NPB. What a splendid (and relatively cheap) way of being seen to be doing something, while actually doing nothing at all! Into the *Working Nation* statement of May 1994 it went, along with vaguely-worded commitments to some of the committee's other recommendations.

The Bevis Committee may feel, with some justification, that it has done a worthwhile job of work in getting the government to consider procurement matters at all, let alone accept some of its recommendations. But the long history of political and bureaucratic inaction in this area must give rise to some scepticism.

The Scott committee, which reported in 1974, depicted a chaotic and fragmented purchasing system. That committee proposed a centralised solution in the form of an Australian Government Purchasing Commission. The situation described by Bevis seems uncannily similar, and the difficulties in partially re-centralising it, circa 1995, almost insurmountable.

The Inglis reports of 1984 and 1987 pointed to the missed opportunities for Australian high technology firms that inattention to offsets policies was causing. That problem, as Bevis seems to acknowledge, has still not been resolved. Indeed the partnership program and other purchasing policies in the IT area (such as the Systems Integration Panel) have arguably made matters worse for Australian suppliers, as it is the transnationals who have the government's 'seal of approval'.

More seriously, the trend towards privatisation and deregulation, coupled with the power of countervailing interests, will tend to undermine the industry development measures of the 1980s. The NPB will prove a flimsy bulwark indeed against these changes. As I pointed out in *The lie of the level playing field*, industry policy should be a system of inter-locking incentives. You cannot pull in two directions at once and expect coherent outcomes[2].

NOTES AND REFERENCES

1 See for example: Walter Scott, *Government procurement policy: report by committee of inquiry*, AGPS, Canberra, 1974; ASTEC *Government purchasing and offsets policies in industrial innovation*, AGPS, Canberra, 1984; Brian Inglis, *Report of the committee of review on offsets*, AGPS, Canberra, 1985; and Brian Inglis, *Committee of review on government high technology purchasing arrangements*, AGPS, Canberra, 1987.

2 Jenny Stewart, *The lie of the level playing field: industry policy and Australia's future*, Text, Melbourne, 1994

Jenny Stewart
University of Canberra

The Ordering of Time: From the Ancient Computus to the Modern Computer *by Arno Borst, translated by Andrew Winnard* (Polity Press, Cambridge, 1993) pp. x + 168, $37.95, ISBN 0-7456-1258-X (pbk)

The theme of Arno Borst's book comes across to the reader as both tightly drawn and coherent. What is difficult is deciding how best to characterise this taut construction in a few words. One way would be to say that the theme is that of the history of *the word* "computer", traced through from Julius Firmicus Maternus' use of the word *computus* (c. 335 AD), with the connotation of "the 'astrological interpretation of computed and observed planetary orbits' " (p. 20), to the present. But clearly the book is much more than just a history of a word

(or perhaps more correctly a closely related cluster of words). Another way of characterising the theme would be to say that it is that of the history of *computation* from late antique astrology and the early medieval discipline of compilers of Paschal (or Easter) tables and ecclesiastical calendars, via the secular commercial practices of the Renaissance and Early Modern periods, to the esoteric mysteries of late twentieth century computer scientists. But this is not quite adequate a characterisation either, for the book does not really have a great deal to say about computation *per se*. Perhaps, it would be truer to say that it is the history of *aids* to calculation, from human fingers (or *digits*), to the abacus and astrolabe, to the weight-driven mechanical clock, to the slide rule and early calculating machines, to "clocking in" machines and the general purpose computer. But to say that would be to create the impression that Borst's book belongs under the rubric of the history of technology. But, while there are speculative forays into the philosophy of technology, there is almost no account at all of the actual origins and development of the devices which are discussed. The book is as free of discussion of post office relays, valves and silicon chips as it is of foliots and verges, locking indents or crown and count wheels.

We could, however, change tack entirely and turn from the sub to the main title of the English edition, and characterise the book as a history of the ordering of time from late Antiquity to the present. Certainly, the volume has much to say about time. However, it is not a pocket of time in Western civilisation comparable, say, to Whitrow's *Time in History!* [1]. In so far as Borst's book is a history of time, it is such from only a limited perspective; just as Stephen Hawking's brilliant, but none too accurately titled, *A Brief History of Time* [2] is a history of time only within the limits of the horizons of cosmology and related branches of physics.

However, perhaps the best way of characterising the work is to say that is it a history of the word "computer"; but one which, in tracing that history, both draws in the history of calculation and of computational aids and instruments, and, moreover, sheds light on changing ideas concerning the ordering of time and (to a limited degree) changing conceptions of the nature of time.

The story Borst has to tell is a fascinating and original one. We all know that the history of computers takes us back to seventeenth century calculating machines, and even earlier to the abacus, but there can be very few people who have ever considered the possibility that the history of the word "computer" (and indeed, in a certain respect, the history of the device as well) might take us back to late Antiquity and, in a very special way, to the early medieval composition of Paschal tables. It is in his account of the early medieval *computus* (or its variant *compotus*) that the book is at its most original. According to Borst (pp. 28-29), it is with Cassiodorus and his circle at the beginning of the sixth century AD that the word *computus* came to connote the calculation of the date of Easter and the compilation of Paschal tables.

The long-enduring Christian preoccupation with Paschal computation and calendrical issues tends to be dismissed today as symptomatic of an imagined foggy, mystical, paranoid world of the Dark Ages and the medieval cloister; and, as such, of no greater significance than medieval calculations of the number of angels which could dance on the head of a pin. The truth of the matter is that the need Christians had to devise an ecclesiastical calendar which would combine the Roman civil tropical year (which determined the schematic months, and on which the death days of martyrs and other significant events were recorded) with the Jewish luni-solar calendar (the use of which was demanded by fidelity to the Gospels and the link between the Jewish and Christian Passovers) led to the creation of an important computational discipline which was anything but peripheral to medieval learning.

Paschal tables of course included a great deal of calendrical and astronomical information in addition to the date of Easter and its dependent festivals. Moreover, the *compotista* was

not only a compiler of Paschal tables but a writer of martyrologies and chronicles. The *computus*, indeed, became the backbone of a wide-ranging medieval discipline which incorporated studies of the age of the cosmos, of the nature of historical time, of the principles of time reckoning and the concordance of different calendars, of planetary astronomy, of the development of instruments for the measurement of time and for automatic computation. There was little, indeed, which was not in one way or another informed or fertilised by the *computus*. Eventually, the science of the *computus* was destined to decline into the blind application of received rules, and calendars were destined to become choked with inane astrological predictions. But by this time the baton had been passed on to the mathematicians, scientists and historians of the Renaissance and Early Modern world.

Borst has done scholarship a major service in rescuing the *computus* from historical oblivion. But, despite the thoroughness with which he traces the central role which the *computus* occupied in the development of Western learning, there is one rather strange omission in his analysis. He notes, as do others, the decline of the ancient tradition of the chronicle after the time of Bede, but what he fails to note is now widely recognised role which the Paschal tables played in the later medieval re-invention of the chronicle. This arose from the habit of possessors of Paschal tables of jotting down in their margins, or between the lines, events which occurred in a particular year. When, having detached itself from the tables, the new medieval *genre* reached maturity it was able to provide a foundation for the writing of history ordered in accordance with a linear time scale provided by the open-ended succession of the Years of Grace.

Arno Borst's book is an immensely scholarly piece of historical writing which fits, broadly speaking, into the tradition of the history of ideas. That is not to say that it is not possible to question its historical accuracy in places. One particularly dubious judgment is the placing of the invention of the weight-driven mechanical clock within the period 1300-1350 (p. 92). This seems impossibly late, and is certainly not in agreement with the consensus of scholars today that its invention belongs to the late thirteenth century. Most unfortunately, a "howler" appears in the legend to the frontispiece; though it is difficult to imagine that the blame for this lies with the author. The frontispiece reproduces the well-known early thirteenth century illustration from the *Psalter of St. Louis and Blanche of Castille* depicting an astronomer observing the heavens with the aid of an astrolabe. However, it is certainly not the case, as the legend avers, that he is also using a "telescope"!

Although the book is largely historical, Borst does devote some space at the end to considerations of the cognitive and socio-cultural impacts of the present computer revolution. However, I was unable to extract from this any very clear thesis. Perhaps the last word would have been better left to Dean Swift, who, in *A Tale of a Tub* (1704) and *Gulliver's Travels* (1726), brilliantly anticipated the computer age. In the 'Voyage to Laputa', Swift describes a machine designed to generate books automatically (Swift's own drawing for the first edition of *Gulliver's Travels* is reproduced by Borst on p. 112). Swift was in fact, with extraordinary prophetic insight, satirising the modern computer. As Borst notes, what the Dean divined about his imagined machine was that: "The time used by the device and its operator was the ahistorical moment rather than the universal history, its number the amassed quantity rather than qualitative evaluation, its language a system of symbols lacking any deeper meaning" (p. 112).

Despite the learning which informs the text, this is a book which is totally accessible to the non-expert and deserves a wide readership. (I shall certainly be adding it to the "Recommended Reading" list for the theory of time course I teach.) The illustrations are well selected and, though the paper doesn't make for high grade reproduction, the quality is, for the most part, satisfactory. As far as I can judge, the translation is generally sound, although there were places where I suspected that a rather freer

approach to the German original might have enhanced the flow and comprehensibility of the text.

NOTES AND REFERENCES

1 G. J. Whitrow, *Time in History: The Evolution of Our General Awareness of Time and Temporal Perspective,* Oxford University Press, Oxford, 1988.
2 S. W. Hawking, *A Brief History of Time: From the Big Bang to Black Holes,* Bantam, London, 1988.

Guy Freeland
University of New South Wales

Women, information technology, & scholarship *edited by H. Jeanie Taylor, Cheris Kramarae and Maureen Ebben* (University of Illinois, Urbana-Champaign, 1993), pp. 127, US $10, ISBN 1-882875-00-1.

This slim work, the product of the Women, Information Technology, and Scholarship (WITS) Colloquium of the Center for Advanced Study of the Urbana-Champaign campus of the University of Illinois, is an attempt to focus on some of the key issues faced by women trying, as the Introduction states, "to establish our rightful place within the complex nexus of new information technologies".

Written in 1993, and alive to the male domination of the computer profession, the editors and contributors turn a specific lens on what is happening in American universities. Although knowledge of information technology systems is now required for much academic work, the editors note a great disparity between women and men in computer use. "On most campuses the science and technology information and policy making groups", they stress, "are composed primarily of men". Given the consequences of technology-push and a dominant male enthusiasm for the new technologies, their concern is directed to flagging key areas where women's perceptions and input in the adoption and development of new information technologies can have their due effect.

These areas range across computerized individual instruction in school and university (will this, they ask, ultimately eliminate the important humanizing communication of student-teacher interaction?); the presentation and growth of data as 'knowledge' (what kinds of 'thinking and excluding' are scholars likely to be doing with the increased use of information technology?); and electronic publishing (there is, they allege, evidence that very little of the research on women and minorities is included in existing and developing electronic data bases of the humanities and social and behavioural sciences. "If women aren't involved in the classification systems of the new electronic publishing", the editors conclude, 'women will be excluded not only in the texts but also in the metatexts".

Aware of this last challenge, two of the contributors, Dale Spender and Cheris Kramarae, are currently editing a CD-ROM version of the *International Encyclopaedia of Women's Studies* to ensure that at least one major reference work involving international research on women will be available electronically.

The book, while aiming to be 'holistic', poses, but does not deeply examine, its spin of ideas. Brief contributed papers touch on women and men on electronic networks; changes in academic concepts of privacy, originality and ownership of ideas; publishing in an elec-