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*The Computer Revolution in Canada: Building National Technological Competence.* By John N. Vardalas. (Cambridge, MA: MIT Press, 2001. vi + 424 p., index. ISBN 0-262-22064-4 US\$45.)

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[Aller au sommaire du numéro](#)

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*The Computer Revolution in Canada: Building National Technological Competence.* By John N. Vardalas. (Cambridge, MA: MIT Press, 2001. vi + 424 p., index. ISBN 0-262-22064-4 US\$45.)

*The Computer Revolution in Canada* does a great service exploring the foundations of our computer based society. It is the tale of a handful of computers designed and constructed in Canada, by Canadians, and for the most part, for Canadians, from the first military sponsored academic research in the late 1940s to industry and government collaborations in the mid 1970s. The subtitle, *Building National Technological Competence*, provides the overall theme, of scrambling in our own peculiar ways to transform the accumulating computer engineering know-how into broad national capability in technology.

Without question, this book is the best historical treatment to date of Canadian computing. The literature on the subject is rather slim: we have Beverly Bleakeley and Jean LaPrairie's anecdotal *Entering the Computer Age*; David Thomas's quick-paced *Knights of the New Technology*; and a special issue of *IEEE Annals of the History of Computing* dedicated to Canadian computing.<sup>1</sup> Readers may be also familiar with the book Vardalas co-authored with Norman Ball, *Ferranti-Packard*.<sup>2</sup> While the material does overlap, this book is primarily a corporate history, and the latter emphasizes the contextual issues of computer research and development. Vardalas has wrapped many of the stories and memories from these sources within a tight contextual analysis to produce a thoroughly researched, technically astute, and highly readable text.

In 1946 plans were in place at the University of Toronto to build or buy their own computer. By 1952 a prototype was operational, making this one of the first organizations in the world with a digital electronic computer. This is the logical starting point for Vardalas, but he emphasizes that the military provided the funding and much of the urgency, not mere academic curiosity. Specifically, the Defense Research Board in conjunction with the National Research Council sponsored the project, to obtain high-speed computing power for the country and, in particular, the accelerating atomic research at Chalk River. These were

powerful masters with a specific need. When it became apparent that the Toronto prototype was years from completion, they forced the University to purchase an early commercial computer and drop the electronics research.

The Royal Canadian Navy (RCN) also turned to digital electronics, in pursuit of self-reliance. During Second World War, the RCN began to specialize in anti-submarine warfare; post-war research and development was aimed at solidifying this role, maintaining their military status on the North Atlantic, and lifting domestic industrial electronics research to self-sustaining levels. The resulting Digital Automated Tracking And Resolving (DATAR) anti-submarine system far exceeded the capabilities of existing British or American systems, but a not-invented-here preference and unmatchable United States Navy crash research program sank the project and the Navy's ambitions.

It was a partial success in that their primary industrial contractor, Ferranti Canada, emerged as a leader in digital electronics development in Canada. Surprisingly, this subsidiary of Ferranti in United Kingdom (UK) operated with considerable autonomy in this area, despite that their parent was also designing computers. Vardalas presents this as convincing evidence against the conventional argument that Canadian industry is doomed to passive branch plant status. Normally an electric transformer and meter manufacturer, Ferranti Canada made several forays into the civilian computer market, taking advantage of knowledge gained on the DATAR project. Public enterprise provided entry points for the world's first computerized mail sorting prototype for Canada Post and the world's first computerized airline reservation system for Trans-Canada Air Lines (now Air Canada). The apogee was the FP6000, a mid-level general-purpose computer and technological marvel—the first true time-sharing, multi-programmable computer. Not even International Business Machines (IBM) could match the features, but few buyers appeared. In 1963 Ferranti UK sold off their non-military computing divisions to International Computers and Tabulators Limited (ICT). The solid design of the FP6000 clinched the deal; and ICT rebadged it the 1900 series, which went on to considerable success in Europe.

This event is often interpreted negatively: a thoughtless foreign owner who destroyed the nascent Canadian computer industry and broke the tight Ferranti design team. However, Vardalas again offers a deeper interpretation. The engineers knew full well they could not compete with IBM on their turf, leading to a remarkably unique and innovative machine. But, they ignored market realities: customers needed software, service, and peripherals. As a relatively small company, they could not adequately supply these, dooming the FP6000 in this country.

There was a silver lining. Fracturing the research and development group dispersed their knowledge across the country, jump starting several other successful high-tech ventures.

In the following chapters Vardalas explores the Canadian government's reaction to losing the FP6000 and their attempts to nurture a native computer industry back to life through two United States owned subsidiaries. Sperry-Canada carved an increasingly exclusive niche in numerical control machine tools, eventually selling the world's first computer numerical control system. But that a subsidiary could initiate and carry to market this technology outside of the parent's control complicated government attempts at assistance, and again, innovative work was lost to foreign masters. Later, when Control Data Corporation sought to move the design and manufacturing of their next generation computer to Canada, the government was eager to respond with historically high levels of financial support. In many ways, the resulting Cyber 170 series saved the company's entire computer systems business, making it one of the few Canadian success stories.

Analyzing military and political attempts to influence domestic technological capacity, Vardalas escapes the pessimistic shadow of the Avro Arrow; he clearly rejects the received generalization that foreign owned Canadian subsidiaries are incapable of research and development. The value of these conclusions has already been recognized. The book is based on his dissertation, for which he shared the 1998 Canadian Historical Association's John Bullen Prize for an outstanding historical thesis written by a Canadian accepted for the doctoral degree.<sup>3</sup>

It must be said, however, that the history of Canadian computing is far from complete. Unexplored is the large and prosperous software and services industry which formed in the vacuum of substantial hardware development in the 1960s and 1970s, followed by the microcomputer revolution in the late 1970s, spawning several more Canadian success stories. The roots of this story can also be found at the University of Toronto, among the first entrepreneurial programmers of the 1950s, and computer scientists of the 1960s, figures Vardalas can only introduce to readers. Regardless these minor quibbles, *The Computer Revolution in Canada* is, overall, an important book.

Scott M. Campbell

1. Beverly Bleakeley and Jean LaPrairie, *Entering the Computer Age: The Computer Industry in Canada* (Agincourt: The Book Society of Canada, 1982). David Thomas, *Knights of the New Technology: The Inside Story of Canada's Computer Elite* (Toronto: Key-Porter Books, 1983). *IEEE Annals of the History of Computing* 16, 2 (1994).

2. Norman Ball and John Vardalas, *Ferranti-Packard: Pioneers in Canadian Electrical Manufacturing* (Montreal: McGill-Queen's University Press, 1994).
3. John Vardalas, "*Moving Up the Learning Curve*": *The Digital Electronic Revolution in Canada, 1945–1970* (Ottawa: University of Ottawa, doctoral dissertation, 1997).

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