Made to Lie

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Kenneth M. Ford, Clark Glymour, Patrick J. Hayes (eds), *Android Epistemology*, AAAI Press/ MIT Press, Cambridge, Massachusetts 1995, £19.95 cloth; Donald MacKenzie, *Knowing Machines: Essays on Technical Change*, MIT Press, Cambridge, Massachusetts 1996, £22.50 cloth; Aart Bijl, *Ourselves and Computers: Difference in Minds and Machines*, Macmillan, Basingstoke 1995, pp225; paperback.

> If an android A passes the Turing Test, then A is conscious (= thinks, ...)
> (Selmer Bringsjord in *Android Epistemology*, p95; ellipsis in original.)

> The machine ... is a mechanism that, after being set in motion, performs with its tools the same operations as the worker formerly did with similar tools.
> (Karl Marx quoted in *Knowing Machines*, p34; ellipsis in original.)

> In short, an intelligent machine would have to be intelligent enough to know when to dissemble, when to lie.
> (A. F. Khan in *Android Epistemology*, p255)

What would you think if, having read this review, you were told that it had been written by an android? If you responded by saying something like 'I would never have known!' then the supposed android would have passed the Turing Test. The Turing Test, devised by Alan Turing in a paper in 1950, is the classical reference in the debate over whether there can be artificial intelligence.[1] The debate hinges on the definitions of 'is conscious', 'thinks', 'has intelligent behaviour'. However, there is another issue that is often ignored and that is, oddly enough, brought out by considering artificial intelligence (called android epistemology here) even more seriously than some of its most devoted advocates such as Marvin Minsky, Margaret Boden, and Paul Churchland, who are all represented in the Android Epistemology collection.

1 A.M. Turing, 'Computing Machinery and Intelligence', in Alan Ross Anderson (ed.), Minds and Machines, Prentice Hall, Englewood Cliffs, N.J. 1964.

That issue is the capacity of the android to dissemble, to lie, to pass itself off as the human other. To begin to understand the concerns of these texts, because they all deal at some level with android epistemology, whether that be at the philosophical (*Android Epistemology*), the sociological (*Knowing Machines*) or the quasi-anthropological (*Ourselves and Computers*), we need briefly to set out the classic origins of the debate: can machines think?

Turing's Test is a simple behaviouristic one: if the hidden android (Turing was thinking of a computer) passes itself off as a human in a series of communications with a human questioner, then it could be considered to 'think'. Whether 'thinking' means 'is conscious' is the nub of the debate between those who argue that androids can have epistemological structures that emulate

human epistemological structures, and those who argue that such structures are merely rule-following structures that do not possess the tacit understandings we have about ourselves, others and the world. (Selmer Bringsjord precisely works through an escalating series of Turing Tests which are all found to be wanting). The philosophical alternative in regards to a criteria for 'thinking' for Turing was the *reductio ad absurdum* of solipsism, suggesting that Turing thought the criterion for 'thinking' was a symbolic system which could represent the world. In line with GOFAI (Good Old Fashioned Artificial Intelligence), this assumes that an android's epistemological structures are formal systems (describable logically in a series of well-formulated propositions) and that these representations symbolise states of affairs in the world.

A different approach, more common today, is to try and emulate brain processing in computer processing circuits. This design method is called reverse engineering and is known theoretically as connectionism; it uses parallel distributor processing to match the non-locatable ego in the human brain (one of the problems of the 'Cartesian theatre' as Daniel Dennett puts it). It is rather like placing a number of computers side by side with different 'search' modes and letting them develop an account of the world.

What I want to concentrate on here is the manner in which androids or machines can be said to have a representation of reality either wholly (androids) or partially (machines). These texts show the philosophical possibility of this representation of reality, and its sociological and anthropological effects. What we find is that this representation of reality is an ongoing concern, just as any other technological development is, in the commercial and military sectors, and that it impacts upon the everyday world. That its practitioners go by the name of 'knowledge engineers' and that the new field of its activity is android epistemology needs to be carefully considered. Ford *et al* write

> Android epistemology ... is the business of exploring the space of possible machines and their capacities for knowledge, beliefs, attitudes, desires, and action in accordance with mental states.... Wherever psychologists propose that human thought or belief or desire are generated by some machine process, psychology is android epistemology. Humans are just a special case; only gods are left out of android epistemology (ppxi-xii).

The editors are here setting out what is called functionalism in the philosophy of mind. This approach describes the processes of thought in terms of inputs and outputs and records the state of any particular being as the functional role that it is presently in, such as 'making a calculation', 'desiring to have an ice cream', 'waiting to print paper', 'deterring an invader.' But they are assuming that there can be some sort of formal description of android epistemological structures. Moreover, whether these structures are replications of human epistemological structures as the rationalist tradition would have it, or whether they are new epistemological structures and so create another reality to the one we hold is a moot point.

If one takes the latter view then one would be moving to a definition of android actions that seem to refer to human actions but actually have different sources of intentionality. In other words, the answer to the question, 'why did you do that?' would substantially differ in the case of the android who passes itself off as a human being and the opposing case of a human being passing itself off as an android. Margaret Boden claims that an android does achieve its own sense of reality, for she argues that it can be creative. What Boden says is not that far removed from Immanuel Kant's definition of creativity in the *Critique of Judgement*. This is the idea that creativity is a modification of established rules, but that genius is the overthrowing of established rules and the setting up of new ones. That Douglas Lenat's program EURISKO has 'generated H [historically] novel ideas concerning genetic engineering ... [and that its] suggestions have even been granted a US patent (the US patent law insists that the new idea must not be "obvious to a person skilled in the art")' (pp61-62) is confirmation that philosophically, legally, and I will dare to say socially, androids have already become accepted beings. How far androids can integrate themselves into society is not as risible as it may sound. We need only turn to Donald MacKenzie's path-breaking work on the implications of machine technology to see that there are signs of android reality already, and that this reality needs to be interrogated philosophically and sociologically.

In terms of a total representation of reality (android reality) which could work from a database (see Cary G. de Bessonet in *Android Epistemology)* that could note, for example, what sorts of representations were present to a sensing device, such as chairs, tables and mice, what sort were nearly present (recordings of mice, tables and chairs), what sort were not present (pixies, unicorns, the present King of France who is bald), we would still have the problem of trust or guarantee that can be looked at socially or legally. Android reality puts the question in terms of ethical trust. Machine reality (partial representation of reality) puts the question legally, as MacKenzie shows. First android reality:

> As a computer security term, 'integrity' is concerned with the trustworthiness of an automated system (ie defining some acceptable level of assurance that the system will not perform contrary to design specifications)... It is conceivable that some future state [of an autonomous learning automata] may produce unpredictable results, causing the machine to draw the wrong conclusions, take an action when none is called for, or remain inactive when actions is critical (A. F. Khan in *Android Epistemology*, p255).

And machine reality:

> Investigations into why no defensive missile was launched suggest a cause that seems unimaginably tiny at one point in the software controlling Patriot's radar system, there is an error of 0.00001 per cent in the representation of time (MacKenzie, pp182-83).

Donald MacKenzie, following Bloor, calls for a 'strong programme' of the sociology of science that looks at the content of science itself ~ as distinct from the 'weak programme' that has traditionally focused on social influences in the scientific domain. Such a strong programme would look at the way logical, mathematical, verifiable methods are used in the domains of science and technology to guarantee that a certain state of affairs has been or will be brought about. The patriot case seems to be a question of simple software error.

And one could, of course, see this as being an error that was corrected, albeit a day late ~ fatally late for the 28 American servicepeople who died in the Scud attack. But then one would need to judge if the new software is fail-safe. That is, if its performance can be guaranteed. The VIPER case, discussed by MacKenzie, details to an alarming extent the problems with this notion of guarantee. VIPER, the Verifiable Integrated Processor for Enhanced Reliability, is a microprocessing chip that was claimed to be mathematically free of error. The UK Cabinet Office's Advisory Council for Applied Research and Development insisted that such mathematical proof should be forthcoming on computer systems whose failure could result in more than ten deaths (p159) and VIPER was developed by the Ministry of Defence's Royal Signals and Radar Establishment. However, there was controversy concerning its mathematical reasoning. Could it guarantee the performance of a physical device by its series of mathematical proofs? The firm which had the licence to market aspects of VIPER technology doubted the proofs as they had been stated. The firm (Charter Technologies Ltd) took the Ministry to the High Court to test the claims, but before the case could be brought, Charter went into liquidation. As MacKenzie notes this would have been the first court case to deal with the formal proofs of new technology. How the lawyers and judges could deal with abstruse logical and mathematical debate has been merely deferred according to MacKenzie. As a footnote to this case, VIPER has only had one installation in a defence project and one civil application, the controlling of signals on an automated railway crossing in Australia. Even there its representation of time will be tested.

If android reality is the next epistemic step (most of the essays in *Android Epistemology*), then that step needs to be questioned at the level of social effects and in its own formalist assumptions (*Knowing Machines*), Aart Biljl's *Ourselves and Computers* suggests it also needs to be interrogated ontologically and politically.

In the main, the ontological question rests on the work of Martin Heidegger, particularly as this has been somewhat contentiously interpreted by Hubert Dreyfus.[2] The debate revolves around the ontological distinction between the sort of presence we have in ready-made things like androids and televisions and the sort of presence or being we have in human reality or Dasein (Heidegger's 'Being-there' is translated by Dreyfus as 'human reality'). Bijl presents an eclectic argument that draws from an array of debates and he does this in a way that is not always helpful. His first chapter, on 'Pictures of Ourselves', in which he uses graphic images to show the relations between our being, our epistemology and our use of computers I found virtually impenetrable.

2 Hubert Dreyfus, What Computers Still Can't Do A Critique of Artificial Reason, MIT Press, Cambridge, MA 1994.

However, Bijl's reading of Japanese culture is meant, I think, to underline the everyday non-formal practices of people's life-world. This becomes deeply ironic when one considers that Japan is developing some of the most advanced androids.

Bijl's concern with non-formal expression (which he also finds in the work of Heidegger and Wittgenstein) produces some very neat readings of social situations that, like computer systems, are considered to be coherent and 'framed' by rules. In one example, Bijl visits an art exhibition of Otto Dix (an expressionist painter, naturally enough) but what he concentrates on is the captions to the paintings. His ongoing dialogue with the assumptions of the captions reveal how the framing of social reality is at best misleading; when it comes to computers, such formalism is positively dangerous.

For Bijl, computers are evidence of an autonomous technology that is making humans into less accountable, less responsible beings. Indeed, he argues that we are becoming deficient in our very being (*Dasein*). Bijl argues that the formalist structures of computer programs assume a given world that can be mapped onto computers and that these structures replicate human epistemology. Bijl presents an opposing claim based on the tacit knowledge of the human world and suggests a modification to the way that technology operates. He believes it should be developed with users as part of the design process. Bijl's claims extend to the question of the capitalist system which directs technology toward increasing profit margins and produces docile technological users that mimic the formalistic structures they become a part of. It is not that Bijl simply rejects technology which he sees as part of the tradition of *homo faber*. However, he does find a new shift in how social reality is becoming increasingly framed by the rules of autonomous systems.

This would then bring us on to whether connectionism can supply the android with not only formalist epistemological structures such as mathematics and logic but also non-formalist epistemological structures such as how we go about most of our daily activities that are simply 'done' without thinking.

All is not lost in the world of simulation, however. According to MacKenzie and Graham Spinardi it is always possible that we may uninvent android reality as we may do with their specific example of nuclear weapons. An uninvention rests on our forgetting the tacit knowledge (Dreyfus is again cited) which goes to make up the everyday practices associated with nuclear weapons, what buttons to press, what effects the new warhead will have, what effects an old warhead will have. Such calculations are left to computers, such practices and judgments are left with humans.

These three books leave us with two possiblities (i) that androids could simulate our tacit knowledge; (ii) that we are simulating android reality.

Let me add a third and fourth (iii) that if androids simulate our tacit knowledge they may uninvent themselves; (iv) that if we simulate android reality we may uninvent ourselves and become 'is present' (that would be typical of *Dasein* to dissimulate).

Beyond the Consensual Hallucination

Richard Tutton

Robert Markley (ed), *Virtual Realities and Their Discontents*, Johns Hopkins University Press, Baltimore 1996; £12.50 paperback, £32.00 cloth; Mark Dery (ed), *Flame Wars: The Discourse of Cyberculture*, Duke University Press, Durham, North Carolina 1994; £12.95 paperback, £37.95 cloth.

> We inhabit cyberspace when we feel ourselves moving through the interface into a relatively independent world with its own dimensions and rules. The more we habituate ourselves to an interface, the more we live in cyberspace, in what William Gibson calls the 'consensual hallucination'. [1]

1 Heim, M. The Metaphysics of Virtual Reality, Oxford University Press, New York and Oxford, 1992, p79

There has been a plethora of critical writing in the last five years on the culture and technology of cyberspace, which has been both celebratory and tenebrous in its discourses of our virtual futures. Conferences, such as 'Cyberevolution' at the University of Warwick held in summer 1995 which served as my introduction to the field of what some might call cybercriticism, have brought together a range of commentators from within and without the academic community. Represented at the Warwick conference were the worst of these commentators who indulge in hyperbolic diatribes, shot through with the rhetoric of cyberbabble; and the best, in the form of David Porush, Manuel de Landa, and Scott Bukatman whose work is represented in the collections of essays under review here. The majority of the essays in both collections have been selected from a number of journal and conference papers, and are repackaged and recontextualised with new theoretical directions by the editors. These directions are distinctive in both purpose and approach, but there are common centres of interest between them: the theoretical and historical significance of cyberspace; the forms of textuality generated by electronic technologies, and their effects on human knowledge and interaction; and readings of that emblematic literary form of the postmodern, post-human matrix: cyberpunk.

Virtual Realities and Their Discontents is a tightly focused inquiry which is engaging and challenging in its approach as delineated by Robert Markley in his introduction: 'The indebtedness of cyberspace to its logocentric past is one of the threads that ties together the essays in this collection. Another is the contributors' insistence on distinguishing, in various ways, virtual technologies (the hardware and software that intervene in our bodies) from the abstraction of 'cyberspace' (p2). The first of these threads develops an argument delivered by Markley himself in which he claims that 'at the heart of cyberspace lies a fundamental belief in the mathematical structure of nature, in the computability of the universe' (p58). In other words mathematics is the

alphabet of creation ~ of both natural and virtual worlds ~ a view that is traced to the seventeenth century and to the philosophy of Plato, the figurehead of logocentricity. It is this theoretical and historical basis of cyberspace that Markley claims literary and cultural critics ignore, failing to recognise the metaphysical suppositions of those involved in developing cyberspace technology. This argument is supported by a lengthy and demanding extrapolation of 'boundary mathematics' (not for the mathematically challenged). This perspective offered by Markley would repudiate, then, the idea that cyberspace represents a radical coupure with the metaphysical and logocentric tradition most closely associated with modernity. I am undecided about this argument, but there are parallels with that other alphabet of creation - genetics - that has recently been exploited by a computer science that uses the principle of DNA to write better computer programmes, to make it more persuasive.

N. Katherine Hayles in her essay 'Boundary Disputes' pursues the second of the threads identified above by arguing that virtual reality is the product of developments within the science of cybernetics from the post-Second World War period. Cybernetics was predicated by Norbert Weiner on the thesis that 'the operation of the living individual and the operation of some of the newer communication machines are precisely parallel.'[2] The brain of the individual human subject, as the name of cybernetics implies, is 'the pilot or steersman' of the body into which information is co-ordinated through the nervous system. The subject becomes a feedback loop, receiving input, processing it, and acting on its determinations ~ this is called communication in cybernetics. This thesis served as a repudiation of the Cartesian mind/body division, and in so doing embraced the materialistic and functionalist perspective of the human subject that would issue through into psychology, cognitive science and AI that are all based on the foundational structures laid by cybernetics. But what is, perhaps, equally important is the will to virtuality articulated by the fantasy of teleportation that would involve in Weiner's terms 'not so much the transmission of human bodies as the transmission of human information.'[3] Hayles's analysis centres on the Macy conferences of the 1940s and 1950s where different conceptualisations in cybernetics were contested. To understand the most constitutive science of the last fifty years would seem to be crucial in reaching an informed understanding of the development of certain technologies and certain models of subjectivity, especially the figure of the cyborg. Hayles's essay, although in a very unfinished way, does deliver some useful insights into this area and prepares the ground for further work.

2 Weiner, N. The Human Use of Human Beings Cybernetics and Society, Hoghton Mifflin Co., Boston, 1950, p15.

3 Ibid., p111.

Another 'virtual technology' that is explored by two other contributors is the technology of electronic writing, hypertext, which 'is no less than an electronic intertextuality, the text of all texts, a supertext.'[4] In his essay 'Hacking the Brainstem', David Porush suggests an antecedent for hypertext in the form of the Jewish Talmud. 'It may seem strange to suggest ... [that] the Talmud represents a precursor of cyberspace. However, several writers including Jacques Derrida himself, have located talmudic method as an important influence on

4 Heim, op. cit., p30

postmodern alterity and resistance, at the level of writing, to totalising knowledge' (p130). On looking at the Talmud, at the way in which it is presented ~ several concurrent texts, each with a different purpose, each written by a different writer ~ it is radically different from the hypertext systems found on the World Wide Web. For anyone who uses the Web will know, although there are many links to other documents, the form of writing remains much like the linear print I am producing here. The Talmud, on the other hand, presents a number of texts arranged on a single page, all of which have different functions, and are to be read concurrently, thereby creating several layers of textuality.

The electronic technology of hypertext has been credited by some writers as being a kind of post-structuralist technology since it appears to resist totalising knowledge and is non-linear and non-hierarchical in its arrangement. It could also be credited with erasing the distinction between author and reader and decentring both in relation to the writing. This is discussed in Richard Grusin's essay, 'What is an Electronic Author?', which inflects Foucault's 'What is an Author?' and Wimsatt and Beardsley's essay, 'The Intentional Fallacy', the thesis of which is reconfigured for the purposes of Grusin's essay as the technological fallacy: the view that technology itself is seen as an agency, replacing that of the author in the original model. Transferring literary theoretical models seems to be a great temptation in discussing electronic technologies of writings, and extensive work in this area has been done by the writers whom Grusin discusses, such as Mark Poster, Richard Lanham, and George Landlow (pp40-41, and *passim*). His criticism of these writers is incisive and provocative, especially on the issue of the effect that hypertext will have on education. Grusin reports Landlow as saying 'hypertext, by holding out the possibility of newly empowered students, self-directed students, demands that we confront an entire range of questions about our conception ... of education' (p47). As those of us who are involved in teaching at any level will realise, students should be self-directed and empowered without the need for intervention by such electronic technology. However, the argument goes further than this with Nick Land and Sadie Plant who view the developments in cyberspace technologies ~ computer networks, broadcasting, telecommunications merging in new corporate structures ~ as signalling the end of academia and the state education system. This seems ironic, considering that the majority of Net users are probably higher education students enabled to gain access due to the Joint Academic Network maintained by their universities and colleges. It is more likely, as evidenced by this very collection of essays, that disciplinary barriers between 'literature' and 'sciences' will be increasingly blurred, the effect of which will be an increase in academic writing in terms of quantity and quality rather than a decay.

As with all discussions of cyberspace, cyberpunk novels are considered an important source of thought, especially *that* novel written by William Gibson in 1984 *Neuromancer*. David Brande in 'The Business of Cyberpunk' performs the task of re-situating the study of cyberspace within a Marxist perspective. The focus is on the figure of the cyborg which Brande discloses as the construct of the flows of capital and ideology. It is the product of a 'denaturing process',

described by Marx and Engels in *The Communist Manifesto* as the constant revolutionising of the modes and relations of production. This 'denaturing' is particularly seen in science and technology, especially cybernetics and AI that have allowed a deconstruction of the human subject as that Cartesian self of the mind/body composite, and reconstructed it now as cyborgian through a multiplicity of human-machine interfaces.

Neuromancer and other cyberpunk novels are also discussed in *Flame Wars* which is a more multivalent and discursive collection combining fiction and criticism from a range of perspectives. Here Scott Bukatman reveals that Gibson actually wrote *Neuromancer* on a manual Hermes 2000 typewriter. That 'the novel that invented cyberspace (sort of), the hippest, highest novel of the 1980s, should have been written on such an antiquated device' (p72) is wonderfully ironic. Bukatman uses this anecdote as a point of purchase to provide us with a detailed history of the typewriter that in turn is also a history of the novel and a technological history of cyberspace. Through this Bukatman is able to draw some interesting parallels between the metaphors that described the now debased typewriter through its kinetic power and those of the 'information super highway' used today. Further exploration of cyberpunk is continued by Pat Cadigan with an extract from her novel *Synners*; in interviews with Samuel Delany, Greg Tate and Tricia Rose on African American SF; by Anne Balsamo on the wider question of cyberpunk as a literary form, especially its relationship with cultural post-modernism; and by Claudia Springer who appraises representations of women cyborgs in cyberpunk. As Springer correctly identifies, cyborgs are often depicted as having repressed, troubling memories that continue to haunt them after their transformation, and this is especially so for the cyborg woman. The example that she provides is again from Gibson's novel, Molly Millions, who 'paid for her transformation into a sleek killing machine with money earned while working as a prostitute, when she experienced overwhelming depravity, including men killing women for sexual pleasure' (p169). The imagery of cyborg women like Molly is ambivalent and problematic ~ hardwired, hard armoured techno-bodies, a fetish of male fantasy yet bodies that are also presented as the means of escape from patriarchal oppression. It is this kind of ambiguity that makes female figures in cyberpunk enigmatic and attractive to both men and women.

The introduction to this collection provides us with an understanding of the title *Flame Wars*, which in compu-slang are vitriolic on-line exchanges. Often, they are conducted publicly, in discussion groups clustered under thematic headings on electronic bulletin boards, or ~ less frequently ~ in the form of poison pen letters sent via E-mail to private mailboxes' (p1). A cause of these exchanges, suggests Dery, is the misinterpretation that can occur with a text-based communications system where there are no non-verbal gestures or indicators. (To combat this 'flattened affect', 'emoticons' have been developed such as the :-), or my personal variation the :-| which I use to imply vexation.) The textuality of the Internet, according to its celebrants, enables an escape from those human conditions that are also the sources of prejudice, like race,

gender, age, etc. , into a pure and neutral state of a communicative sublime. Julian Dibell explores this kind of textuality further through relating an account about a rape in LambdaMOO, one of the object-oriented Multi-User Domains. The rape was text-based, committed by a 'character' called Mr Bungle on two other 'characters' in the MOO, created by two female users who 'suffered a brand of degradation all-too customarily reserved for the embodied female' (p242). The outcome of this leads Dibell to meditate on the nature of the textuality that encourages a spontaneity in the way we communicate, but also gives an unprecedented permanency to those words. There is an ambivalence between the plasticity of electronic textuality on the one hand, and the fact these words could be stored on computers that are designed to survive a thermonuclear war.

On the theoretical and historical significance of cyberspace and its technologies there are two main pieces of writing. The first is from Manuel de Landa who, in a dense and abstract essay, discusses synthetic versus analytic reasoning in the sciences of AI and AL (Artificial Life). The latter adopts synthetic reasoning, which is to say, it constructs from the bottom-up, in de Landa's terms, as opposed to top-down. This can be illustrated by the development of neural nets which, unlike other computers, have a number of decentred and inter-linked processors ~ they are not programmed but rather 'learn' tasks through experience which reinforces certain connections between the processors. In this fashion they act more like the human brain than a traditional computer with a single central processing unit. This development is the outcome of the science of cybernetics, described by Hayles in the other collection, that originally conceived of the human brain as a computer before designing the computer to operate like a human brain.

The second piece is an intriguing essay by Erik Davis, 'Techgnosis, Magic, and Memory, the Angels of Information', which presents us with a magico-mythic structure in which to view the phenomena of cyberspace. Davis suggests a comparison between cyberspace and aspects of hermeticism, especially the use of 'artificial memories' that functioned by constituting virtual locations where visual icons were located to represent words or things. This type of Gnostic virtual memory is akin to a program manager on a PC perhaps, where icons are points of access to applications or to the artificial memory of the global computer network. He states that 'part of the hermetic urge was encyclopaedic, and magicians hoarded a stunning amount of information: ritual names, spells, and astrological correspondences; numerological techniques; ciphers, signs, and sigils...' (p32). The promise of hermeticism we are told was 'if you embrace in thought at once, time, place, substances, quantities, qualities, you will comprehend God' (p32), and could it not be argued that the drive we are experiencing now, in collapsing time and space in cyberspace, is the drive towards a disembodiment, an escape from the messy material world for a state of god-like knowledge and existence?

This argument, although revealing in some ways, takes no account of the politics and socio-economics that determine the access to informatics. This is

addressed by Gary Chapman, in one of the superior essays in this collection, who points to underlying contradictions in the 'information society': 'we are witnessing a growing disparity between the passionate fascination with computer technology among a small segment of affluent young people ~ a phenomenon that is now loosely identifiable as 'computer culture' ~ and the majority of people who care little or nothing about computers, or are even hostile to the changes brought about by computer technology' (p313). This is a vital contradiction and one that is not properly addressed by the books under review here, that contain essays written by a privileged few who have extensive, and, most of them, free access to the technologies of cyberspace. Although most people find the 'cyber-revolution' irrelevant, their lives are equally affected by the power of computerisation, as Chapman clearly demonstrates. The failure of all the contributors, except Chapman who at least identifies and describes the problem, is to connect the privileged discourse of cyberculture to the experiences of the majority of the population: that is the only way to effect political action and increase public understanding of the technologies that are at the centre of attention in these essays.

In conclusion, I agree with the thesis of Michelle Kendrick's essay in *Virtual Realities*: cyberspace is a 'discursive site of ideological struggles to define the relationship between subjectivity and technology' (p160). In other words, cyberspace is that 'consensual hallucination' which all the writers in these volumes share, while contesting its theoretical and historical significance. For insights into the themes and issues raised by this phenomenon both collections are excellent points of purchase.

Musical Modernism

Robert Samuels

Georgina Born, *Rationalizing Culture: IRCAM, Boulez, and the Institutionalization of the Musical Avant-Garde*, University of California Press, Berkeley and Los Angeles 1995; £14.95 paperback, £45.00 cloth.

The prospect of a sociological study of IRCAM, the music research institute attached to the Centre Georges Pompidou in Paris, is one to fascinate any musician who has had contact with this formidable presence in European art musical life of the last twenty years. Generously funded by the French state, and always allied with the personality of Pierre Boulez, even after his retirement from the post of Director, it is perhaps the most visible assertion, from its steel and concrete exterior in the Place Igor Stravinsky, of the belief that what Born characterizes as the 'modernist narrative' represents the authentic history of twentieth-century art.

Born's study goes far beyond a simple account of the musical canons and aesthetics represented by the concerts put on and the pieces composed within IRCAM. The core of the book is concerned with a detailed depiction of the institute as a bureaucratic, political and social entity, as it existed in 1984, the date of her main fieldwork. And allied to this carefully constructed ethnography is a sustained examination of the interrelation of working practice with the rhetoric which has always sustained IRCAM's activities. The result is an attempt at 'the social critique of subsidized high culture' (p22), and one which makes telling points on several different levels. Despite the ten-year gap between the date of most of the interviews and observation and the study's publication, this project creates a genuinely timely book. As Born comments, IRCAM is an unusual subject for anthropological study, and yet part of a much wider artistic culture which often remains unreflective and uncritical of its claims to legitimacy, partly from a need to protect its funding within western capitalist democracies.

The fundamental architecture of IRCAM's aesthetic position scarcely needs argument. Born characterizes it as a dual opposition firstly, of modernist art music against postmodern art culture, which is addressed antagonistically by the rhetoric which justifies IRCAM's activities; and secondly, an opposition of both these cultural entities to popular music, which remains an un-named 'other', whose aesthetic legitimacy is denied. In tracing the respects in which these oppositions have influenced the development of the institute, Born argues persuasively that this ideological programme, which cannot be disentangled from Boulez's personal aesthetic agenda, has dictated events in domains as separate as the unionization of office staff and the development of advanced electronic hardware.

There are several strands to Born's narrative. First is a history of modernist musical endeavour which led eventually to IRCAM's union of a predilection for

postserial compositional technique with scientific research and potentially commercial development of technology. This history is a perceptive account of factors as diverse as Milton Babbit's aggressively scientistic definition of composition, the growth of computer music at Stanford and Bell Labs during the 1960s, and the continuing dominance of the Darmstadt Summer School for composers over a generation of young musicians in Europe. Born is concerned to stress the lineage into which IRCAM attempts to insert its own protégés – an unremittingly modernist view of musical significance which the early concert programmes of the new institute took over directly from Boulez's earlier *Domaine Musicale*. Of much more interest, however, are the chapters which describe the day-to-day interactions of internal committees, staff tensions (the designation 'composer' is a treasured accolade) and policy formulation. It may come as little surprise to learn of Boulez's avowedly autocratic methods, frequently promoting what he perceived to be young talent and grooming potential successors; more intriguing is the analysis of the culture in which financial insecurity and exploitation are willingly embraced by junior tutors, not just in hope of eventual promotion, but as part of a modernist asceticism in which it is curiously unsurprising to discover that one of the caretakers has a physics doctorate.

It is in her account of the interactions of aesthetics and technology, however, that the most valuable element of Born's study is to be found. She has a commendable ability to pick her way through the detail of changing hardware and its associated acronyms – PDP, 4A, 4B, 4C and the mighty 4X – in the service of demonstrating the heterogenous nature of the work undertaken within the apparently monolithic institution. Her account of the internal resistance to widening the scope of music created and performed under the institute's auspices (especially to improvisation), and what she describes as the 'aesthetic uncertainty' towards practically all the music ever produced by the awesomely powerful computers is an important comment, not only on the specific society of programmers and composers described here, but also on the institutionalized version of modernism which is observable in campuses and subsidized broadcasting throughout Europe and America.

There are moments when the origins of this study as a doctoral dissertation are slightly intrusive. The early chapters contain a great deal of theoretical scene-setting; a form of scholarly throat-clearing which occasionally seems unnecessary. That said, the seven chapters dealing with the 1984 material constitute an absorbing and extremely clearly written study in which the author's own recognized involvement with and investment in the subject give a critical edge to the exposure of vested interest and rhetoric. This is a book which constantly raises questions, and indeed ends with one, asking of the tendency for composers to become their own audiences, 'But is this to be desired?' One can only hope that studies of this sort will begin to orientate the musicological community towards formulating a response.