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THE PROGRAMME OF THE PULP AND PAPER DIVISION, FOREST PRODUCTS LABORATORIES OF CANADA, 1913-1933*

James P. Hull**

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The Forestry Branch of the Department of the Interior created the Forest Products Laboratories (FPL) in 1913. Modelled on the United States Forest Products Laboratory (USFPL), the new facility had Divisions of Timber Tests, Wood Preservation, Wood Distillation, Timber Physics and Pulp and Paper. This marked a significant departure from the Forestry Branch's traditional concern with forests and forestry, to the industrial processes of wood-using industries -- from resource availability to resource usage. It is no coincidence that this occurred at a time when Canada's position in the huge and growing North American newsprint market was changing from a supplier of pulpwood to a manufacturer of pulp and of paper.[1]

Elsewhere, I have described the separation of the Pulp and Paper Division from the FPL in 1927 and its incorporation into the Pulp and Paper Research Institute of Canada (PAPRICAN).[2] I argued that this development was due, in part, to the refocussing of the scientific concerns of the industry from wood to cellulose and the resultant separation of the knowledge base of the pulp and paper industry from that of other industries served by the FPL. Now I wish to shift attention from institutional to programmatic matters and examine both the formal research agenda and the service bureau function of the Pulp and Paper Division.

It would be useful indeed to have a great deal more explicit information on the manner in which the research agenda of the FPL was set. Unfortunately, it does not exist. Apparently, in a very informal process, the intersection of the capabilities of the laboratories with the interests of its own personnel and the influences of industry defined the year-to-year research programme. The latter influences came most especially through the members of industry advisory committees. Following USFPL practice, an advisory committee was appointed almost as soon as the laboratories were founded; representatives of industry and of McGill University, host institution of the FPL, sat on it. This was no novelty for McGill, as a similar approach had been taken for the university's Department of Railway Transportation.[3] An early indication of the special status of the Pulp and Paper

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Division of the FPL was the organization of a separate advisory committee for the Division in 1916. Its mandate was to suggest areas of, and vet plans for, the Division's investigations, arrange for mill tests and assist in obtaining information from industry for the Division. Care was taken to represent the principal parts of the pulp and paper industry on the committee: the first members were C.B. Thorne of the Riordon company (sulphite pulp), F.A. Sabbaton of Laurentide (groundwood pulp and newsprint), H. Helin of Wayagamack Pulp and Paper (alkaline pulps) and S.F. Duncan of Provincial Paper Mills (high grade paper).

The historian of the USFPL has noted that the pulp and paper industry had a more complete experimental programme there than did other wood industries. He attributed this to the oligopolistic structure of the industry, which allowed more pressure to be brought to bear in lobbying efforts. Other wood-using industries with less concentrated structures could not articulate their needs nor lobby so effectively.[4] At least in the case of pulp and paper, the Canadian industry seems to have developed an even closer and more direct relationship with the Canadian FPL than was the American experience.

In his discussion of agricultural experimental stations in the United States, Rosenberg writes of the research entrepreneur who 'had not only to tailor a research policy to the needs of his lay constituency, but still remain aware of professional values and realities.'[5] This is an exceedingly useful concept and certainly the superintendents of the FPL fell into this category of research entrepreneurs. It is not at all difficult to see tensions between the routine, analytical and applied research functions of the FPL and long-term fundamental research. The easy conclusion is that the FPL had to pander to its industry constituency while sneaking in as much 'real' science as it could. In some measure this likely was the case. Some very strong caveats must be kept in mind, however. The pulp and paper constituency cannot simply be characterized as a lay one. The industry had competent scientists on its technical staffs.[6] By no means did such men oppose government-sponsored fundamental research, either at the FPL or elsewhere. The other side of the coin is the background and interests of the FPL staff itself. The superintendents and division chiefs were not pure science PhDs with long backgrounds in a research environment; most were young engineers.[7] Finally, while the tensions discussed certainly existed, there is little evidence of an open struggle over the setting of the research agenda between the ideals of science and the demands of industry.[8]

The FPL also seems to have been remarkably free from direct political meddling with its research programme. The USFPL certainly found itself subjected to much greater and more detailed political pressure. Congressional committees could and did dictate certain researches to that facility. Parliament took no such interest in the FPL; indeed, it took little interest at all. While minor researches would occasionally be passed on to the FPL from the Director of Forestry

or the Deputy Minister of the Interior, this was similar to other sources of demand for FPL services, rather than anything that could realistically be termed political interference.

Often, and increasingly as the years went on, the FPL engaged in cooperative research projects with private firms.[9] The movement of the FPL staff members, and later also PAPRICAN graduates, into industry facilitated these contacts. In the early years of the FPL the two most important industry cooperants were Process Engineers of Montreal and the Riordon Pulp and Paper Company. Not surprisingly, senior executives of these two firms, Judson De Cew and Carl Riordon, were members of the FPL advisory committee.

Process Engineers helped furnish equipment to the FPL, including an Erfurt sizing system. In November 1914, at Process Engineers' expensve, the FPL's O.F. Bryant inspected the Carthage, NY, plant of Sulphite Pulp and Paper Company, a user of the sizing system developed by Process Engineers. In his report to the Director of Forestry, the FPL superintendents pointed out, "This is a strictly Canadian process and for this reason is especially interesting to us.' In May and June of 1916, the Pulp and Paper Division worked with Process Engineers to make wax paper by the Waxine process, using the Erfrut System emulsifier. In addition, the firm used the FPL on occasion for routine testing and analysis of pulp and paper.

The FPL's close relationship with the Riordon company came not only through Managing Director Carl Riordon, but also through C.B. Thorne, the firm's technical chief and chairman of the Pulp and Paper Division's advisory committee. Riordon was probably the most technically advanced of all Canadian pulp and paper firms and faced special technical problems in the production of high-grade dissolving pulp (bleached sulphite) for non-paper cellulose products, rayon in particular. The earliest FPL work in microbiology was performed for Riordon. In spite of the company's own extensive technical facilities, Riordon still made use of FPL resources for the examination of pulpwood samples. This work proved of such benefit to the firm that Thorne even made the suggestion that the FPL really should charge for its technical services, a suggestion not pursued in this period.

These types of relationships must be analysed with care. It is possible of course to argue that De Cew, Riordon and Thorne exploited their positions with the advisory committees to get the government laboratory to do work for their companies. Much can be said in mitigation. There is no evidence that such work was done in preference to work for other firms. There is no reason to believe that the work done for the Riordon Company or Process Engineers was not valid in terms of the FPL's mandate. Both firms gave as well as got contributing expertise, time, facilities, equipment, materials and money. Finally, the FPL did not provide an institutional framework for firms to do proprietary research. Rather, it maintained a strict policy that no research

for private parties remained private if the results were of general interest. Perhaps surprisingly, this policy was not treated as an issue of great moment by the industry, though it implicitly constrained the private sector's relations with the government facility.

The question naturally arises of whether the activities of the FPL came into conflict with the commercial interests of particular firms or individuals. Examples of such conflict are few and of little significance. In August 1916, Quebec pulp and paper mills attempted to enlist the FPL in their fight against the province's Sunday closing laws. The FPL investigated the mills' assertion that pulp stock left in machinery over twenty-four hours would deteriorate, but this was found not to be the case.[10] In November 1919, the manufacturers of a brand of roof insulation objected to FPL statements about their product. The laboratories tested the material, found the statements to be true and so informed the manufacturers. This is the sole recorded instance of this type of dispute.[11] In 1920, the FPL discovered that a published report by its timber pathologist had been plagiarized by the author of a pulp and paper textbook. It appears that no action was taken.[12] Not until the Depression did private laboratories complain that FPL analytical and testing work competed unfairly with them. A schedule of fees for such hitherto free services was drawn up, but it is not clear whether or when this was implemented.[13]

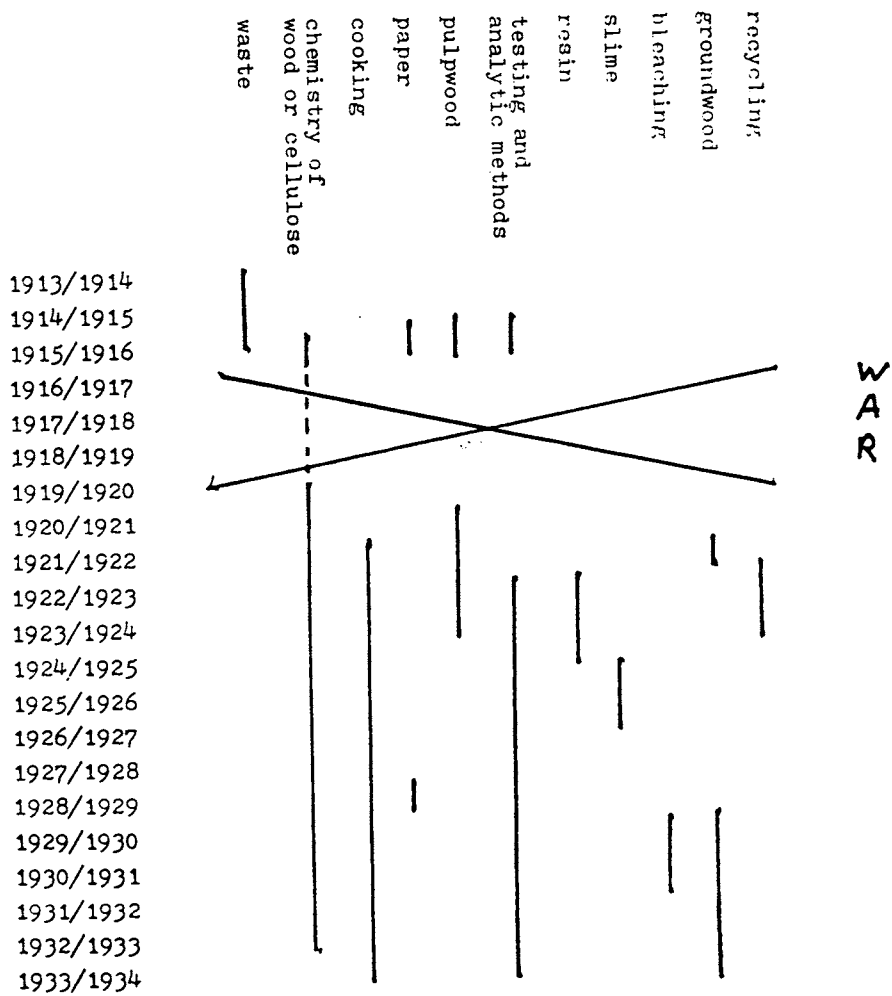
These experiences tell an interesting tale. The FPL did not steer clear of, nor could it have avoided, involvement in matters of an explicitly commercial nature. But the laboratories do seem to have manoeuvred through dangerous shoals, emerging remarkably unscathed, while providing genuinely useful and directly applicable information for industry.

The formal programme of the Pulp and Paper Division from 1913 to 1934 is summarized in Figure One.[14] These are major researches, those lasting more than one year. It shows the broad scope of the Division's investigations, touching on most of the significant areas of technical concern to the pulp and paper industry. It also indicates that these lines of investigation may be divided into two principal categories. First are those in which the FPL displayed a long-term interest, lasting over a large part of its history. These include chemical studies of wood and cellulose, the processes of pulp cooking and testing, including methodology. The second category which includes the remainder of the topics listed may be described as those areas in which the FPL had an occasional or intermittent interest.

Three reasons may be cited to explain why some areas of research received attention over a long term: 1) They were areas of consensus. All, or at least a large segment, of the industry had an interest in these issues, which would not be true of, for instance, sulphite liquor; 2) These areas were of considerable importance to the efficient operation of mills, and thus at least potentailly to the profitability of operations. This would not be true, for example, of recycling paper; 3) These areas held interest for

FIGURE ONE

PULP AND PAPER RESEARCH INTERESTS OF THE FPL



scientific investigators both in the years around World War One, and in the more sophisticated environment of the later 1920s and 1930s.

An even more interesting story is told by the record of technical inquiries which came in to the FPL (Figure Two).[15] Between 1915 and 1920 inclusive, the FPL handled 322 technical inquiries relating to pulp and paper. During this period an average of about 230 technical inquiries per year of all types were handled. Thus about one quarter of the inquiries received by the FPL in this period related to pulp and paper. Fully 40% of those inquiries came from outside the central Canada heartland of the nation's pulp and paper industry, with 20% coming from outside the country. This suggests that the FPL quickly gained a high profile for itself as one of the three most important English-language centres of pulp and paper research, along with the USFPL and the Forest Research Institute at Dehra Dun. The inquiries came not just from pulp and paper companies but from academics, Boards of Trade, government bodies and other firms both up and down stream from pulp and paper manufacturing. The inquiries were also diverse in type. No single category amounted to so much as 15% of the total handled. The 'bread and butter' categories of analysis and testing, manufacturing processes, waste and by-products and commercial inquiries constituted about half the total. All this indicates the existence of widespread demand for the type of technical services which a facility such as the FPL could offer; it was not an institution in search of a purpose. That these inquiries came to Montreal indicates that such services could not readily be obtained elsewhere.

Between January 1921 and May 1927, when the record of technical inquiries in pulp and paper ends with the administrative separation of the Division and transfer ot the other divisions to Ottawa, a further 592 such inquiries were handled. The contrast between the earlier and later periods offers valuable insights into the evolution of the technical side of the pulp and paper industry. The nature of the inquiries is far more homogeneous after 1920. To state that the service bureau function of the Division in that period consisted in analysis and testing for the pulp mills of central Canada would be a good first approximation, a statement which would not be valid for the Division's early years. Inquiries from eastern and western Canada and from abroad dropped off as a percentage of all inquiries received, as did those from government and institutional sources relative to private firms and individuals. Why this was true is not an easy question to answer. In part, it may be that alternative sources of information, of more use to other inquirers, became available. Conversely, the central Canadian pulp and paper industry most assuredly became more closely linked with the FPL Pulp and Paper Division and made heavier demands on its resources.

The more interesting and explicable change lies in the mix of inquiries by type. Most obvious is the rise in the analysis and testing category to almost 50% of all inquiries received, with no other category even accounting for 10%.

FIGURE TWO: TECHNICAL INQUIRIES

By Type:	Mar/15-Dec/20 (n=322)	Jan/21-May/27 (n=592)
Analysis & Testing	40 (12.4%)	291 (49.2%)
Manufacturing Process	45 (14%)	52 (8.8%)
Methodology of analysis, control & testing	14 (4.3%)	55 (9.3%)
Machinery & Apparatus	22 (6.8%)	15 (2.5%)
Plant Design & Construction	6 (1.9%)	4 (0.7%)
Exotic Materials	18 (5.6%)	23 (3.9%)
Non-spruce Trees	18 (5.6%)	31 (5.2%)
Special Paper Products	24 (7.5%)	56 (9.5%)
Waste & By-products	39 (12.1%)	24 (4.1%)
Commercial	34 (10.6%)	16 (2.7%)
Chipping, Baling & Storage	27 (8.4%)	14 (2.4%)
Bibliographical	16 (5%)	6 (1%)
Cellulose Products	5 (1.6%)	12 (2%)
Non-cellulose Inputs	10 (3.1%)	23 (3.9%)
Microorganisms	1 (0.3%)	13 (2.2%)
Other	22 (6.8%)	15 (2.5%)
By Inquirer:		
Private Individuals & Firms	267 (82.9%)	546 (92.2%)
Canadian Government	23 (7.1%)	18 (3%)
Institutional	32 (9.9%)	28 (4.7%)
By Place:		
Central Canada	196 (60.1%)	422 (71.3%)
Eastern Canada	19 (5.9%)	29 (4.9%)
Western Canada	29 (9%)	50 (8.4%)
United States	54 (16.8%)	70 (11.8%)
Foreign	12 (3.7%)	13 (2.2%)
Unknown	12 (3.7%)	8 (1.4%)

This can be explained and understood in two ways. This was an 'active' category; it could not normally be a simple literature search or dispatching of a pamphlet or advice. It involved laboratory work. Once the Division had solved its wartime and postwar personnel problems and as its physical facilities expanded, it was able and willing to supply such services. Conversely, it shows that firms demanded the types of analysis and testing that a relatively sophisticated facility such as the Division could provide. A demand existed from mills for information of that level for use in their day-to-day operations. The more subtle change comes in the remainder of the categories. Those which increased proportionately were the most scientifically sophisticated, including methodology, specialty and cellulose products, non-cellulose inputs and micro-organisms. Those with a low chemistry content, such as machinery, plant design, commercial inquiries, wood preparation and bibliographic searches suffered significant declines. Intermediate categories such as exotic and non-spruce materials and process studies experienced modest proportionate declines explicable more in terms of the rise in importance of other topics.

The Division performed this service bureau work for firms without charge. The superintendent of the laboratories commented on paper and fibre analysis, stating that:

> Work of this kind represents the regular technical service which is given by the laboratories and while work is of a routine character the service is a useful one to the public and cannot be had elsewhere.[16]

These inquiries also served the purpose of signalling the government laboratory to the demands of its clientele. Conversely, the work of the Division had a demonstrable effect, convincing industry of the importance of a commitment to research.

A rather obvious alternative explanation exists. It could be suggested that the Division formed a substitute for the development of such facilities. After all, why pay for what you can get free? There is a superficial attractiveness to such a position, even if no documentary evidence exists to support it. A number of arguments could be made against it, however. The Division performed services otherwise unavailable. Even the most technologically sophisticated firms turned to the Division for assistance. The Division did things for the industry, not in preference to industry doing them itself but in preference to their not being done at all. It demonstrated the usefulness of science and both implicitly and explicitly encouraged more science in mills, in concert with science boosters in the Technical Section of the Canadian Pulp and Paper Association and the *Pulp and Paper Magazine of Canada*. The existence of such a facility as the Division provided an incentive to have more sophisticated production methods in mills. The Division actively assisted mills to upgrade their technical facilities. The growth in both analysis and testing, coupled with

the growth in FPL-produced knowledge about analytical and testing *methods* for industry, and the fact of the expansion of mill laboratory facilities, provided powerful evidence that the Division successfully educated its clients to demand more technical services and, in part, to meet those demands themselves.[17]

The changes in the programme of the Pulp and Paper Division of the Forest Products Laboratories can only be understood in a context of changes in the Canadian pulp and paper industry. That industry had its start in forestry operations and imported technical knowledge. As it grew to become Canada's largest manufacturing industry and leading non-agricultural export, the knowledge structure of the pulping and papermaking processes grew as well. Technical aspects of woodlands operations consistently lagged behind advances in mill operations. The industry hired more scientists and engineers, established research units, demanded more and better science and recognized that its raw material was not wood but cellulose. The industry supported the creation of and influenced the direction of domestic institutions to provide the science and scientists it needed. Principal among these was the Pulp and Paper Division.[18]

NOTES

1. H.V. Nelles, *The Politics of Development* (Toronto, 1974).

2. James P. Hull, 'From the FPL to PAPRICAN: Science and the Pulp and Paper Industry,' *HSTC Bulletin* 23 (January 1984), 1-13.

3. 'FPL Personnel Advisory Committee,' Public Archives of Canada [PAC], RG 39, V.113, file 40683.

4. Charles August Nelson, 'A History of the Forest Products Laboratory,' (Unpublished PhD dissertation, University of Wisconsin, 1964), 161.

5. Charles E. Rosenberg, *No Other Gods* (Baltimore, 1976), 159.

6. James P. Hull, 'Early Membership of the Technical Section, Canadian Pulp and Paper Association,' *Scientia Canadensis* 26 (June 1984), 68-72.

7. O.F. Bryant to R.H. Campbell, 22 August 1917. PAC, FPL Papers, RG 39, V.20, file 43174.

8. *Cf.*, Stuart W. Leslie, 'Thomas Midgley and the Politics of Industrial Research,' *Business History Review* 54 (Winter 1980), 480-503; George Wise, 'Ionists in Industry: Physical Chemistry at General Electric, 1900-1915,' *Isis* (1983), 7-21.

9. See the *Reports* of the FPL Superintendent in PAC, RG 39, file 40567.

10. *Ibid.*

11. *Ibid.* Cf., Bruce Sinclair, *A Centennial History of the American Society of Mechanical Engineers 1880-1980* (Toronto, 1980), 214-16.

12. *Reports* of the Superintendent.

13. Minutes of the Joint Administrative Council (PAPRICAN), 19 June 1931.

14. Compiled from the *Report* of the Director of Forestry, 1913-1934.

15. *Ibid.*

16. *Ibid.*

17. Mowery, in another context, has noted that extra-mural and in-house research facilities 'rather than functioning as substitutes ... were complements ... exhibiting a division of labor in the performance of research tasks.' David C. Mowery, 'The Relationship Between Intrafirm and Contractual Forms of Industrial Research in American Manufacturing, 1900-1940,' *Explorations in Economic History* 20 (1983), 351-74.

18. These issues are explored in further depth in my York University dissertation, 'Science and the Canadian Pulp and Paper Industry, 1903-1933.'