Future Imperfect: The Mixed Blessings of Technology in America *by Howard P. Segal*, (The University of Massachusetts Press, Amherst, 1994), pp. xv + 245, US$15.95 (paperback), ISBN 0-87023-882-5; US$40 (cloth), ISBN 0-87023-881-7.

In *Future Imperfect*, Howard Segal presents a collection of twelve essays based on his professional experience over the last 15 years teaching technology and society courses to American engineering students. The stated aim of the book is to reject the "doctrine of the technological imperative" and to make a "modest contribution" to the "growing contemporary debates over technology and progress".

Segal counts himself as one of "technology's contemporary critics". He strongly refutes the 'Whig Theory' of the history of technology, arguing that the fact that technologies have unexpected consequences, undermines the Whiggish argument that there is a "smooth unceasing technological and social progress towards some kind of technological utopia". In his view: "Technological progress surely has brought social progress, but it has not brought as much social progress - or as much happiness - as its fervent nineteenth- and twentieth-century advocates repeatedly predicted it would. And technological progress has obviously left a considerable share of social regress and unhappiness in its wake."

Segal argues that in the United States an "uncritical faith in technology's ability to solve all problems", and a belief that technological progress must continue unabated has "historically characterised American society and culture". However, he believes that more Americans are beginning to seek limits on unadulterated technological advance, and senses a movement towards what he calls a 'technological plateau' viz. "a society in which technology has become sufficiently advanced and widespread that equivalent attention can be given to achieving equally vital non-technical improvements: social, economic, cultural, political and so forth." While he was once very optimistic about this, recent events such as the 1991 Persian Gulf War have made him less sure as, in his view, many Americans "still believe that the US is a potential utopia to be brought about by technological progress".

Curiously, for someone who claims to have gone into bat against the doctrine of technological determinism, Segal believes that American society is fundamentally defined by its technology. While acknowledging that the relationship between technology and society can have cultural and historical differences, he believes that the United States fits Jacques Ellul's definition of a 'technological society', being one in which "[t]echnology has become not just the material basis for society but in a real sense its social and ideological model as well". This being the case, he argues that Americans are "long past the point of debating whether to live in some kind of pervasively technological society." Rather, the critical issue, and the focus of his book "is how to live sanely and humanely in America's pervasively technological society. That is where serious discussion about America's and technology's future ought to begin."

While he believes that the United States is fundamentally a 'technological society', Segal at times argues that there is a "two-way impact" between technology and society, mediated by culture: "Just as specific structures and machines do not come about in a social vacuum, neither does technology more generally come about without needs and desires to be filled and values to be promoted on the part of at least some persons or groups in a particular society."

Segal's collection of twelve essays is grouped into four sections: Technology and American History Rethought; Technological Museums Revisited; Four Technological Visions Reexamined; and High Tech Culture Reconsidered.

The first groups of essays sets the scene by exploring how the attitudes of Americans

towards technology have changed during the 19th and 20th Centuries. The lead essay looks at writings of the 19th and early 20th Century technological utopians, and offers a critique of the notion of a 'Middle Landscape' put forward by Segal's mentor Leo Marx in his book *The Machine in the Garden: Technology and the Pastoral Ideal in America* (1964).

The next essay, a 'case study' of the automobile, is used to explore the changing attitudes of Americans towards technology in the 20th Century, and to introduce Segal's concept of a 'technological plateau'. Segal argues that technology leads to progress, but there is a price to pay for this: if, as in the significant case of the auto, modern technology solved a number of problems, social as well as technical, from the outset it simultaneously bred or helped to breed several others, social and technical alike.

He believes that historically Americans have "accommodated" technological change, rather than opposing it like the English Luddites. This is so because technical advances, such as the automobile, have been promoted as "allowing Americans to achieve various changes without fundamentally altering their basic institutions and values." Thus, the history of American technology "is properly understood as reflecting more than shaping the society and culture from which it derives."

In the next essay in this group, Segal explores the dilemmas of modernisation by referring to the writings of 19th Century Frenchman Alexis de Tocqueville. By 'modernisation' Segal refers to the "[e]normously popular concept (or ideology) in the 1950s and 1960s" which theorised "the evolution of supposedly 'underdeveloped' societies into 'developed' ones, especially through technological advances". Like the technological utopians of the 19th and early 20th Centuries, Segal argues that "these anti-communist modernisation proponents believed that sufficient technological advances could in turn bring about the non-technological advances they sought: a higher standard of living, greater equality and equality of opportunity, greater social mobility, expanded mass political participation, and improved education and technical training".

While an exploration of the views of 'modernisation' theorists provides yet another example of utopian technological visions, and an opportunity to criticise the 'Whig Theory' of the history of technology, the references to Tocqueville are bizarre. As Segal himself admits, Tocqueville "doesn't have anything resembling a concept of modernisation in his work", and so he proceeds by reconstructing his view of social change and by suggesting how his would-be contemporary disciples might apply it today. One is left wondering what the point was.

In the next group of three essays Segal uses case studies of technological museums to provide a guide to contemporary American attitudes to the relationship between technology and society, and to criticise the Whiggish theoretical basis upon which he claims most technological exhibitions are founded. The case studies include the Armington and Simms Machine Shop and Foundry re-opened at Greenfield Village, Michigan in 1982, the Made in Maine exhibition at the Maine State Museum opened in 1985, the Computer Museum in Boston opened in 1984, and the Beyond the Limits: Flight Enters the Computer Age exhibition which opened at the National Air and Space Museum in 1989.

While the observations and criticisms of exhibition material provided in these essays are no doubt sound, and offer useful cautionary advice to Museum curators, too much time is spent analysing the views of groups of Segal's students who had visited the exhibitions, and there is nothing to push the bounds of contemporary debates about technology. Segal seems to be satisfied with even the slightest deviation from Whig Theory which, he or his students, discover in the exhibitions.

In the third group of essays Segal examines four technological visions. Two of the visions are utopian: Edward Bellamy's *Looking Backward: 2000 - 1887* (1888) and Mary E. Bradley

Lane's *Mizora: A Prophecy* (1890), claimed by Segal to be the first feminist technological utopia. And, two of the visions are dystopian or at least very sceptical: Kurt Vonnegut's *Player Piano* (1952) and Lewis Mumford's writings ranging from *Technics and Civilisation* (1934) to *The Myth of the Machine* (1967 & 1970). While contributing to Segal's notion that Americans have historically been technological utopians, the first two authors would be little known in Australia and are of little interest. The last two are much better known in Australia, and the analysis of their writings is handled fairly well by Segal. He points to them as evidence that from the 1950s to 1970s Americans started to question the benefits provided by technology, and to develop a more sophisticated understanding of the relationship between technology and society.

However, this propensity to question the benefits of technology, and the more sophisticated understanding, are being undone by the proponents of high technology, a subject which Segal deals with in the final essay of his book. Unfortunately Segal himself adopts a less sophisticated understanding of technology, talking of so-called 'high tech' as if it was an autonomous entity.

High tech, in fact, appears not only as optimistic about the future as, but also more indifferent toward and, in other respects, more manipulative of the past than earlier technologies have been. Indeed, high tech, is eager to proclaim itself the supreme technological revolution while enjoying an unprecedented ability to articulate and spread its message, thanks to the very communications and transportation systems it exalts.

Segal examines four leading ways in which 'high tech', "misusing and abusing as well as ignoring history, promotes high tech's products and its ideology": prophecies; advertising; world's fairs and theme parks; and, the technological literacy crusade. The main point which runs through Segal's critique of these aspects of high technology is the lack of historical knowledge displayed by the proponents of high technology's virtues, and the boosterish tone they adopt. Segal prefers the view that high technology has mixed blessings.

In what for me was probably the most satisfying, and coherent, part of the book, Segal lines up some of the contemporary 'prophets' of the virtues of high technology, and proceeds to mow them down. Alvin Toffler's *Future Shock* (1970), *The Third Wave* (1980), and *Power Shift* (1990) are dispatched with first. Next John Naisbitt's *Megatrends: Ten New Directions Transforming Our Lives* (1982) and *Megatrends 2000* (1990) come in for a bit of intellectual biffo. Segal is most harshly critical of the ahistorical and 'Whiggish' nature of the visions presented by these writers, and of the fact that they stand to make a lot of money form the commercialisation of their utopian predictions. Mind you, most undergraduate students of science and technology studies would have little trouble claiming the scalps of the likes of Toffler and Naisbitt.

I came to Segal's book seven years after actively pursuing science and technology studies and am left with the overriding feeling of "Is this the best they can do?". Segal's criticisms of the 'Whig Theory' of the history of technology are sound enough, but are spoiled by his woolly understanding of the relationship between technology and society. On the one hand he poses as the arch critic of the "technological imperative", even going so far at times as pointing to the way in which technologies can be socially shaped, while at the same time arguing that in the United States society is fundamentally determined by technology, that technology is more or less autonomous, and the only thing to do is to try and adapt sanely and humanely to its excesses. In this respect, Segal does not seem to be alone. In another collection of American writings published about the same time I noticed this same tortured line of argument at work: a desire not to be seen as naive technological determinists but a reluctance to deprive technology of its agency. After all, it can have unintended consequences.

The promised contribution to contemporary debates over the relationship between tech-

nology and progress turned out to be, for me, very modest indeed. Surely debates about the relationship between technology and society had proceeded further than this by the beginning of the 1990s, even in America. Segal makes little reference to the work of his contemporaries David Noble and Langdon Winner, two Americans who have already made contributions to this debate way beyond the level of Segal. The writings of these authors, and the writings of contemporary European and Australian sociologists and historians of technology are largely ignored. In fact, Segal doesn't really seem to have contributed to contemporary debates at all.

On the positive side, the book appears to provide a good historical overview of American technological utopian writings, and would be of interest to people pursuing American Studies and studying American literature. Museum curators would no doubt benefit from the critiques of contemporary technological exhibitions offered in the second group of essays, and undergraduate students would find some worth in the discussion of the writings of Vonnegut and Mumford, and the criticisms made of the technological boosters such as Toffler and Naisbitt.

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The Long Wave in the World Economy: The Current Crisis in Historical Perspective *by Andrew Tylecote* (Routledge, London, 1993) pp. xiv + 340, $44.95, ISBN 0-415-03691-7.

Is there a long cycle in economic activity? If there is, we need to know the underlying process in order to acquire any ability to predict or explain economic growth patterns. Andrew Tylecote maintains that there is a sequence of "technological styles" underlying long period fluctuations. Mismatches between these styles and contemporary institutions potentially generate three different types of crisis at turning points. But the picture is enriched by a number of other relations. Feedback loops (procyclical if they contribute to the cyle, or countercyclical if they detract from long wave) driven by population, money (the interest rate), inequality and international relations are included. In addition, chance factors such as climate and crop failures or political contingencies are involved to explain the particular course of events.

Technological styles are new paradigms that develop in response to the reduction in one or more input costs. The styles are from *circa.* 1785–1820s water, then steam transport until the end of the 1870s, steel and electricity to 1915, Fordism until the late 1970s, and microelectronics and biotechnology thereafter. These styles are "a new best productive common sense which strives to get maximum advantage from the key factor across wide families of related, or apparently related, technologies". Diffusion of the new style leads to a restructuring of the whole economy and influences the direction of technological change.

Integration and disintegration are key ideas behind mismatch crises. England experienced more rapid economic growth than France in the eighteenth century because English society was more integrated. English landowners discussed improvements in farming techniques with their tenants, unlike French landowners. Presumably a comparison between Western