Gingras, Yves. *Physics and the Rise of Scientific Research in Canada*. Montreal & Kingston: McGill-Queen's University Press, (1991). xii, 290 pages. Price: $37.50. Reviewed by L.A.K. Watt, University of Waterloo, Department of Electrical and Computer Engineering.

This book describes the development of research in physics in Canada from 1850 to the early 1960s. The book is detailed and well researched (the author provides almost 500 references) and the story is well told. The major emphasis is on the period before the Second World War. There is not much discussion of the role of physicists in the war effort or of the influence on post-war developments of scientists who worked at places such as Chalk River. The history of that period has been covered elsewhere. This book provides a valuable and interesting account of the earlier period with which most readers will be less familiar; and, while it will be of particular interest to physicists, it should also have a broader appeal since similar developments took place in the other scientific disciplines.

The book is divided into three parts. The first part which comprises over half of the book, tells how university physicists in the late 1800s and early 1900s made the transition from a purely teaching role to one involving both teaching and research, how they struggled to find resources to support their research, and how they finally succeeded in establishing a flourishing research enterprise.

In the beginning, Canadian universities were exclusively teaching institutions. The concept of the research university, which originated in Germany in the early 1800s, did not reach this continent until the latter part of the century. In the 1850s physics was taught as a service course for civil engineers who were in demand for work on the railroad. It was not until the 1800s, when physicists trained in Britain joined the departments at Dalhousie, McGill and Toronto, that research began to develop in the English-Canadian universities. Canadians J.G. McGregor at Dalhousie and John C. McLennan at Toronto, and Britishers H.L. Callendar and Ernest Rutherford at McGill led the effort.

In French Canada the situation was quite different. "There the educational system, organized around the classical colleges and controlled completely by the clergy, retained for a long time its primary function of reproducing of the traditional élites and their culture." (p. 21). It wasn't until the early 1950s that Quebec universities trained the first generation of francophone physicists. In the early years, both Laval and the Université de Montréal had to rely on French-speaking European physicists to head their departments.

The book describes how the early research pioneers struggled to obtain recognition. Resources were hard to come by and there was a continual battle for space and equipment. Gingras quotes from a letter written by McLennan to the head of his department in 1897 when he was a demonstrator at Toronto in which he points out "that the growth in student numbers was such that "it has become quite impossible to carry out my laboratory work with desirable efficiency unless more room is placed at my disposal" " (p. 51). Eleven years later McLennan, by then head of the department, received a similar letter from E.F. Burton, one of his demonstrators.

There was also no support for graduate students. When American universities, led by Johns Hopkins, began offering scholarships to graduate students regardless of nationality, the best Canadian students were attracted south. In an effort to counteract this, some Canadian universities established their own scholarships and, in the early 1900s, Toronto and McGill introduced the first doctoral programs. The situation was helped somewhat when, in 1890, Britain established the 1851 Exhibition Scholarships and included four Canadian universities, McGill, Toronto, Queen's and Dalhousie, in the program. Even though there were few of them, these scholarships played a significant role in supporting young Canadian scientists, many of whom later took up academic positions in Canada and achieved distinction. However, it wasn't until the establishment of the National Research Council (N.R.C.) in 1916 that the twin problems of research funding and graduate student support were finally addressed.

In the meantime new universities were being established, particularly in western Canada. The University of Manitoba, established in 1877, accepted its first students in 1904. The University of Alberta opened its doors in 1908, the University of Saskatchewan the following year and the University of British Columbia six years later. The First World War had brought about a greater realization of the importance of research and "By the 1920s research was considered an integral part of the modern university" (p.58). This made the need for an adequate program of research and graduate student support even more urgent and the role of N.R.C. became critical. The book documents the profound impact N.R.C. funding had on research activity in the universities and shows that "The creation of grants for research and scholarships for students by the N.R.C. ... led to a rapid expansion in research in Canadian universities..." (p. 66).

The second part of the book, "Reforming Institutions," describes the efforts of the physicists to bring about changes in the Royal Society of Canada so it

would better serve their interests. Founded in 1882, the Royal Society "was intended to bring together the most eminent representatives of the main scientific and literary disciplines" (p. 85). One of its functions was to sponsor annual meetings at which papers were presented and to publish them. Since not many of the Society's members in those early years were active in scholarly work, the papers generally dealt with topics of a didactic nature and there was no pressure for rapid publication. As more of the members, particularly the scientists, became active in research, timely publication became important and the Society's journal, the *Transactions*, did not meet the need. As a result, the physicists published in British or American journals while they continued to work towards reforming the Society. The book describes in detail how the physicists, led by Rutherford and McLennan, worked to bring about the necessary changes. One strategy was to increase the membership of the Society by adding colleagues who shared their views. Their efforts in this were so successful that the Royal Society of Canada soon came to resemble the American Physical Society, to which many Canadians belonged, rather than the Britain's elite Royal Society, after which it had originally been patterned.

The research and publishing activity of the physicists continued to expand and the author describes how the Royal Society continued to struggle to accommodate the growth through its *Transactions*. The number of issues was increased to four a year, but, in 1917, the federal government reduced the Society's grant and it was forced to return to a single issue. The immediate problem was solved when N.R.C. came to the rescue with funding support. However, the physicists were convinced that their publication needs would never be met until they had their own journal. Members of the N.R.C., however, were not convinced and the Royal Society's *Transactions*, supported by N.R.C., remained the only Canadian scientific journal until 1929.

By the mid-1920's, several prominent Canadian scientists had become convinced that a change was necessary and steps were taken that eventually led to the establishment of the *Canadian Journal of Research (CJR)*, the first issue of which appeared in July 1929. The scientists had their disciplinary journal. "...the *CJR* replaced the *Transactions* of the Royal Society and ensured the diffusion of research results produced in Canada" (p. 111). The book includes a number of tables and graphs showing the impact of the *CJR* on publication patterns as well as valuable data on citations that demonstrate the high quality of the research being done by Canadian physicists (pp. 107-111). After the Second World War, it was clear that the *CJR* could no longer meet the often conflicting demands of the different disciplines and the surging growth in

research output and, in 1951, it was replaced by six different disciplinary journals, one of which was the *Canadian Journal of Physics*. The physicists finally had their own journal.

The final section of the book, *Changing Definitions*, describes the efforts of the physicists to establish an identity with a collective voice, to become what the author calls a "social category" (p. 117). This did not prove to be easy because there were two groups of physicists with different views of themselves and of how they should be viewed by others. Physicists working in industry wanted to form a professional association similar to that of the engineers; the academic physicists, on the other hand, saw themselves as "professionals," not in the legal sense as engineers and medical doctors did, but in what the author calls an "ethical sense" (p. 118). The book describes in detail the struggle between these two factions which came to a head following the second World War and centred around the issue of pending federal legislation concerning collective bargaining. The industrial group wanted to establish a Canadian Association of Professional Physicists (C.A.P.P.) to represent the interest of "those whose employment depends on the utilization of the science of physics" (p. 130) and applied for a federal charter. The academic physicists, however, felt that such an approach "depreciated university physicists" (p. 131). The final outcome was really preordained, at least in part, because the university physicists outnumbered their industrial colleagues. In the end the C.A.P.P. failed to get a federal charter and, in 1951, the Canadian Association of Physicists (C.A.P.) was established. Canadian physicists had developed from "...a simple aggregate of individuals at the end of the first World War [to] a well constituted group...that could now defend its long- and short-term interests...and define implicitly and explicitly the place due scientific research among other societal activities" (p. 149). This book provides an excellent account of that journey.

Richardson, Douglas. *A Not Unsightly Building: University College and its History.* Toronto: Mosaic Press for University College, (1990). ix, 174 pages. Price: $29.95. Reviewed by Charles M. Johnston, Professor Emeritus of History, McMaster University.

Many years ago, while visiting the University of Toronto campus with a friend who happened to be a student there, I was regaled on its wonders and solemnly advised how it, unlike presumably most other Canadian campuses, including