consent) and cultured it in a lab dish. Her cells doubled relentlessly every 24 hours, even though scientists had tried (and mostly failed) for years to grow human cells in culture. HeLa cells are now found in their trillions in virtually every biomedical lab in the world. An estimated 99 per cent of knowledge about human microbiology is believed to have been derived from them. They were involved in developing the polio vaccine, in vitro fertilisation, gene mapping, and drugs to treat AIDS. Researchers continue to use them in exploring how external agents cause DNA mutations and how the environment triggers genes in normal DNA to turn off and on.

Yet while biotech and pharmaceutical companies have profited from selling HeLa cells or the drugs made possible by them, Henrietta Lacks died at the age of 31, was buried in an unmarked grave, her husband and children were not told about her cells, and many of her descendants suffered ill-health from under-treated medical conditions because they had no health insurance (Skloot 2010).

Notes

1 See Hildyard (2008); Lohmann (2009); Lanchester (2010); Singh (2008, 2010).

2 Venture capital typically comes from institutional investors and high-net-worth individuals, and is pooled together by dedicated investment firms. A venture capital firm will spread its money around several biotech firms rather than putting all of it into one company.

3 An estimated 40,000 patents relating to some 2,000 human genes have been granted. Patents and intellectual property rights, more generally, are also key in financial accumulation (Sikka and Willmott 2010).

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