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BOOK REVIEWS/COMPTES RENDUS

Science and the Canadian Pulp and Paper Industry 1903-1933.
James P. Hull, York University, Department of History, unpublished PhD dissertation, 1985. Pp xi + 465.

This dissertation examines the transformation of the pulp and paper industry from one based on craft tradition to one founded on science and possessed of a knowledge-base separate from that of other wood-using industries. Hull approaches this revolution from the perspective of the structure of the industry's knowledge-base, by which he means both its infrastructure as well as its scientific agenda. His emphasis is on the impact, or push, of science on the pulp and paper industry. This approach stands in sharp contrast to one which sees the pull of the market as the cause of change. The structure of knowledge, then, serves to organize Hull's work which, for the most part, is devoted to the changes taking place in the early twentieth century in the processes of pulp and paper manufacturing, the organization and research programme of knowledge in the industry, and in the industry's knowledge environment.

The thesis begins with some background chapters. A lengthy introduction provides the general features of the pulp and paper industry in Canada, which by 1924 was the most important manufacturing industry in the country, and of the emergence of industrial research. An excellent overview of the movement for scientific and industrial research in Canada in the early part of this century is given in chapter one. Its focus is on the public lobby surrounding the birth of the NRC. Chapter two reviews the processes of pulp and paper manufacturing and notes the central role of testing in controlling these processes. The next two chapters examine the organization and programme of science in the industry before 1920. Hull sees the period around that year as a watershed in the revolution taking place in the industry's knowledge structure. A series of related transitions were occurring: from a craft tradition to a chemical industry, from a wood to a cellulose industry, from control by craftsmen to control by university-trained chemists and chemical engineers and from no research infrastructure to a well-developed one. Chapter three looks at the emergence of an infrastructure for knowledge generation, storage and transmission. It centres on the establishment of the Forest Products Laboratory (FPL), but also includes such other institutions as the *Pulp and Paper Magazine of Canada*, the Canadian Pulp and Paper Association and the latter's Technical Section. Chapter four describes the research agenda of the FPL. The remaining three chapters of the dissertation review events after 1920. While an infrastructure had arisen prior to that year, the relations among the three chief stakeholders, university, government and industry, were still in a state of flux. In large part this was due, it appears from Hull's thesis, to the growth of research in the industry and to a shift in the focus of pulp and paper research from wood to cellulose and lignin studies. How joint institutional arrangements were settled with the formation of PAPRICAN in 1926 is explored in chapter five. Chapter six looks

at the corresponding growth of an elaborate and sophisticated research programme within the FPL/PAPRICAN. The final chapter reviews science inside the industry. It deals with the issue of why firms participated in cooperative research. It also underlines the strength of science in the mills through three case studies: two short reviews of the Ontario Paper Company and the Howard Smith Company, and a longer one of Abitibi Power and Paper.

Hull's work provides an excellent framework for further studies on science in the pulp and paper industry. It is very thoroughly researched and makes good use of quantitative results which are well woven into the text. It clearly points to the need for further research, especially in the history of PAPRICAN and of science within various firms. A strong feature of the thesis is the comparison it makes between events in the Canadian pulp and paper industry and those of the American industry as well as in other industries. It often refers to the process of scientification occurring in such other industries as glass, sugar, dairy and boiler manufacturing. Those wishing to work in the history of the pulp and paper industry or in industrial research will profit from reading Hull's dissertation. In future work, no doubt, some will want to refine the notion of the structure of knowledge Hull uses, in the light of work in the sociology of scientific knowledge. And others will want to pursue aspects of the interface between science and industry that Hull merely scratches, for instance, the incorporation of science into production or the links between a firm's business and technological strategies.

The most significant feature of this dissertation, in my opinion, is that it considers the events in the pulp and paper industry within the broader context of the development of R & D in Canada. Thus Hull contributes to our understanding of the emergence of R & D in this country, of the changing relationships among universities, government and industry it gave rise to, and especially to our knowledge of the growth of industrial research in Canada--a topic much neglected in the historical literature. The dissertation sends a clear message to historians in general and to historians of Canadian science and technology in particular. It shows that serious attention needs to be paid to the role of science and technology in accounts of the development of Canadian industry. It also demonstrates that the history of Canadian science and technology embraces much more than simply Canadian contributions to advancing the frontiers of academic science or to adding to the stockpile of inventions. Hull's work treats science and technology as an important and integral element of Canada's changing economy. This dissertation is an important contribution to the history of Canadian science and technology, and to how we perceive that history. It deserves to be widely read.

Philip C. Enros