# BioFutures – where futurists thinking about biology meet biologists thinking about the future

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Doing Futures frequently involves the conceptualization and visualization of future worlds, tentatively feeling our way through the mights, maybes, coulds and shoulds of the “not-yet” – Ernst Bloch’s *noch nicht* (Garforth, this volume; Bloch, 2000). These scenarios, these visions, of other worlds may be broadly divided into utopias and dystopias, the preferred and unpreferred extremes of our spectrum of future possibilities. Of course, we more often find ourselves, in the fullness of time, in some intermediate condition, but the unfulfilled utopian and dystopian visions of past generations and soon-to-be unfulfilled ones of the present, serve as beacons illuminating our navigation into the inevitably somewhat different future. I begin with just one such brightly shining beacon, a dystopia from over two hundred years ago that still directly engages our attention today.

In 1798, Thomas Robert Malthus published *An Essay on the Principle of Population*. Malthus’s deeply dystopian vision of an overpopulated planet ravaged by famine, war and plague, was a major influence on Charles Darwin’s theory of natural selection and continues to inspire modern neo-Malthusians (e.g. Ehrlich, 2013). Recently, dystopian thought within biology has widened its focus from humans to the entire planet. For instance, Louis Leakey and Roger Lewin’s *The Sixth Extinction* (1996) provides some of the theoretical background to activist groups such as Extinction Rebellion, who may be broadly described as eco-dystopian. Juxtaposed to this dystopian strand in biology, a more optimistic outlook has been fostered by the discovery of antibiotics, the implementation of mass vaccination programmes, organ transplantation, *in vitro* fertilization, regenerative medicine and genetic modification, among other technologies. This viewpoint, of which a representative example may be found in Aubrey de Grey and Michael Rae’s *Ending Aging* (2007), can be broadly described as techno-utopian. Such biological techno-utopianism has been deeply influential on techno-utopian thought outside of biology, for instance Ray Kurzweil’s *The Singularity is Near* (2005), which envisages the integration of living things into, and their ultimate subsumption within, computer systems.

This chapter proposes that such Futures-oriented thought within biology and biological themes within Futures (of which more in a later section), may usefully be collated under the rubric of BioFutures – a retrospective hash-tagging of numerous contributions to the area, whether consciously futurological or not, from wherever they sit on the utopian-dystopian spectrum. BioFutures is a discipline that does not yet formally exist, but which I hope to show has existed *avant la lettre* since Thomas More’s original *Utopia* of 1516. My purpose in this chapter is to persuade biologists to do Futures, to persuade futurists to think about the biological implications of their future visions, and to bring both together under the BioFutures umbrella. The first step is to investigate just why Malthus’s dystopia was so influential.

## The Fevers of Evolution

In February 1858, naturalist Alfred Russel Wallace lay gravely ill with a fever on the island of Ternate in the Moluccas (now North Maluku Province, Indonesia). In the throes of his delirium, strange dreams began pulsing through his semi-consciousness, dreams of a dystopian world where all living things were engaged in a fight to the death over diminishing natural resources. As Wallace’s fever subsided and clarity returned to his mind, he began writing urgently. Wallace realised that the source of his nightmares had been the writings of Malthus, which predicted that humanity would eventually expand beyond the capacity of the planet to support it, triggering terrible famines, wars and pestilences (Malthus, 2004). A common enough nightmare, but Wallace’s delirium had also thrown up another idea. Supposing many species are in a state of permanent Malthusian crisis, with population sizes at the ceiling of what the natural environment permits - the “carrying capacity” as modern ecologists describe it – what would the consequences be? Suppose that one or two individuals were naturally equipped with some physical, constitutional or behavioural advantage that allowed them to survive where their fellow conspecifics died. And suppose that this advantage was heritable through the generations…. . Wallace pondered what to do with his manuscript, then decided that there was only one possible course of action – to send it to Charles Darwin (Wallace, 1905 pp. 361-363).

“On The Tendency of Varieties to Depart Indefinitely from the Original Type” (Wallace, 1858), more usually referred to as *The Ternate Essay* was read at a meeting of the Linnean Society in London on the 1st July 1858, along with a hurriedly prepared summary by Darwin of his own thoughts along the same lines. Darwin was unable to attend, having just lost his youngest son, one of six children that died in an outbreak of scarlet fever in the village of Downe in Sussex that summer. The theory of evolution by natural selection was conceived and born in the midst of terrible fevers.

Darwin was already well acquainted with the Malthus family, both intellectually, having read *An Essay on the Principle of Population*, “for amusement” he claimed, in October 1838 (Darwin and Huxley, 1974 p.71), and socially - Malthus’s daughter had been a bridesmaid at the wedding of Darwin’s cousin (Wilson, 2017 p.156). However, there is little indication that either Darwin or Wallace were much persuaded by Malthus’s argument concerning the *future*. The theory of natural selection was about how the natural world had evolved over *past* aeons of time. Darwin’s great work, appearing in the following year of 1859, was entitled *On the Origin of Species* (Darwin, 1964), not *On the Future of Species*. Malthus’s theory had become a powerful tool to understand the past of all species, but his dystopian vision of the future of humans was quietly brushed off by Victorian optimists.

To modern biologists, “nothing in biology makes sense except in the light of evolution” (Dobzhansky, 1973). Malthus is thus a pivotal figure in the creation of modern biology, but his dystopian vision sits quietly, even anonymously, at the heart of a theory he did not himself envisage. However, taken on his own terms, Malthus also represents the first example of thinking in a dystopian Futures vein written from a biological standpoint. Biologists since Malthus have occasionally also turned their attention to what their discipline can say about the future, and futurists have sometimes added a biological dimension to their predictions and scenarios (see section “I had a family….”). These activities are usually carried on independently with little interaction between the two perspectives. The construction of an interface between biologists thinking about the future and futurists thinking about biology is what I propose to name BioFutures, a discipline that can be retrospectively reconstructed from both strands of thought. This chapter both attempts this reconstruction and urges its use as a starting point for further work.

Although prediction of the future has been a perennial human interest, Futures has never been just about forecasting. Indeed, Futures is just as often a wrangling over the present – as much about what is desirable as it is about what is possible or likely (Amara, 1978). The utopias and dystopias of our dreams and nightmares are devices to shake us out of TINA (“there is no alternative”; see Garforth (this volume)) attitudes to the present, a process that Immanuel Wallerstein (1998) has termed “utopistics”. Modern readings of Malthus often emphasize just such controversialist elements in his work, pointing out that his ideas should be interpreted in the context of his long-running polemical interchange with William Godwin over state welfare policy (Malthus, 2004). Similarly, many of the BioFutures arguments I shall consider, come with prescriptive implications, whether explicit or more disguised.

## The Ghost of Malthus

Exactly 160 years after the publication of *On the Origin of Species* in London, the streets of that city, and to a lesser extent many others across the world, were filled with protestors calling for co-ordinated global action on climate change. Environmental protest is, of course, nothing new. Its intellectual roots can be traced back to Fairfield Osborn’s *Our Plundered Planet* (1948) and its leap into the public conscious to Rachael Carson’s *Silent Spring* (1965). However, what distinguishes the new generation of protestors is their emphasis on the likelihood of global catastrophe, including a mass extinction event that would wipe out the natural world as we know it. This idea has its origins in Louis Leakey and Roger Lewin’s *The Sixth Extinction* (1996) – although modern extinction activists are more likely to have read Elizabeth Kolbert’s identically titled work (2014). What Malthus predicted for humans is now predicted for all species according to modern eco-dystopians - a warming, polluted, deforested planet with greatly diminished carrying capacity. Although rarely explicitly mentioned in the climate activism debate, Malthus is back to haunt us.

But the biology that Darwin and Wallace created by co-opting Malthus has other descendants. Two centuries of scientific advances have engendered a spirit of immense optimism about the power of biotechnology to improve our future. The discovery of antibiotics, the implementation of mass vaccination programmes, organ transplantation, *in vitro* fertilization, hormonal contraception, regenerative medicine, genome projects, genetic modification and synthetic biology among other technologies have all made, or are widely predicted to make, massive changes to human life. Ecologists may see planetary degradation, but laboratory scientists more often see a glowing future. This tension between eco-dystopianism and techno-utopianism, both of which are often packaged with their own political agendas, is a central issue in BioFutures. The argument is not just about the biological future we might have, but the future we ought to have.

## The Singularity is (almost, maybe, or perhaps not) Near

Biologists have no monopoly on techno-utopias. Ray Kurzweil’s *The Singularity is Near* (2005) envisages a point, the singularity, where Moore’s Law – the exponential improvement in computer processing power – produces computers that can calculate anything, and therefore solve any problem. Furthermore, having calculated how the human brain and consciousness work, it will then be possible to devise a method of uploading our personal conscious selves onto computers, where we can live immortally *in silico* long after our corporeal bodies have withered and died. Frank Tipler sees such a singularity as the state of perfection that religions have dimly perceived over the millennia in the form of heaven (Tipler, 1995). In Tipler’s work, computer science and physics meet Teilhardian theology (Teilhard de Chardin, 1959) in techno-utopian apotheosis.

Kurzweil’s silicon-embodied human consciousness has its conceptual roots in transhumanism. Originally another facet of Teilhardian eschatology, transhumanism later took a more materialist form in the thought of Fereidoun M. Esfandiary – for the last years of his life known by his chosen transhuman moniker of FM-2030 - who predicted that by 2030 (his own centenary), biologists would know enough about the ageing process to design medical treatments to halt it. Since 2000, FM-2030 has been in a deep freeze at Alcor, the cryonics repository, his “deep nostalgia for the future” (Nichols, 2005) provoking him to take a long-odds bet on being resurrected to see it. Transhumanism rapidly entered the popular mainstream, appearing in various forms beginning with Martin Caidin’s *Cyborg* (1972) right up to Russell T. Davies’ near-future themed television drama series *Years and Years* (2019).

In the transhuman movement today, there are both cyborgisers who wish to replace the fragile flesh of biological components with longer lasting hardware, and those that see synthetic biology as the way forward, a transhumanism which grows replacement parts in the laboratory rather than manufactures them on the assembly line. But not all biotechno-utopians go as far as transhumanism - Aubrey de Grey and Michael Rae’s *Ending Aging* (2007) advocates a more conventionally pharmaceutical solution to human life extension. If the process of ageing can be understood at the molecular and cellular level, then it ought to be possible to design drugs that modify or preserve the functions of the relevant sub-cellular parts. De Grey believes that the first humans who will live forever, or at least for timespans far greater than our current upper limit of 120 years or so, are currently alive.

The plausibility of such techno-utopias depends on the validity of various assumptions they make about exactly how well we understand biology. Nobody doubts that we now understand far more than we did at the time of Darwin, or even at the turn of the present millennium, but, whether we know enough really to engineer life in the way that is proposed, is debatable. Kurzweil’s singularity, in particular, makes very large assumptions about both the validity of Moore’s Law and how close neuroscience is to understanding conscious awareness. Nevertheless, even if transhumanity and the singularity are still unachievable dreams, the cumulative impact of multiple technological advances on many fronts, which Damien Broderick and Colin Mason have described as “The Spike” is undeniable (Broderick, 1997; Mason, 2003). For techno-utopians in biology, the spike in computing and telecommunications technology that began in the mid-1990s after many decades in gestation is a sure sign of the coming spike in biotechnology. There is also no doubt that they regard this as a desirable future.

## “Might not we unleash horrors…. a biological Hiroshima?”

Those looking at biotechnology from the outside have often been less utopian. The protagonist of Mary Shelley’s *Frankenstein* (1818) gets into terrible trouble because he irresponsibly experiments, not on explosives, poisons or other weapons, but on life. Exactly 150 years after Shelley, the title of Gordon Rattray Taylor’s *The Biological Time Bomb* (1968) speaks for itself. The above quote is not from Taylor’s jeremiad, but from a work at the centre of the Futures canon, Alvin Toffler’s highly influential *Future Shock* (1970 p.177). Toffler’s short-term predictions in the bio-medical field for the 1970s were largely accurate, if unambitious – organ transplantation, *in vitro* fertilization, an increase in the proportion of dementia sufferers due to an ageing population and the biotechnology industry were all Toffler prophecies that did indeed come to pass. Toffler only overreached himself on the artificial uterus, which still has not been realised some half a century later. Amongst these, it was the biotech industry that worried Toffler most. His concerns continued in his sequel *The Third Wave* (1981 p.158). Again, BioFutures is not just about prediction of the form of future human life, but about influencing its governance.

Similar disquiet can be found in Anthony Giddens’ *Runaway World* (1999 pp. 32-33). Giddens offers a more explicit policy recipe than Toffler, leaning towards the “precautionary principle”, which dictates that the implementation of new technologies should only be permitted after extensive investigation into their likely, or perhaps unintended, consequences – taking Futures into the realms of regulatory and marketing approval. Giddens in particular discusses genetically modified organisms (GMOs) in this light, but ends by admitting that we may need to have GMOs simply to feed the growing population, a conclusion that Toffler had also slightly reluctantly reached in 1981. Nevertheless, these forebodings have continued to be voiced in more recent work by Francis Fukuyama (2002). On the other hand, one of the godfathers of modern environmental activism, Al Gore, in *The Future* (2013), synthesizes a viewpoint that is broadly techno-utopian while also eco-dystopian. For Gore, biotech is part of the solution to the climate crisis, not another crisis in its own right.

Toffler’s “biological Hiroshima” 1970 quote above was apparently paraphrased from a discussion with “many of the world’s leading scientists” (unnamed) and within a few years discomfort at the potential dangers of biotechnology culminated in a moratorium on genetic engineering research in the USA in 1974. The Asilomar Conference of the following year (Berg and Singer, 1995) formulated safety guidelines that continue to be the basis for academic and industrial biotech research around the world to this day, and from which regulatory frameworks such as the UK Genetically Modified Organisms (Contained Use) Regulations 2014 are descended. Debate about the safety of biotech is now virtually unknown within biology, but the heritage of techno-dystopianism can still be found in reference to “Franken-foods” in discussions of GMOs in the popular media. European Union Directive 2001/18/EC allowed regional or national EU governments to ban GMOs without the requirement to provide scientific evidence to the European Food Safety Authority (EFSA). Wales and Scotland are among the regions that have implemented 2001/18/EC. Beyond politics, modern biotechno-dystopianism refers back to its Shelleyian roots in H. K. Gruber’s opera *Frankenstein* (1977) which contains the aria “Frankenstein is dancing with the test-tube lady” (official English language translation, although “baby” might be more idiomatic than “lady” in this context). Biologists still have some convincing to do to bring large sections of the general public on board.

## “I had a family …. . it got to be a drag, I like it much better here”

Beyond, and prior to, these current debates, Futurists have often turned their attention, not so much like Malthus to the quantity of human procreation, but rather to the variety of its potential future forms. The above quote is from an interviewee in the film version (1972, section beginning 26:08) of Toffler’s *Future Shock*, part of which is devoted to what many at the time saw as the inevitable disappearance of the nuclear family and its replacement by more communal forms of living. A strong hint is given that polyandry and polygyny would be prominent components of this new lifestyle.

More radically, Shulamith Firestone’s *The Dialectic of Sex*, written in the same year as Toffler’s *Future Shock*, looks to a future where reproduction could somehow be de-biologised, echoing Toffler’s speculation about artificial uteri, thus liberating women not just from the social tyranny of family life, but from the biological tyranny of pregnancy and childbirth with all their concomitant dangers (Firestone, 1971 pp.222, 233, 263). Here we see a further use of Futures, not merely predictive, nor even simply normative, but positively performative. A future that is currently implausible is offered as a device to loosen the constraints of the collective imagination. Such performative Futures are common in literature. Mary Shelley offers *Frankenstein* as a “what if” scenario rather than providing scientific details, leaving her more literally minded modern film interpreters to compensate with added scenes involving lightning bolts. Firestone’s vision is prefigured in Aldous Huxley’s *Brave New World* (1932) where rows of artificial uteri gestate away in baby farms, and contraception is readily available to all women – who carry it in “Malthusian belts”, a nod by Huxley to the father of all bio-dystopias. The slightly less technologically advanced dystopia – One State - of Yevgeny Zamyatin’s *We* (1924) has children conceived by sexual appointments. The hero, I-330, finds himself in trouble with the authorities for flirting with D-503 rather than getting down to business. In One State, pregnancy and childbirth are natural, but all resulting children are turned over to the state for a communal education. Further back still, Thomas More’s original *Utopia* (1516) has a patrilocal family structure, with distribution of surplus children to childless families, thus maintaining a steady family average size. Utopia’s inhabitants risk penalties for “forbidden embraces before marriage”, but should this fail to control societal overpopulation, a colonial policy prevails, sending surpluses to begin new Utopias elsewhere.

The speculations of More, Zamyatin and Huxley are mostly with how future societies might police sexual activity and deal with any resulting children. Other authors have gone beyond this to grasp the potential evolutionary consequences of such controls. H. G. Wells, in *Anticipations* (1902) and *A Modern Utopia* (1903), advocated temporary marriages – although not quite so fleeting as those of Zamyatin – for which generous state subsidises would be available. Access to these arrangements, however, is positively means-tested so only those who have been economically successful may then reproduce. Fertility testing must also be carried out to ensure that the state’s aid is spent (re)-productively. Lurking behind this, of course, is the approaching shadow of the eugenics movement. It is very difficult in hindsight to see something that ended in the “Doctors’ Trial” at Nuremberg in 1947 as an exercise in utopianism, but there is no doubt that it began with such intent. Others needed no hindsight – as early as 1913, G. K. Chesterton was campaigning successfully against inclusion of eugenic clauses in the 1913 Mental Deficiency Act, publishing the pamphlet *Eugenics and Other Evils* (Chesterton, 1922). In the USA, Franz Boas was engaged in a similar campaign (Boas, 1916). This is a perilous subject for modern biologists to write about. While we may be convinced that modern biotechnology is a force for good, we have to acknowledge that, as biologists, our track record on eugenics is entirely to our shame. Being sure of our positive contribution as a discipline to the future becomes difficult and uncomfortable when we pause to remember that our very fallible predecessors were usually equally sure of theirs. Part of my intention in advocating the BioFutures approach is to help biologists see our current views, on what is possible/likely/desirable, in the context of the decisions our predecessors made when faced with their own choices.

After Darwin’s *Origin of Species*, the second most important book in evolutionary theory is R. A. Fisher’s 1930 *The Genetical Theory of Natural Selection* (Fisher, 1999). The first seven chapters are a *tour de force* of scientific brilliance and the remaining five a standard exposition of inter-war eugenics. This dichotomy means that Fisher needs to be taught to modern undergraduates without actually encouraging them to read him. Fisher, a eugenic utopian, has therefore come to sit anonymously at the heart of modern evolutionary theory in the same way that Malthus, a population dystopian, sits anonymously at the heart of its nineteenth-century equivalent. Equally, advocating G. K. Chesterton as a shining opponent of eugenics becomes a little problematic once it is realised that his definition of the practice was wide enough to include birth control, and that one of the main targets of his polemics over the years was Marie Stopes. And again, those who wish to highlight Stopes’ valiant fight for women’s reproductive rights cannot deny that she was, like Fisher, Wells and many others, a eugenicist.

Even to claim, as I did in a previous paragraph, that Nuremberg finally disposed of eugenics, is wishful thinking. There is no doubt that the full realization of the horrors that its practice implied were laid so bare that most remaining advocates turned away in disgust. Nevertheless, compulsory sterilization of those deemed unfit to breed continued in Sweden until 1976, while voluntary sterilization of those deemed fit was restricted. The Canadian provinces of Alberta and British Columbia, among several other jurisdictions around the world, also pursued a compulsory sterilization policy into the 1970s. Lee Kuan Yew’s Singapore introduced the Graduate Mothers Scheme in 1984, encouraging Wellsian marriages of economically successful youth, although perhaps without Wells’ enthusiasm for their temporariness. Even within Futures circles, similar ideas occasionally resurfaced. Writing in Jungk and Galtung’s compendium *Mankind 2000*, Werner Hirsch proposed increasing life expectancy and intelligence by administering growth hormones to the foetus during the period of neuronal development (fortunately not seriously contemplated either then or now), and the same Wellsian eugenic pairing of high IQ individuals that Lee Kuan Yew later advocated in Singapore (Hirsch, 1969).

## The inescapability of our biological being-in-the-world

Biology is the most morally and socially corrosive of the sciences. Astronomers may gaze at the stars, but we biologists are down in the mud with the cannibal snails and the parasitic wasps. It is no accident that Richard Dawkins, the main modern populariser of atheism (Dawkins, 2007), is an evolutionary biologist. In the words of the wife of one nineteenth-century bishop “I pray that Mr Darwin is wrong, but if he is right, I pray that it may not become widely known”[[1]](#footnote-1). Ironically, Biblical metaphors of our creation from, and dissolution into, dust seem to capture the biological world view perfectly. Human beings are not separate from the natural world around us, but merely one manifestation of it. This inevitably brings biology into potential conflict with other disciplines, especially sociology. Biology may appear to be making a perpetual “appeal to nature” argument, imposing a normativity on human existence, insisting that we are prisoners of one or other aspect of our genetic heritage. Exactly which aspects depends on one’s disciplinary stance within biology. Evolutionary psychologists (EP), for instance, postulate an Environment of Evolutionary Adaptation (EEA) generally taken to be the central/southern African savannah in the period 350,000 to 75,000 years before the present (exact boundaries varying according to author). It was in that environment, claim EP practitioners, that modern humans and their immediate ancestors underwent natural selective processes that brought them to a state of almost perfect adaptation. Our current morphology, physical abilities, psychological dispositions, our social organization and even our politics (Rubin, 2002) must be seen against that background. We do not have a “caveman” mentality (they came later, in Ice Age Europe) but a more “tribal long-range stamina hunting” mentality. We may look rather like our ape ancestors, but evolution in the EEA has made us more like a voracious pack of bipedal hyaenas. There is little room here for any belief that humans can be whatever we wish, that human society can be what we want it to be, if only we have the will. Firestone’s biological tyranny seems to be extendible beyond reproduction, to all of life.

On the other hand, the appeal to nature argument is simply stood on its head by other biologists. We may know our nature and we may not like it – so let’s set about working on how we can transcend it. This is part of the motivation for both mainstream biotechnology and its speculative transhumanist Futures. Attempts to create utopias of perfect justice, peace and equality, from Robert Owen to the 1960s commune movement, may have foundered because their creators did not know, or had forgotten, that the material with which they were working – genus *Homo*, species *sapiens*, sub-species *sapiens* – is tied to the rest of the natural world through four billion years of evolutionary adaptation, and has been honed in an EEA from which we need to de-adapt now we are no longer in it. Perhaps we *are* prisoners of our biology, but the first step in escaping from any prison is to know its layout, and the routine by which it operates. Only then can planning begin.

## The future of BioFutures

In the preceding paragraphs, I have retrospectively constructed a discipline of BioFutures co-opting More, Malthus, Shelley, Wells, Chesterton, Fisher, Huxley, Firestone and Toffler together with contemporary thinkers such as Fukuyama, Giddens, Kurzweil, Leakey, de Grey and Gore. Only from Toffler onwards would the label of Futures be recognised, and only Fisher, Leakey and de Grey can be considered as primarily biologists. Even Malthus, whose work was so important to biology, regarded himself as an economist. Nevertheless, all have taken intense interest in what the future holds for us as biological beings, as living, eating, breathing, breeding, chattering, fighting and occasionally thinking animals, and in the power our increasing technological prowess gives us over that future. BioFutures has been alternately, or concurrently, utopian and dystopian; it has been predictive, speculative, normative and performative. Firestone, Kurzweil and de Grey have shocked readers with their insistence on counter-intuitive future possibilities; Fukuyama, Giddens and Leakey have issued dire warnings about human responsibility; Shelley, Wells and Huxley created classic fictions around BioFutures issues with which we are still grappling today. Biological themes run through Futures from More to Gore, and conversely today, in an age dominated by visions of eco-dystopias and techno-utopias, Futures has become impossible for biologists to ignore.

Futures, as has been stated, is concerned with what is possible, probable or desirable. Biologists have rather a lot to say about all three. Evolutionary psychologists of the EEA school place great limits on positive possibilities; ecologists of the Malthusian tradition fear the negative possibilities; synthetic biologists push the implausible towards the possible and onward to the probable; transhumanists propose to solve the possibilities issue by ditching biology entirely. However, despite this explosion of intellectual activity, few of these conversations occur within earshot of the others. BioFutures seeks to create a disciplinary tent within which this can happen, and to show that this space has, since the time of Thomas More, always been inhabited by the most interesting interlocutors.

## One final BioFuture: The next variety will be departing shortly

It is the year 802,701. A square-jawed late-Victorian scientist arrives in the Garden of Eden in a time machine resembling a steampunk sports car. He is the actor Rod Taylor, in George Pal’s 1960 version of H. G. Wells’ *The Time Machine* (1895). The apparent paradise turns out, to his disappointment, to be nothing more than an elaborate agribusiness, where the gentle but clueless Eloi, co-incidentally (or not?) in the film portrayed as universally blond and Nordic enough to satisfy any eugenicist, are farmed as a protein supply by the hideous subterranean Morlocks. The twist is that both Eloi and Morlocks are our descendants. Humanity has not gone extinct, as Malthus and modern climate activists fear, but has speciated. *Homo sapiens* has given way to *Homo eloi* and *Homo morlockensis*. In the long run, these are the only two BioFutures, extinction or speciation, oblivion or reincarnation, transformed by natural selection into something rather different.

Although the film does not venture beyond the 803rd millennium, in the novel the time traveller turns the dial several million years forward, to a landscape filled with creatures resembling crabs and butterflies. As in Wallace’s fevered dream on Ternate, “Varieties . . Depart Indefinitely from the Original Type”. Our BioFuture has become their distant evolutionary past.

## References

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Amara, R. (1978) Probing the Future. In: Fowles, J. (ed.) *Handbook of Futures Research.* Westport CT. : Greenwood Press.

Berg, P. & Singer, M. F. (1995) The recombinant DNA controversy: Twenty years later. *Proc. Natl. Acad. Sci. USA,* 92(September)**,** 9011-9013.

Bloch, E. (2000) *The Spirit of Utopia.* Stanford, Calif.: Stanford University Press.

Boas, F. (1916) *Eugenics* [Online]. Wikisource. Available at: <https://en.wikisource.org/wiki/Eugenics> [Accessed 3rd December 2019].

Broderick, D. (1997) *The Spike. How Our Lives Are Being Transformed By Rapidly Advancing Technologies.* New York: Tor Books.

Carson, R. (1965) *Silent Spring.* Harmondsworth: Penguin Books.

Chesterton, G. K. (1922) *Eugenics and other Evils* [Online]. Wikisource. Available at: <https://en.wikisource.org/wiki/Eugenics_and_other_Evils> [Accessed 3rd December 2019].

Darwin, C. (1964) *On the Origin of Species.* Facsimile of 1st ed. ed. Cambridge, MA: Harvard University Press.

Darwin, C. & Huxley, T. H. (1974) *Autobiographies.* New York: Oxford University Press.

Dawkins, R. (2007) *The God Delusion.* London: Black Swan.

De Grey, A. & Rae, M. (2007) *Ending Aging: The Rejuvenation Breakthroughs that Could Reverse Human Aging in Our Lifetime.* New York: St. Martin's Press.

Dobzhansky, T. (1973) Nothing in Biology Makes Sense except in the Light of Evolution. *The American Biology Teacher,* 35(Mar 1973)**,** 125-129.

Ehrlich, P. (2013) The Population Bomb. In: Robin, L., Sorlin, S. & Warde, P. (eds.) *The Future of Nature. Documents of Global Change.* New Haven: Yale University Press.

Firestone, S. (1971) *The Dialectic of Sex. The Case for Feminist Revolution.* London: Jonathan Cape.

Fisher, R. A. (1999) *The Genetical Theory of Natural Selection. A Complete Variorum Edition.* Oxford: Oxford University Press.

Fukuyama, F. (2002) *Our Posthuman Future. Consequences of the Biotechnology Revolution.* New York: Farra, Straus and Giroux.

Garforth, L. (this volume) What can we do with utopia? Futurity, realism and the social.

Giddens, A. (1999) *Runaway World. How Globalisation is Reshaping our Lives.* London: Profile Books.

Gore, A. (2013) *The Future.* New York: WH Allen.

Grasshoff, A. (1972) *Future Shock* [Online]. McGraw Hill Films, via YouTube (Jamie Clay). Available at: <https://www.youtube.com/watch?v=fkUwXenBokU> [Accessed 3rd December 2019].

Gruber, H. (1977) *Frankenstein. A pan-demonium for baritone chansonnier and orchestra after children's rhymes* [Online]. Boosey & Hawkes. Available at: <https://www.boosey.com/audiovisual/sample_detail.cshtml?sampleid=24> [Accessed 3rd December 2019].

Hirsch, W. Z. (1969) Education and the Future. In: Jungk, R. & Galtung, J. (eds.) *Mankind 2000.* Oslo, London: Universitetsforlaget; Allen & Unwin.

Kolbert, E. (2014) *The Sixth Extinction. An Unnatural History.* New York: Henry Holt & Co.

Kurzweil, R. (2005) *The Singularity is Near. When Humans Transcend Biology.* London: Gerald Duckworth & Co.

Leakey, R. & Lewin, R. (1996) *The Sixth Extinction. Biodiversity and its Survival.* paperback ed. London: Phoenix.

Malthus, T. R. (2004) *An Essay on the Principle of Population.* 2nd ed. New York: W.W. Norton & Co.

Mason, C. (2003) *The 2030 Spike. Countdown to Global Catastrophe.* London: Earthscan Publications.

More, T. (1516) *Utopia* [Online]. Project Gutenberg. Available at: <https://www.gutenberg.org/files/2130/2130-h/2130-h.htm> [Accessed 3rd December 2019].

Nichols, J. (2005) *The Futurist: FM-2030—F.M. Esfandiary* [Online]. Greenwich Village Gazette. Available at: [https://web.archive.org/web/20110714215926/http://www.nycny.com/columns/nichols/nichols09-15-00.html](https://web.archive.org/web/20110714215926/http%3A//www.nycny.com/columns/nichols/nichols09-15-00.html) [Accessed 3rd December 2019].

Osborn, H. F. (1948) *Our Plundered Planet.* 1st ed.: Faber and Faber.

Rubin, P. H. (2002) *Darwinian Politics. The Evolutionary Origin of Freedom.* New Brunswick: Rutgers University Press.

Taylor, G. R. (1968) *The Biological Time Bomb.* London: Thamas & Hudson.

Teilhard De Chardin, P. (1959) *The Phenomenon of Man.* London: Collins.

Tipler, F. J. (1995) *The Physics of Immortality. Modern Cosmology, God and the Resurrection of the Dead.* New York: Anchor Books.

Toffler, A. (1970) *Future Shock.* London: The Bodley Head.

Toffler, A. (1981) *The Third Wave.* paperback ed. London: Pan Books.

Wallace, A. R. (1858) *On The Tendency of Varieties to Depart Indefinitely from the Original Type* [Online]. Available at: <http://rpdata.caltech.edu/courses/Evolution_GIST_2013/files_2013/articles/Ternate_1858_Wallace.pdf> [Accessed 3rd December 2019].

Wallace, A. R. (1905) *My Life. A Record of Events and Opinions.* London: Chapman & Hall.

Wallerstein, I. (1998) *Utopistics. Or, Historical Choices of the 21st Century.* New York The New Press.

Wilson, A. N. (2017) *Charles Darwin. Victorian Mythmaker.* London: John Murray.

1. The quote is probably apocryphal, but has been circulating since the 1890s. [↑](#footnote-ref-1)