It was harder to be a politician than it was in the days of Leslie Frost. In the old Ontario, "the market would dictate choices and the resentments of the losers tended to dissipate for lack of a target. Now that planners tried to dictate choices, politicians would be the target of the resentments" (p. 249).

There is a fascinating underground stream in this biography which surfaces from time to time. Robarts seems to have mirrored within himself the contradictions over which he was presiding. Although his intellectual universe was that of old Ontario, he was drawn to the new on another level. His home town, his wife of many years, and the respectability of his roots, were gradually abandoned for the moral ambiguity of the Toronto metropolis and its temptations of wine and women. "Not only had his own roots been deep in the old Ontario that was passing, but now the deterioration of his personal life meant that he was too often himself adrift, a victim of swirling political and personal winds" (p. 206). In 1971, he reached the limits of his public career. As he announced his retirement, he told a reporter: "I am a product of my times exactly, and my time is finished" (p. 260). He remarried a younger women and cut himself from his old friends. One morning in 1982, he stepped into the bathroom and took his own life.

It was a perplexing ending to a 'success' story, and one which inevitably calls into question the inner stability of Tory Ontario. This book only intermittently responds to such questions, but it does raise them. And there is, early on in Robarts' life, an extraordinary hint of the darkness at the end. In his grade twelve yearbook of 1934, young Robarts had a composition called 'Retribution':

> There are two characters: a lone scientist trying to discover the secret of alchemy, and a chattering, 'almost human' monkey. When the monkey's noise distracts the scientist, he beats the little animal unmercifully. Then, just as the scientist succeeds in producing gold from lead, the monkey leaps into the apparatus in a frenzy, smashing everything. At the end of 'Retribution' we have an insane scientist, a dead monkey, and a wilderness of broken glass (p. 8).

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Dianne Newell — *Technology on the Frontier. Mining in Old Ontario*. Vancouver: University of British Columbia Press, 1986. Pp. 220.

Perhaps the one theme that has most preoccupied the small but growing number of scholars engaged in the history of Canadian technology is the notion that, historically, Canadian technology cannot be dismissed merely as "borrowed" technology, imported wholesale from Britain and the United States. Dianne Newell's *Technology on the Frontier* is a pioneering attempt to describe how, in actuality, industrial practice was introduced into a Canadian setting: the mining regions of southeastern Ontario, the western peninsula, and the Upper Great Lakes before 1890. Professor Newell's book is a rare example of Canadian economic history informed by a sustained concentration on the fundamental *practical* factors, material and technical, in production. By no means a narrowly conceived study, the book has the additional virtue of providing a sound general introduction to nineteenth-century Ontario mining. Technology, ordinarily ignored in Canadian historiography, was a key variable in determining the vicissitudes of "frontier" enterprise. *Technology on the Frontier* demonstrates the value of understanding material environments and the complex patterns of technological innovation and diffusion in analyzing regional and industrial development. Moreover, while accounts of technological innovation commonly concentrate on single aspects of the process "such as invention, diffusion, adaptation, or [technological] lag" (p. 1). *Technology on the Frontier* broadens the scope to include the entire progression of events from initial stages of technical development to eventual routine application. The result is a more satisfyingly complete account of technological change.

Although Ontario mining *did* depend heavily on infusions of British and American practice, imported technology invariably demanded some measure of experimentation, "adaptive change," and on occasion, wholesale improvements on existing techniques. Even within the one province, regional patterns varied. In the salt and petroleum-producing fields of the western peninsula, few technical solutions existed for local problems in production and storage. The general infancy of petroleum production both inside Ontario and without, the distinctive physical characteristics of petroleum (especially its flammability), and impurities within regional oil and salt deposits all demanded considerable development of new technology. Innovations ranged from comparatively sophisticated scientific processes to more elementary common-sense improvements based on practical observation. The unpleasant sulphureous odour created by locally refined illuminating oil, for example, inspired no fewer than seventeen chemical patents for deodorizing petroleum. Developments in drilling and pumping "took on the characteristics of a distinctively Canadian system" (p. 127) and were eventually imported throughout North America, Asia, and Eastern Europe by Ontario-trained drillers.

By contrast, silver and copper mining on the north shores of Lake Huron and Lake Superior generated very little new technology, the one notable exception being the Frue Vanner developed at the Silver Islet Mine in the mid-seventies. This became a common fixture internationally to separate metals-rick ore "concentrates" from the ground. Northern Ontario mining was capital-intensive, and depended almost entirely on advanced engineering proven in the older mining regions of Britain and the United States. Mining's main challenges in the North, Newell acknowledges, were geological and geographical: unpredictable mineral veins, a reliance on comparatively inefficient wood fuels, daunting transportation and labour shortages created by severe frontier isolation, and the distinct seasonality of climate. Technological innovation nevertheless remained a critical variable. Ironically, while the congenial geographical setting of southeastern Ontario ought to have encouraged equal or greater imports of foreign high technology, local factors again intervened: weak mineral deposits and disappointing market prices. As might be expected, the most successful innovations throughout Ontario were, in general, limited in scale, simple to maintain, and exploited cheap local materials for fuel and constriction – particularly wood.

While *Technology on the Frontier* is a decidedly competent, and often very interesting piece of original scholarship, difficulties do appear. It is regrettable that more attention was not paid to integrating narrative and analysis in the crucial fourth to sixth chapters. Here entrepreneurial and engineering experiences within the regions are described. The argument is obscured, in the absence of clear direction, by a welter of detail — albeit much of it valuable in understanding the fate of individual enterprises. A strong summary conclusion repairs much of the damage, and the introductory first chapter *does* introduce readers new to the field to a number of basic concepts and arguments in history of technology — especially those relating to patterns in inventiveness and geographical diffusions. But there virtually all further discussion ceases, and Newell is not clear as to which concepts she finds most convincing, and applicable to the Ontario situation. Throughout, social historians will find disappointingly few references — though some do exist — to influences exerted on technological practice by labouring traditions, strategies of wok organization, and informal and organizational contacts among mining professionals and managers.

Quite possibly, weaknesses within the evidence presented limitations. In the absence of more extensive manuscript documentation the author has relied largely on such printed sources as annual reports of the Geological Survey of Canada and an impressive list of British, American, and Canadian scientific and technical journals. While in many respects excellent sources (engineering journals are, in particular, widely ignored by Canadian historians), many publications of the period are better at describing *which* methods and machinery were in place than in indicating the routes by which these arrived, as well as the various social and cultural factors affecting introduction and evaluation. Considerable interpretation becomes necessary. Although by no means universal, problems of evidence become most apparent in the third and most interesting chapter of the book — on diffusion mechanisms. It is reasonable to assume that mine managers read British, American, and Canadian engineering and scientific journals and then applied their knowledge. It is also reasonable to assume

that Cornish copper miners brought practical experience with them to the north shores of Lakes Huron and Superior from Michigan and that, moreover, the marketing of patented inventions through publications, exhibitions, and direct contacts with mine managers was a significant form of technical communication. Yet Newell acknowledges finding only "indirect" (p. 44) evidence that these and other mechanisms actually influenced specific mining practices in any consistent manner. While generally cautious, at the same time she suggests perhaps too central a role for the Geological Survey of Canada in educating mining companies on developments in technology. The GSC's activities in promoting technology transfer were a distinctly secondary function, and GSC publications, for example, normally carried little more than abbreviated descriptions of company mining plants.

In another respect, more analysis should also have been helpful. Some technical descriptions are ambiguous and demand prior knowledge on the part of the reader. It will not be clear, for example, why the way individual stamp mill components were designed helped make the stamp mill one of mining's most widely used mill "appliances". These components are not well described, nor — in a number of instances — are certain other aspects of milling technique. Here, and in describing other elements in mining, simple line drawings might well have clarified details not easily conveyed in words. It is critical that a reader get "inside" the technology to understand clearly why its physical and operational characteristics were appropriate or inappropriate to its task. In not always providing this insight, *Technology on the Frontier* fails in communicating entirely the logic behind individual innovations and the innovative process as a whole.

Future studies of Canadian industrial technology may go beyond questions of innovation, diffusion, and adaptation here treated primarily as *economic* processes, to analyse in greater depth the social conditions of technical change, the institutionalization of education and discovery, and the influences of technology, in turn, on Canadian social and cultural development. The development of "practical culture" (or what might also be termed "technical culture") may prove to have been more central to the nineteenth century Canadian experience than most historians have acknowledged. In the meantime, Professor Newell has provided a useful and vigorously researched account of a difficult subject which should stimulate further studies on similar topics.

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Denis G. Paz — *The Priesthoods and Apostasies of Pierce Connelly: A Study of Victorian Conversion and Anti-Catholicism*. Lewiston and Queenston: Edwin Mellen Press, 1986. Pp. xv, 422. Appendices Index.

Pierce Connelly (1804-1883) was born in Pennsylvania of Scotch-Irish stock, a birth-right Presbyterian. In his early twenties, he converted to Anglicanism and soon became a priest of the American Episcopal Church (1828). In 1834, he shocked his small congregation at Trinity Church in Natchez, Mississippi, by announcing his resignation for the purpose of studying the truth about Roman Catholicism. After six months in Rome, he and his wife Cornelia formally converted to Roman Catholicism.

Connelly seems to have been misled by the considerable attention that he received at this stage from Roman Catholic dignitaries (bishops, cardinals, scholars, and lay churchmen, notably the sixteenth Earl of Shrewsbury and his circle) into the hope of ordination without delay in Roman orders. But the Church chose to test him for a while; and so it was not until 1845, after several humiliating chapters, working as a teacher and in a bank, crossing and re-crossing the Atlantic, visiting and re-visiting Rome, that he was accepted as a Roman Catholic priest and posted to England. Meanwhile, Cornelia and Pierce, still professing their love for each other, secured a deed of separation at Rome