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RESEARCH ARTICLE

Futurism, Futurology, Future Shock, Climate Change: Visions of the Future from 1909 to the Present

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Abstract

This essay charts a brief intellectual history of the futures—both utopian and dystopian—conceived in the twentieth and twenty-first centuries. It traces perspectives on the future since 1909, when the term ‘futurism’ was coined in the publication of the ‘The Founding and Manifesto of Futurism.’ The essay maps changes in the vision of the future, taking a chronological approach in noting developments in the discourse on the future. A prominent theme in pronouncements on the future is technological progress, first in relation to industrial technology, later in the context of post-industrial or information technology. A turning-point in this discourse can be isolated in the early 1970s, when ideas of technological progress begin to be challenged in the public sphere; from that date, environmental concern becomes increasingly significant in discussions of the future.

Keywords

Future, futurism, futurology, climate change, environment.

1963/1984/2007/2018

In July and August 1963, a two-part article on the future was published in *Playboy* magazine. The article documented the proceedings of a roundtable discussion featuring twelve of the

eminent science-fiction authors of the day, including Isaac Asimov, Arthur C. Clarke, Robert Heinlein and Ray Bradbury. The authors, considered experts on the future, were asked to predict what life would be like from 1984 to 2000. This remarkable text, recording the projections and predictions of famous science-fiction authors, is a document of the futurism of 1963. Apart from their celebrated ability to imagine the future, several of these writers could claim expert status in technical and scientific fields: Asimov in astronomy and chemistry; Clark in space and sea exploration; Heinlein in space travel and plastics. These authors, in other words, were superbly qualified as futurists.

The roundtable conversation was a Space Age projection of a technologically advanced future society. The science fiction experts made the following confident predictions concerning the period 1984–2000: space stations on the moon in the 1970s; the conquest of human diseases; the disappearance of dull jobs; three months' annual paid vacation by 2000; the elimination of the need for sleep; and a glorious age of 'social emancipation and scientific revolution' (Godfrey 2007: 21). Their vision of the future, as notated in the *Playboy* article, was optimistic, grandiose, and wildly inaccurate.

But of course, the writers' earnest predictions can only be deemed wildly inaccurate from a perspective beyond their time-scale: beyond 1984, beyond 2000. In 2007, the Irish artist Gerard Byrne exhibited a video installation work at the Venice Biennale entitled *1984 and Beyond*. This work, comprising three video channels of 60 minutes' total duration, and 20 black and white photographs, used the text of the *Playboy* article to recreate on video the 1963 roundtable discussion. Byrne's intriguing artwork plays with temporal disjunction: the writers in 1963 were asked to project to a time beyond 1984; yet we, as viewers of this artwork in 2007, or 2018, are situated in time well beyond that projection-point. We look back, with amusement and perhaps wonder, to this prediction of the future from 1963. Their future, imagined with supreme optimism and unmitigated faith in technological progress, has long been incorporated into our past. The future conceived in 1963 is a Space Age construction; we file it within a history of the future, or of futures that have been imagined, predicted or projected; futures that were never realised.

Byrne's artful recreation of the 1963 roundtable carefully situates the writers in their historical context. The actors playing the venerated science fiction authors are dressed in the fashion of 1963: turtlenecks and fitted cardigans, narrow ties and thin suits. They smoke pipes and cigarettes constantly; they stroll and pontificate against a high Modernist architectural setting, the Sonsbeek Pavilion in the Netherlands, originally built in 1955. The effect of the re-enactment is to seal off the futurist vision of 1963; even the surrounding buildings suggests the failed utopian vision of internationalist Modernist architecture. The authors' pompous pronouncements on space travel and a world of leisure are rendered ridiculous by their failure to become reality. But the overall effect of this re-staging of the beliefs of 1963 is not one of ridicule. It is rather a sense of distance: that the optimistic, utopian attitudes of this period are hopelessly lost. These attitudes are foreign to us, as is the undiluted faith in the future demonstrated by these zealous 'futurists' of 1963. The science fiction writers conceived a utopian future; but for us looking back at their beliefs and hopes, they represent, as Lytle Shaw has observed, a 'utopian past' (2007: 121).

This essay proposes a brief intellectual history of the futures—both utopian and dystopian—conceived in the twentieth and twenty-first centuries. It traces perspectives on the future since 1909, when the term 'futurism' was coined in the publication of the 'The Founding and Manifesto of Futurism.' The essay maps changes in the vision of the future, taking a chronological approach in noting developments in the discourse on the future. Components

of this discourse, over a span of 108 years, include the published pronouncements of self-proclaimed futurists and futurologists. Other contributors to the discourse on the future include industrialists, engineers, scientists, economists, architects, artists, writers, film-makers, entrepreneurs, technicians, activists and environmentalists. The rhetoric of advertising and public relations is also significant in promoting visions of the future, as found in the 'Futurama' exhibits—sponsored by energy corporations—at World's Fairs in the twentieth century.

A prominent theme in pronouncements on the future is technological progress, first in relation to industrial technology, later in the context of post-industrial or information technology. A turning-point in this discourse can be isolated in the early 1970s, when ideas of technological progress begin to be challenged in the public sphere; from that date, environmental concern becomes increasingly significant in discussions of the future. The discourse on global warming and climate change becomes highly influential when the future of the environment—and of the planet—is considered in the twenty-first century.

Theorising the future

There is a substantial cross-disciplinary scholarship on future studies, drawing on sociology, anthropology, media and cultural studies, literary studies, studies of technology and society, and other disciplines. Futurologists have made predictions in recent years based on economics, demographics, political theory and developments in information technology. The future studies scholarship in general adopts a critical sociological perspective, describing the socio-economic and cultural determinants that shape visions of the future. As the anthropologist Marc Augé writes in his book *The Future*: 'The future, even when it concerns the individual, always has a social dimension: it depends on others' (Augé 2014: 2). The anthropologist Arjun Appadurai has considered the theoretical approach to 'the future as cultural fact,' taking into account the human preoccupations 'imagination, anticipation, and aspiration' (2013: 286). Augé's critical anthropology focuses on the political and economic forces shaping social development: 'change is fundamentally economic and driven by technological development' (2013: 47). Globalisation, growing social inequality and environmental damage resulting from 'the imperatives of development and growth' (2013: 51) are for Augé the factors determining the near future: 'we can already see the outlines of a transnational planetary oligarchy and an unequal planetary society' (2013: 52).

Augé's vision of the future is a general one, proceeding from a projection of 'globalization and the extension of the capitalist market to the whole planet' (2013: 60). The economist Jacques Attali offers a far more detailed prediction of world societies up to the year 2100 in *A Brief History of the Future* (2009). Attali's vision of the future has an economic base similar to Augé's: 'I predict that in the course of the twenty-first century, market forces will take the planet in hand,' leading to the evolution of 'super-empire' (2009: xiii). Attali makes the general observations that 'every prediction is first and foremost a meditation on the present,' and that a work of prediction is 'also a political work' (2009: xvii). More specifically, Attali foresees a political and economic conflict between 'super-empire' and 'hyper-democracy,' a political system in which the market and globalisation are contained for the benefit of world citizens. His political hope is that the 'common good' and 'collective intelligence' of hyper-democracy will prevail by 2100 (2009: 271).

Other recent predictions of the future focus on the social impact of advanced information technology in the near future. In *Homo Deus: A Brief History of Tomorrow* (2017), Yuval Noah Harari concludes his history of *Homo sapiens* with a prediction of the species' displacement by

one of its own inventions: 'dataism' or the 'data religion.' Harari defines dataism as the view that 'the universe consists of data flows,' with the corollary that 'the value of any phenomenon or entity is determined by its contribution to data processing' (Harari 2017: 430). Harari projects a future of data controlled by algorithms and artificial intelligence, finding the possibility that 'dataism threatens to do to *Homo sapiens* what *Homo sapiens* has done to all other animals' (2017: 460).

A number of scholarly publications have charted a 'history of the future,' tracing visions of the future in the nineteenth and twentieth centuries, particularly in the domains of science fiction and architecture. These texts include Donna Goodman's *A History of the Future* (2008), Richard Barbrook's *Imaginary Futures* (2007), Oona Strathern's *A Brief History of the Future* (2007) and the collection of essays *Histories of the Future* edited by Daniel Rosenberg and Susan Harding (2005). For these historical studies, 'looking backwards is the precondition for moving forwards,' as Barbrook states in *Imaginary Futures* (2007: 11).

Previous imaginings of the future are located in their social, economic and political contexts. Barbrook, for example, focuses on the grand showcases of new technologies as emblems of the future, beginning with the 'Great Exhibition of the Works of Industry of All Nations' in London in 1851, and continuing in the 'Futurama' exhibits at the New York World's Fairs of 1939 and 1964. In 1851, a futuristic building of iron and glass known as the Crystal Palace was built to house the new industrial products of the British Empire. The various new machines produced by industrial capitalism were the stars of this 'great exhibition,' which offered a 'public celebration of economic progress' (Barbrook 2007: 26) and a vision of a new prosperous social order. Barbrook traces the growth of an international series of Expositions and World's Fairs modelled on the 1851 Crystal Palace exhibition. The Paris Universal Exposition in 1900 attracted nearly 48 million spectators: world expositions became international travel destinations and even 'appeared to be prefiguring world peace' (2007: 26).

If that hope did not survive long into the twentieth century, the New York World's Fair later became a showcase for optimistic visions of the future founded on technological progress. Corporations sponsored exhibits displaying the wonders of the near future: 'Building a World of Tomorrow' was the theme of the 1939 World's Fair. General Motors' Futurama exhibit, depicting a high-tech USA twenty years into the future, was enormously popular with spectators. Barbrook demonstrates the economic and political base of future imaginings in his study of these exhibits. The World's Fair, he observes, 'expressed the productive potential of American industry' (2007: 28), as did its vision of the future.

The following essay takes a chronological approach, describing visions of the future made public since 1909. These imaginings of the future have economic, political and technological bases. For the first six decades of the twentieth century, optimistic visions of the future—such as those of the science fiction authors in 1963—emanated from a base of industrial capitalism, reflecting a faith in technological progress. However, a significant change to imaginings of the future occurred in the 1970s. Environmental concerns punctured faith in technological progress, while industrial technology was targeted for the environmental damage it had caused around the world. New political imperatives—conservation, environmentalism, sustainability, the questioning of economic growth—influenced visions of the future. From the 1970s on, these imaginings were more likely to be dystopian than utopian, expressing anxiety for the future of the environment and for humanity.

1909: The caffeine of Europe

F. T. Marinetti invented 'futurism' on February 20, 1909. On this date, Marinetti—poet, provocateur, and the self-proclaimed 'caffeine of Europe'—published 'The Founding and Manifesto of Futurism' on the front page of the Paris newspaper *Le Figaro*. 'We declare that the world's splendour has been enriched by a new beauty: the beauty of speed,' proclaimed the manifesto, identifying the motor car as the symbol of this new order. Marinetti willed the future into being—and the future was built with industrial technology. He sang the love of racing car danger, of 'broad-chested locomotives,' electric light, factories and the tumult of cities. (Marinetti 1961: 124)

Previous writers had predicted the future—Jules Verne, HG Wells, Edward Bellamy in *Looking Back*, published in 1888 and set in 2000—but these were science fiction authors. Political theorists had peered into the future with hope of new political orders. But Marinetti invented the idea of futurism: a world-view perpetually geared to the glories of things yet to come. He inscribed the future into the core of a new art movement, which proposed a new way of life. This was the avant-garde: dragging the rest of society onwards into the future. Marinetti's new movement gave voice to a love of machines, youth and technological speed—and to a love of the future.

Based in Milan, Marinetti and his fellow Futurists—artists, composers, architects, performers—were inspired by the newly industrialised northern Italian cities, which promised liberation from the dreary agrarian past. Futurism was proposed as a total art form, incorporating all available means - including film - and re-invigorating old forms, as Marinetti's typographically radical 'words-in-freedom' revolutionised the printed word. There was Futurist music (The Art of Noises), Futurist clothing, Futurist sleeping (briefly, standing up) and Futurist food: the Futurist cookbook rejected pasta as too slow and heavy a food for Futurists.

Marinetti's face was turned only towards the future in his reverence for Progress, which 'is always right, even when it is wrong, because it is movement, life, struggle, hope' (Marinetti 1972: 82). This orientation to the future, this love of Progress, was distinctively Modern, unknown in the ancient world. Only in the Enlightenment of eighteenth century Europe did the idea of Progress gain currency (Bury 1955). Reason would drive a continual social progress until the perfect society was achieved; in this way the present could be considered superior to the past, and the future would be better than the present: the definition of progress.

The Industrial Revolution of the nineteenth century transformed Progress into technological progress: great railway stations became cathedrals of progress, as technological innovation raised living standards in the 'age of improvement'. This was the version of progress—built on the advances of technology—inherited by the futurist Marinetti in the early twentieth century. He had no doubt that industrial machines were forging a triumphant future: 'Progress is always right.' Coupled with this utopian zeal for the technological future was a contempt for the past: the 'useless administration of the past' must be let go, Marinetti cried, if Futurists were to hymn the beauty of mechanical speed (Marinetti 1961: 125).

Marinetti not only repudiated tradition: he ridiculed it, insulted it, slapped it in the face. He challenged it to a duel and then overwhelmed it with modern military machines. In the founding manifesto, Marinetti declared hostilities against: museums, which cover Italy 'like so many cemeteries'; libraries—'set fire to their shelves, good incendiaries!'; academies; and even second-hand markets. The disdain for all 'passéists' extended to any individual cursed with middle age. This included Futurists, whose time, Marinetti reckoned, is up at forty. Then 'let

other Futurists, younger and more valiant, throw us into the basket like useless manuscripts!’ (1961: 125) The Futurists’ embrace of youth, speed and novelty pre-dated the ‘Hope I Die Before I Get Old’ youth culture of the 1960s by almost six decades. There was no place in the future for the old, the weary, the traditional—or anything associated with the dead hand of the past.

1913: Assembly line to the future

The American industrialist Henry Ford introduced moving assembly belts into his automobile manufacturing plants in 1913. This innovation yielded a massive increase in production of the Model T Ford, produced at affordable prices. By 1918, half of all cars in the USA were Model Ts, and Henry Ford was one of the wealthiest and most famous men in the world.

The Ford factory was a model for the new industrial process: efficient, mechanised, the paragon of time-and-motion control of labour. It was the realisation of Frederick Taylor’s vision, published in his book *Principles of Scientific Management* in 1911. Each worker performs a single task, timed to optimum efficiency, and repeated with machine-like monotony. Every individual worker is in fact a small cog in a gigantic industrial mechanism. This new form of the workplace was later satirised by Charlie Chaplin in his film *Modern Times* of 1936: the dehumanising effects of the factory-machine are shown in the hapless worker unable to switch off his mechanical task. But for Taylor, and Ford, and the other industrialists who pursued the goal of ‘scientific management’ of labour, this was the way of the future.

The assembly line was rationalised movement; it operated a strict control of effort in manufacturing the motor cars so revered by Marinetti and his Futurists. The industrialist Ford shared the Futurists’ zeal for technological progress, an orientation to the mechanised future. He also professed a complete disdain for history, which he dismissed as ‘more or less bunk.’ Why look back when you can look forward with optimism? ‘We don’t want tradition,’ Ford said in 1916. ‘We want to live in the present, and the only history that is worth a tinker’s dam is the history we make today’ (Ford 1916: xxv)

1919: Engineers know best

The word ‘technocracy’—the management of society by technical experts – was introduced by the American engineer William Henry Smyth in 1919. Smyth’s article “‘Technocracy’: Ways and Means to Gain Industrial Democracy’ saw the future of democracy as ‘the rule of the people made effective through the agency of their servants, the scientists and engineers’ (1919: 385). These were the technical experts who best knew the potential of technological systems to solve social ills.

The Technocracy Movement, founded by Howard Scott in 1932, went further in proposing government by technical decision-making. Technicians know better than politicians how to benefit society; the experts who run factories and machine systems should be trusted to organise the economy along mechanical lines. The Technocracy Movement even proposed energy as the new metric of value: money should be replaced by energy certificates measured in joules. If the politicians would only get out of the way, the technocrats could improve society—by making it run like an enormous benevolent machine.

1924: Tomorrow is better than today

In 1924, 'planned obsolescence' was introduced as a strategy by the Head of General Motors, Alfred Sloan. The idea was to make changes every year to the cars produced by General Motors, so that car owners could be convinced to buy the new improved model. Advertising pushed the imperative to upgrade as often as possible: why be stuck with last year's model, when this year's is so much better? And next year's model will be better still!

Sloan called this production strategy 'dynamic obsolescence,' but critics preferred 'planned obsolescence.' This term incorporated the planning behind a vision of constant upgrading and purchasing of the new. The current model is only new for a short period of time; before long it becomes old, inferior, and in need of replacement. The tactic of planned obsolescence was copied by manufacturers of commodities everywhere. Henry Ford resisted the idea, seeing no need to tinker with his beloved Model T; General Motors surpassed Ford in car sales in the US in 1931.

1930: Flash forward

Clarence Birdseye introduced the flash freezing of food in 1930. The Birdseye company used new freezing technology to sell frozen vegetables, fruit and meats. Freezing food makes all foods available at all times: no longer are we dependent on seasonal produce. This technological innovation was seen as another means of improving on nature, which stubbornly follows a seasonal cycle. Now summer fruits could be thawed out in winter: the consumer does not need to wait. Frozen food reached its peak in the 1950s with the frozen TV dinner. This 'complete meal' was designed to be heated up and eaten in front of the TV which, no doubt, screened ads on the modern marvels of the age such as plastics, synthetics and frozen foods.

1932: Cathedrals of the future

The 'International Style' was the name given to Modernist architecture in 1932 by Philip Johnson and Henry-Russell Hitchcock. Their exhibition *Modern Architecture: International Exhibition* celebrated the distinctive style of Modernist design and architecture as it emerged in Europe and spread around the world. The European master architects—Walter Gropius (director of the Bauhaus design school), Le Corbusier, Mies van der Rohe—were gurus of minimal, pure, rationalised design style. Embellishment and decoration were banished, as were any traces of pre-Modernist style. A house is 'a machine for living in,' Le Corbusier declared in *Towards a New Architecture*, originally published in 1923 (7).

There was a utopian aspect to the Modernist blueprint for architecture and urban design: Gropius called the Bauhaus 'a cathedral of the future' (Jencks 1989: 25). The purity of design was thought to have a spiritual dimension, which would uplift all those who experienced it. Social problems would be eradicated in the near future by the sheer presence of Modernist urban development. Slums would be replaced by Modernist design on a grand scale: high-rise buildings and vast housing projects full of uplifted inhabitants. In the gospel according to Mies and Le Corbusier, the future would be pure, sleek, and free of the urban decay of the past.

1938: Caffeine of the New World

Nescafé launched its instant coffee, based on an advanced refining process, in 1938. The benefits of this new form of coffee were sold by advertising: convenience and speed of preparation. It was the modern version of a traditional drink; in the succeeding years, other

instant foods were successfully marketed, including instant gravy, instant mash potato, and whole pre-prepared meals. The convenience of these new foods was the key to their market success: they were quicker, easier, an improvement on the old ways. But surely even Marinetti, the self-confessed caffeine of Europe, must have had his doubts about this manifestation of technological progress?

1939: Futurama

The World's Fair of 1939, held in New York, followed earlier World's Fairs in showcasing technical innovations and gadgets. But the 1939 event offered to take visitors into the future. The theme was 'The World of Tomorrow'; corporate-sponsored pavilions showed off the homes and cities of the near-future; and visitors were given badges that proudly claimed 'I have seen the future' (Turney 2010: 65). The central exhibit was 'Futurama,' sponsored by General Motors. Futurama was a glimpse of tomorrow: super-cities linked by huge seven-lane highways. In the vision projected by General Motors, technology is good, highways are good, energy is good, progress is good, and the future is a very happy place indeed.

1943: Futurology

In 1943, a German social scientist named Ossip Flechteim coined the term 'futurology.' Flechteim proposed a new science of probability, drawing on scientific scholarship to make informed predictions of the future. Futurology was meant to be systematic and scientific in its workings, enabling educated forecasts in a range of possible directions. In his 1945 article 'Teaching the Future,' Flechteim recommended the study of the future as an academic discipline. This recommendation was not realised until 1966, when the first university course solely devoted to the future was founded by Alvin Toffler. 'Futurologist' was increasingly used with 'futurist' to mean any scientist, social scientist or technical expert qualified to predict aspects of the future.

1945: A MAD future

A global policy 'think-tank' was established in 1945, along the lines laid down by Flechteim's new social science of futurology. The RAND corporation was born at the end of World War II, initially formed by Douglas Aircraft to advise the US military on matters of policy and long-range planning. RAND would provide research, analysis and projections on all things military and geo-political. In 1948, it was decided that RAND should become independent of Douglas; henceforth it was funded by the US government and various corporations.

RAND became the planner and adviser to the US military through the Cold War period. RAND offered advice on the Vietnam conflict, on the space race with the USSR, and—most famously—on the doctrine of nuclear deterrence. RAND's vision of the future during the Cold War was based on the concept of 'mutually assured destruction' (MAD), which would ensure a stand-off between the nuclear-armed superpowers. At times RAND went further: in 1960 its chief strategist Herman Kahn proposed the idea of a 'winnable' nuclear war. Kahn's reward for this vision was to serve as one of the models for Dr Strangelove, the deranged military strategist in Stanley Kubrick's satirical film of 1964.

1955: Assembly line food

Businessman Ray Kroc opened his first franchised McDonald's fast food restaurant in 1955. The McDonald brothers had opened their fast food establishment McDonald's in 1948, based on an assembly line kitchen for the quick and efficient preparation of hamburgers and fries. The premises were themselves designed to encourage customers to order, consume their food and leave in quick succession: the idea was not a restaurant where diners can linger for hours over a meal, but a bright, shiny outlet for the rapid production and consumption of simple meals. It was the rationalisation of food, along the lines of Henry Ford's rationalisation of the factory.

Kroc saw the vast potential for replication of the McDonald's-machine, whereas the founders, sceptical of franchising, did not. By 1959, Kroc had increased the number of McDonald's restaurants to 102; in 1961 he bought out the brothers and assumed command of a vast franchising empire. Kroc saw the future of food: produced assembly line-fast, served in outlets everywhere the same, with the same limited range of items. He knew the value of the McDonald's model better than did the McDonald's themselves: by 2017, there were 36,899 McDonald's outlets in 120 countries (2016 Annual Report 13).

1957: Into space

The space race—and the space age—began in 1957, when the Soviet Union launched Sputnik, the world's first artificial satellite, into orbit. Stung by the demonstration of Soviet superiority in space technology, the United States formed NASA in 1958. The Soviets sent the first human, Yuri Gagarin, into space in 1961, prompting President Kennedy to publicly announce the Americans' determination to catch up in the space race. Kennedy pledged a moon landing by the end of the decade.

The 1960s was the space age. New feats of architecture, including Eero Saarinen's TWA Terminal at JFK Airport New York, completed in 1962, suggested the look of space stations. Popular culture was full of optimistic visions of a future lived in space: *The Jetsons*, *Star Trek*. Family picnic blankets were replaced by 'space blankets,' using the materials taken into space by astronauts. It was assumed that everyday necessities—like food—would increasingly become more like astronauts' food: processed, squeezed out of tubes. The upcoming journey into space was the latest chapter in the wondrous story of technological progress.

1962: Silent future

An alternative perspective on the future appeared on 27 September 1962, with the publication of Rachel Carson's book *Silent Spring*. This book, inspired by reports of birds dying as a result of the spraying of insecticide DDT, was a detailed account of the environmental devastation caused by pesticides. Carson challenged the chemical industry and the narrative of scientific progress, posing instead a future without birds and wildlife as a result of the indiscriminate use of chemicals. The manufacturers of DDT, along with other proponents of the chemical industry, bitterly attacked *Silent Spring*. But the book became a focal point of the budding environmental movement, an inspiration for activists concerned for the future of the environment.

1964: A jet-pack future

1964 was a big year for the future. At the California State Fair, a pilot flew in with a jet-pack. Imagery of this feat shot around the world, exciting dreams of a near-future when everyone would fly to work or school by jet-pack.

Robert Ettinger, a college physics teacher, published his book *The Prospect of Immortality* and founded the Cryonics Institute. Cryonics held up the promise of deep-freezing individuals, to be thawed out in the technologically advanced future. The first cryo-preserved person underwent this treatment in 1967. In his 1972 book *Man into Superman*, Ettinger crystallised the futurist creed: ‘When the future expands, the past shrinks’ (Lepore 2010: 29).

The 1964 World Fair, held in New York, was a joyous space age celebration of the future. A ‘millennium of progress,’ it was proclaimed, is culminating in the feats of today and tomorrow. NASA hosted a Space Park where its gigantic rockets were on display. General Electric’s pavilion ‘Progressland’ claimed to showcase ‘thermonuclear fusion’ in displays of light and noise. The Ford exhibit situated its cars as the prototype for impending rocket ships. General Motors once again hosted an exhibit called Futurama, this time promising space travel, undersea holidays, and moving pathways in super-cities – all just around the corner. Futurama showed the future process of constructing super-highways, as trees were felled by ‘searing laser beams,’ and a monster road-building machine cleared the jungle (Turney 2010: 64). In the Futurama vision, nature is no match for the powers of progress.

1965: Moore is the law

The future will be computer-powered, with processing power increasing exponentially—according to Moore’s Law, expounded in 1965. Gordon Moore, co-founder of Intel, published a paper in that year entitled ‘Cramming More Components Onto Integrated Circuits’. Moore noted the doubling every year of the number of components fitted onto an integrated circuit, and predicted that this yearly doubling of capacity would continue into the future. Revised by Moore in 1975 to a doubling every two years, Moore’s ‘law’ served as a target for the industry of semiconductor manufacturers. It was not so much a law as a challenge for technical innovation, a challenge successfully met by the computer industry over decades. Integrated circuits became smaller and more powerful every year; by 2015 the Intel chip was thought to cram two billion transistors, spaced 14 nanometres apart, onto a tiny surface. Even Moore by this time doubted that his law could continue, observing the saturation of chips at this infinitesimal scale. Captains of post-industry, however, continue to aim at proving Moore’s law: ever smaller, ever faster, ever more powerful.

1968: A connected future

Computers will not only become faster, they will connect with each other and enable a new form of communication. This prediction was made in 1968 in the paper ‘The Computer as a Communication Device’ by computer scientists J. C. R. Licklider and Robert Taylor. Taylor was research director at the Pentagon’s Advanced Research Projects Agency (ARPA); he was frustrated that he needed a different computer terminal for each project. He and Licklider envisaged a future in which computers would be connected, and users could communicate through that network. ‘In a few years, men will be able to communicate more effectively through a machine than face to face,’ they wrote in 1968 (Licklider & Taylor 1968: 21). The two computer scientists looked forward to a new world of ‘on-line interactive communities’

of 'geographically separated members.' These new communities would be founded 'not of common location, but of *common interest*' (Licklider & Taylor 1968: 26). Their prescience was informed by a Space Age enthusiasm for the technological advances of the future, which would bring a 'boon to humankind ... beyond measure.' Like the science-fiction authors in 1963, the two scientists were convinced that unemployment 'would disappear from the face of the earth forever,' if only due to the magnitude of work in adapting the network's software 'to all the new generations of computer' (Licklider & Taylor 1968: 31).

Their prediction of networked communication was realised to a limited extent in 1969, when ARPANET launched as a network linking four computers. By the mid-1970s, this network had expanded to a network of networks—an internetwork or internet—for university researchers. The online interactive communities envisioned by Licklider and Taylor emerged globally after 1991, with the development of the World Wide Web and the opening of the internet to commercial traffic.

1969: First stop the moon

In 1969, NASA did its part for the future by landing the first astronauts on the moon. This feat vindicated Kennedy's pledge at the beginning of the decade; it secured victory in the space race for the United States. It was also seemingly the first step in the trajectory of humanity to outer space. The science-fiction writers of 1963, it seemed, might well have been right in their predictions.

1970: Future shock/On the run

A new, discordant, voicing of the future appeared in 1970 with the publication of the book *Future Shock* by futurologist Alvin Toffler. This book documented the stress and disorientation occasioned by the 'information overload' of modern living (1970: 318). Technological innovation could provoke negative responses, according to Toffler, including fear of the future. Future shock arises from 'too much change in too short a period of time' (1970: 12), as citizens of a technologically advanced society struggle to deal with the heightened pace of life. Toffler characterised contemporary Western societies as 'post-industrial,' drawing on the term coined in 1969 by sociologist Alan Touraine, and later popularised by Daniel Bell in his 1974 book *The Coming of Post-Industrial Society*. A post-industrial society has the majority of its urban workforce engaged in the service sector, dealing with information rather than industry or agriculture. Toffler warned that future shock is the 'disease of change' in a post-industrial society, when individuals fail to adapt to the accelerating pace of this 'roaring current of change' (1970: 11). As a futurologist, Toffler wanted to increase the 'future-consciousness' of his readers and to 'humanise' the future (1970: 14)—but *Future Shock* highlighted the adverse social effects for those, especially the elderly, 'overwhelmed by change' (1970: 11).

The environment became more prominent in public life in 1970. In the USA, the Environmental Protection Agency was founded, instituting new regulations on the chemical industry: DDT was banned in the USA two years later. Popular culture was beginning to reflect concerns for the ecology as a result of pollution and industrial damage to the environment: 'Look at Mother Nature on the run in the 1970s,' Neil Young sang in 'After the Goldrush,' released in 1970. The following year, Marvin Gaye's 'Mercy Mercy Me (The Ecology)' documented a range of environmental blights caused by industrial contaminants: pollution, oil spills, radiation, mercury-poisoning of fish and—echoing Rachel Carson's *Silent Spring*—'animals and birds who live nearby are dying ...'

1972: Coup de grace/Applying the brakes

1972 brought a severe reverse for the ideals of Modernist architecture and urban design. The architecture historian Charles Jencks dates the death of Modernist architecture to 'July 15, 1972, at 3.32 pm (or thereabouts). At this moment, a vast Modernist housing project, 'the infamous Pruitt-Igoe Scheme' in St Louis Missouri, was given 'the final coup de grace by dynamite' (Jencks 1987: 9). Similar demolitions occurred around the world in the next decade. The utopian vision of a rationally ordered paradise, built with purity of design, had failed dismally. Inhabitants had not been uplifted by the design; rather they had been alienated. Faith in progress went into decline in architecture, as designers began using styles and ideas from the past—a practice previously outlawed by the International Style.

Another check to the momentum of technological progress came in 1972, with the publication of the report *The Limits to Growth* by The Club of Rome. This club of industrialists, scientists, diplomats and academics had formed in 1968, voicing a concern for the future of humanity. *The Limits to Growth*, the Club's first report, generated computer simulations of five variables—population, food production, industrialisation, pollution, and consumption of natural resources. The Report's conclusion was that economic growth could not continue indefinitely due to depletion of resources. *The Limits to Growth* was heavily criticised by economists and technologists on publication, largely due to its discounting of the role of technological progress in solving problems of resource depletion. Yet its warnings have been more favourably received in the twenty-first century, as climate change and environmental damage have been accepted internationally by scientists. Since 1972, *The Limits to Growth* has sold 30 million copies in 30 languages, reflecting a major international impact.

1973: Reverse thrusters

One more year into the 1970s, and things were turning sour for the future. The Oil Crisis of 1973 showed the perils of dependency on oil and the energy industry. Confidence was shaken in the vision of a future as energy-based prosperity without limits. The space age had evaporated, as the public lost interest in the Apollo program. The last Apollo was Apollo 17, in December 1972. It seemed in 1973 that no-one was going any further than the moon, for some time. Environmental awareness was growing, and with it a linking of industrial progress with ecological damage. Throughout the 1970s, information emerged on acid rain, air pollution, nuclear contamination, oil spills and other environmental catastrophes. There was increasing concern that industrial development needed to be checked, for the health of the planet.

1975: A new warning

In 1975, Wallace Smith Broecker published a scientific paper in which he coined the phrase 'global warming': 'Climatic Change: Are We on the Brink of a Pronounced Global Warming?' Broecker warned of the possibility that 'we are on the brink of a several-decades-long period of rapid warming' (1975: 460). Climate change and global warming became more prominent terms as climate science built its case in the next decades. When surveying the environmental costs of industrial progress, it became increasingly difficult to agree with Marinetti that 'progress is always right.'

1982: A new world awaits

Ridley Scott's science fiction film *Blade Runner*, released in 1982, was set in 2019. The world of 2019 has flying cars and other technological marvels—but it also has constant rain and what appears to be a chronically damaged environment. The wealthy are summoned to start a new life off the planet: 'A new world awaits you ...' declares the advertisement for outer space living; anyone who can afford it abandons the contaminated Earth.

Blade Runner depicted a dystopian vision of the future, in contrast to the optimism of 1960s films and TV programs. A spate of science-fiction films in the 1980s and 1990s, dubbed tech-noir by critics, portrayed a ruined future of environmental catastrophe: *Terminator* (Cameron 1984), *Mad Max* (Miller 1979), *Escape from New York* (Carpenter 1981), *Robocop* (Verhoeven 1987), *Dark City* (Proyas 1998), *The Matrix* (Wachowski L. & L 1999). In each of these films—and in many others—the future was no longer a world of wonders to be desired. It was a future to be feared, a future world destroyed by pollution, warfare and industrial damage. Technology in films such as *Terminator* and *The Matrix* leaves humanity imprisoned and degraded. This trend culminated in the 2008 film *Wall-E* (Stanton), ostensibly a children's film, but with a severe environmental message. The future of the Earth in *Wall-E* is as a blighted wasteland, destroyed by technology, where no living thing grows. Humans, overweight and complacent, live off the planet. *Blade Runner 2049* (Villeneuve), released in 2017, depicted a world 30 years later than depicted in *Blade Runner*: the environment was even more devastated than in the original film.

1988: Slow down/Climate change

The International Slow Food Movement, founded in Turin in 1988, valued tradition over progress, the past over the future, and slowness over speed in cooking. As revealed in its manifesto, it was anti-fast food, anti-industrialism; it was anti-Marinetti. For Slow Food International, speed has become the 'shackles' of culture; the 'fast life' is denigrated as a 'virus' that fractures customs. The manifesto advocates instead 'historical food culture' and defends 'old-fashioned food traditions' (1989: 1). Slow Food, whose proud symbol is the snail, was one manifestation of a reaction against the dictates of technological progress. Another was recycling; another was conservation. The virtues of speed and convenience were considered less valuable than the virtues of quality and traditional techniques of food preparation. Lovers of food were encouraged to look back, to the lessons and techniques of the past. Tradition was celebrated as a store-house of knowledge and methods. The future was less important as an idea than the present, in communion with the past.

Also founded in 1988 was The Intergovernmental Panel on Climate Change, set up within the United Nations to provide an objective, scientific perspective on climate change. The IPCC's reports, drawing on all published climate science literature, offer guidelines for policy-makers to limit global warming in the future. Its First Assessment Report, published in 1990, predicted that under a 'business as usual' industrial scenario, global mean temperatures will increase by 0.3 degrees Celsius per decade in the twenty-first century. By the Fifth Assessment Report of 2014, the prediction becomes more alarming: without new policies to restrict climate change, the global mean temperature in 2100 will increase by 3.7 to 4.8 degrees Celsius.

1994: Welcome to the virtual

In 1994, the web browser Netscape was marketed. The new hypertext transfer protocol called the World Wide Web was transforming the Internet into a vast web-based commercial entity. 1.3 million personal computers were already connected, and this figure grew exponentially; by 1997 there were 19.5 million. In 1994, an online store named Amazon was founded. This new business soon described itself as the biggest store in the world—as a virtual store. New possibilities for the future, and for progress, emerged in this virtual environment. If heavy industry had been vilified as the contaminator of the environment, perhaps the online community could generate another, cleaner future. Progress was quickly re-defined in post-industrial terms. Technological speed was central, as it was for the Futurists in 1909; now, however, the crucial speed was that of micro-processing, and the speed of connection. Planned obsolescence re-emerged in the digital context: how can you be happy with last year's computer when the new model is so much faster?

2006: Truth be told

In 2006, the release of *An Inconvenient Truth*—the book by Al Gore; the documentary by Davis Guggenheim—took climate change and global warming mainstream. The science was compelling, but more compelling were the images of parched environments, ruined natural worlds, and endangered species. Heavy industry was portrayed as the villain; ideas of technological progress were refuted.

The science of climate change uses computer models to chart the future. The documented rise in global temperatures since the advent of industrialism is modelled and projected into the future, showing us the likely increase in air temperature along with other impacts on the environment. Extreme weather events are predicted to occur with greater frequency as a result of climate change: drought, bushfires, hurricanes, storms, floods. Polar ice caps will melt, coral reefs will be irreparably damaged, islands will disappear under water.

The future was now something to be feared: it promised global warming, ecological disaster, displacement of millions due to the effects of climate change, the doom of natural species. Climate change was taught in schools; there were reports of school children frightened to tears by the spectre of a devastated future. A 2011 study found that 82 percent of US children aged 10 to 12 expressed fear regarding the environment, while a majority of children 'shared apocalyptic and pessimistic feelings about the future state of the planet.' A word—ecophobia—was coined to describe this fear of environmental problems (Strife 2012: 37).

2008: Smart takeover

2008 was the year mobile smartphones took over. The earliest smartphones had been developed in 1997, while their popularity increased from 2004, coinciding with Web 2.0 and the rise of social media. The turning-point was 2007/2008: in 2007 Apple launched its iPhone, with improved rendition of web pages on a mobile phone; in 2008 Google launched its Android operating system for smartphones. Internet access was a major feature of smartphones, allowing constant connectivity while on the move. The smartphone became ubiquitous in the years following 2008: by 2017 there were an estimated 2.6 billion smartphone users worldwide (Lanchester 2017: 22).

The mobile phone is now a customised information-system for each user. It is a user's social media base; it provides access to constant information and entertainment; it is used to send

and receive texts, emails and phone messages; it takes photos and videos and uploads them in an instant; it is always and everywhere in use. Teenagers sleep with them so that they are always connected, from the moment before they fall asleep and from the moment they wake up. The iPhone is a sleek, glamorous, sophisticated personal object; each new model is the look of the future, rendering the previous models obsolete – or, at least, old. Queues of avid users line up outside Apple stores whenever a new iPhone is launched, eager to seize the new model and hold it in their hands.

2011: All future, No past

The ephemeral messaging app Snapchat launched in 2011. This addition to social media was distinguished by its complete focus on the present message, the evacuation of the past. A ‘snap’ containing photos or text disappears soon after it is opened: the sender selects a time between one and ten seconds, after which the message disappears and is deleted from the server. In the constant stream of messaging that is social media, the vanished snap will soon be replaced by a new message. But there is no archive, no store of past message: the past is empty.

The data-stream in other social media privileges the present message: previous messages are swept aside; anticipation rests on the next message about to be received. Advertisers target social media users on an individual basis: algorithms process a user’s searches, purchases, and ‘likes,’ before sending suggestions for the next purchase. The future of consumption is designed by the algorithms.

2017/2075: Disrupt or be disrupted

In the early twenty-first century, the centre of the Western world is Silicon Valley. Here the future is devised by Apple, Google, Facebook, Twitter, Amazon and countless start-ups, tech incubators, venture capitalists and angel investors. These are the Captains of Post-Industry, the prophets of a digital and connected future. They cannot be blamed for the ills of heavy industry, because they are purveyors of information and connection, not pollution and chemical waste. Indeed, the new digital products lead the way to a new green world: a Kindle, iPad or iPhone, used in preference to newspapers, magazines, and books, will save trees.

The Silicon Valley leaders are the new technocracy. They have a vision of the world improved by technology that is just as strong as that of their predecessors in the early twentieth century. Internet connectivity will find new pathways for democracy, interaction, and prosperity; the most helpful contribution politicians can make is to keep out of the way and let technology perform its wonders. Futurologists working in many disciplines – economics, sociology, demography, information technology – continue to predict the wonders of the future. A dominant focus remains technological change: driverless cars, networked objects, shops without checkouts.

At the Silicon Valley Comic Con, held in April 2017, futurologists were asked to address the theme of the conference: ‘The Future of Humanity: Where Will We Be in 2075?’ The event’s technology exhibits—for virtual reality, robotics and smart devices—echoed the ‘Futurama’ exhibits, showcasing new technologies, found in the World’s Fairs of 1939 and 1964. Prominent in media reports of the conference were the pronouncements of Steve Wozniak, co-founder of Apple in 1976. Wozniak was deemed credible as a futurologist: apart from co-founding Apple, he had predicted in 1982 the emergence of portable laptops. One of Wozniak’s predictions in 2017 was that Apple, Google and Facebook would continue to shape the future, well beyond 2075, if only due to these corporations’ enormous cash reserves, which

allowed them to invest in a wide range of futuristic projects. Wozniak made further predictions of life in 2075: new cities with domed structures built in deserts; special suits to allow people to venture outside the domes; smart walls for shopping and communication; technology-enabled medical self-diagnosis and doctor-free prescriptions; a colony on Mars (Swartz 2017: 12). Wozniak's optimistic predictions have a remarkable similarity to the positive vision of the 1963 science-fiction writers: technological advancements will lead us to an exciting future. The contemporary futurists can dream more expansively than did their predecessors: Wozniak's vision in 2017 extends to life on Mars, whereas the authors in 1963 saw only as far as a colony on the moon.

In Silicon Valley, everyone dreams of a new app that will disrupt the present and yank the world forcibly into the future. 'Disruption' is the new term for progress, for effecting the future, as the historian Jill Lepore (2014) has noted in a critical article on disruption. It has an apocalyptic tone as a post-industrial incarnation of progress: the new must succeed over the wreckage of the old disrupted business or technology. Disruption incorporates a contempt for 'legacy' industries and the dead weight of the past – a contempt for the world before the Internet and social media. Legacy forms, including old media, are consigned to the unloved past; the future belongs to the disruptors of networked technology.

2018: Looking backwards/Looking forwards

If digital disruption continues the imperative of technological progress, displaced into a post-industrial context, it is not nevertheless the dominant factor in current imaginings of the future. The most significant 'disruption' in the future will not emanate from networked computers, unless the electricity needed to power the servers and computers is taken into account. Climate change is a projection into the future publicised widely on an international basis, through the agency of the Intergovernmental Panel on Climate Change and other outlets. Climate change is now incorporated into many models; insurance and risk management, professions whose business is managing the future, install global warming as a central factor in modelling the future. Environmentalists demand of government and industry a future based on renewable energy sources rather than on fossil fuels, in a desperate bid to contain carbon emissions and climate change. Melting permafrost and rising sea levels threaten islands and sea-level cities, with potential displacement of millions due to global warming. In April 2017, the *New York Times* asserted that 'our climate future is actually our climate,' observing that the future 'we've been warned about is beginning to saturate the present' (Mooallen 2017: MM36). Record high temperatures and extreme weather events around the world in 2017 and 2018 provoked the growing fear that we are already living in the future. Visions of the future now project anxiety for the state of the environment, and for all creatures—including humans—who depend on it.

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