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*CO-OPERATION BETWEEN FOREST SCHOOLS AND THE INDUSTRY IN FOREST EDUCATION.

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WOOD-USING industries of Canada owe a good deal to our forest schools and their leaders; yet both the schools and the industry realize that private employment of college graduates is a problem. It is a problem which can be solved to the advantage of all concerned only through their joint efforts. Contact and co-operation between our wood-using industries and our forest schools are inadequate; both groups are, however, conscious of this fact and are willing to co-operate to a much greater extent. To establish effective contact, much thought as well as considerable time and effort may be required, but this should be well repaid by the result. Let us see how the efforts of our schools and the industry could be combined to fit our young foresters better for their work.

The following are my personal views, as I have not asked the permission of my employers, so speak to you in my capacity of a forester for the Canadian Pulp and Paper Association; that body will take up this subject on Thursday of this week at the open meeting of the Woodlands Section, which, those of you who are interested, are very welcome to attend.

According to the requirements of his employer, a forester's work may vary from the scientific or academic to the wholly "practical;" in extreme cases he may be chained either to his office or to the bush, but in at least nine cases out of ten even the office men should understand bush conditions.

Speaking roughly, at least two types of foresters should be trained: one for scientific work and governmental employ—to deal with more or less fundamental problems; the other for employment in the bush by the industry, to run woods operations in such a way as to keep or make them commercially successful, and also to guard against forest devastation.

All our forest schools were established mostly for the first purpose, but as the Government is much nearer the point of saturation with trained foresters than is the industry, a certain re-orientation of our forest-schools is desir-

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able; or at least a vigorous effort should be made to equip more thoroughly for commercial requirements and conditions, graduates who intend to serve in private companies. In the following we consider chiefly the normal needs of the pulp and paper industry in Eastern Canada, regarding the present depression as a temporary condition.

General changes of forest-school training plan. It is gratifying that such changes as would meet the specific needs of the industry are being considered by the Forest School, University of Toronto; we hope that the Laval and New Brunswick forest-schools are also in sympathy with this plan. At present, four years of class work with a few brief trips to the forest, give to successful students the B.F. degree; the M.F. degree requires an additional year or two of work. Several plans are being considered by the Toronto Forest School on the initiative of Dr. Howe. We shall not discuss them all, as no doubt they will be discussed in detail by other speakers. One of the basic ideas is to give a student, after two years or so of more or less general instruction an option of adopting a more intensive program in general forestry, or of specializing in the engineering lines and commercial aspects of woods operations, so as to prepare himself for bush work in the industry. In this connection Dr. Howe, through correspondence and in person, consulted with gratifying results, a number of leading men in the industry.

The plan which I like best was suggested by J. D. Gilmour: after two years' general grounding, the student should spend one year in private woods operations in almost any appropriate capacity, and if possible should be self-supporting; then he returns to the forest school for a period of, say, two years, with the option of specializing for scientific or governmental work or for commercial work for the industry.

Provisions for better assimilation of school knowledge. The plan I have mentioned has many merits and also presents some difficulties, but before discussing it we should pause to patiently consider a point of extreme importance which has been largely overlooked—the thorough assimilation by a student of the school instruction which he receives. This assimilation is often too incomplete.

Whether a belly full of food will do one much good or will make one sick, depends on whether or not the food is properly digested and assimilated. This is a matter not merely of food but of the organic processes, upon which the rate and the completeness of digestion depend. Likewise, in training a student, a square meal even of wholesome knowledge might be beneficially assimilated by his mind or might merely make him dizzy.

Assimilation of knowledge imperatively requires both intelligence and experience. The question of intelligence is a tempting though hardly profitable subject for a lengthy discussion; for this reason we shall not dwell upon

it. But we cannot ignore experience with respect to forest training, particularly if a practical rather than an academic career is the objective.

A certain amount of bush experience, without which a correct understanding and assimilation of school-room instruction is impossible, is imperative for a student while he is still at school.

Importance of a correct conception of the bush. To benefit most from his forestry courses, a student should have a correct understanding of the bush and its working conditions from the viewpoint of the industry for which he intends to work. Theoretical instruction alone, no matter how good, is not sufficient for this, and brief field trips are inadequate.

Conceptions of the forest vary within wide limits. There is, for instance, the layman's forest—a conception based on sentimental impressions acquired on picnics and fishing trips; the student's theoretical forest, conceived only in the classroom; and to take another extreme, the lumberjack's forest—logs on the stump—the source of his wages.

Too many students, being often brought up in the cities, acquire their degrees without knowing what a real forest is. A young man who wants to be a commercial forester must in good time, while yet at school, get the true inward conception of forest reality. One year in the bush in the middle of his course, as suggested by Gilmour, should more or less serve this purpose. In this the industry should co-operate with the schools.

Proper outlook and fitness for forestry. Before his graduation, a young forester should acquire (1) not only a certain amount of basic and technical knowledge, but also (2) the correct outlook on the field of his future activities, and (3) a certain amount of adaptation to his future environment and work. A good many graduates, unfortunately, join the companies with a wrong outlook, without understanding that conservation of our forests could be accomplished best by intensive but proper utilization, that silviculture should be practised chiefly through logging, and that correct and thorough knowledge of logging is imperative for the real practice of silviculture. Unfamiliarity with bush conditions and practices, lack of understanding of the psychology of lumberjacks, and inability to find their way in the bush generally, are unfortunately characteristic of many new graduates. Moving from the school to the bush gives them frequently such a jolt that a great many become discouraged right away, or their employers become discouraged.

If a student, after two years at the university, will spend a year in the bush as a lumberjack-apprentice, it will probably determine his fitness or unfitness for the profession. If he is fit to become a forester, this experience will permit him to make much better use of the following two years at the school; if not, he will drop the idea and will turn his energies into some more suitable channel. In neither case will his bush experience have been wasted.

Selective admission of students. Sorting students at the time of their admission to forest-schools, and the "culling" of those who are not well fitted, are, of course, essential but difficult.

A boy or a man who more or less knows the bush will have with other conditions equal, a greater chance of succeeding in the profession. It would be logical to encourage young men who have had some bush experience, to get their training in forest-schools. The plan suggested by Gilmour should serve this purpose, and will attract to the universities more men who have already worked in the bush, if they are permitted to graduate in a shorter time—say one year less than the other boys.

In the selection of students it is, of course, necessary to consider both physical and mental qualifications, and with respect to the latter, it is important that the bent as well as the degree of intelligence receive consideration.

Curricula changes. In connection with the plan mentioned above, many changes in the curricula are necessary. These require and now receive a good deal of thought. Many suggestions have been made recently by members of the faculties of forest-schools and by foresters from the industry. This is also the subject of a paper to be given by W. A. Delahey at the open meeting of our Woodlands Section. Here we should merely mention that for industrial foresters a more substantial knowledge of engineering as applied to logging, and of logging technique, are essential; also a greater understanding of finance and woods accounting.

Course on logging as related to silviculture. Because of the gap which exists between the courses on logging and silviculture in the school as well as between logging and silviculture in actual practice, it is most important to establish a chair on logging as related to silviculture, or vice-versa; and care should be taken to stress the inter-relation between the two courses in dealing with each of them. It is a pity that this point is insufficiently appreciated by the faculties and by the majority of our profession.

Re-arrangement of courses. To provide time for each of these courses, students who are to become industrial foresters should be relieved from some other work. However, an attempt to decide upon this in detail would be beyond the scope of this paper.

Two differentiated courses on the same subject. In some instances two entirely different courses should be given on the same subject, depending on whether the student is being trained for fundamental work or for bush work in commercial operations. Take, for example, dendrology and wood identification: for scientific work, one should study a great many trees, including commercially unimportant and foreign species, and should be versed in rough ocular as well as microscopic methods of effecting their identification. A candidate for commercial forestry should, on the other hand, concentrate on our

comparatively few commercially important trees. In the bush he is not likely to make use of a microscope; he should therefore receive clear and practical instruction on how to recognize quickly the main species of wood with his naked eye or with a lense.

"Movies" of woods operations. In connection with the courses on logging and on forest improvements, greater use of moving pictures of our woods operations should be made in class work. Cine-kodaks have become rather common, and many of our woodsmen have excellent films representing all stages of logging as well as the equipment and the most important methods employed.

Models, etc., are a good help in class instruction. Much greater use should be made of models when it comes to construction and operation of various types of chutes, flumes, logging sleighs, dams, fire towers, camp buildings, etc. A model often will explain to the students easily and adequately what a text-book or the professor may fail completely to explain. In the Forest School of the University of Montana, I saw a large room full of such dismantable models, made very cheaply but correctly and to scale, which the students were required to be able to assemble. A great many such models can be made or acquired at a minimum of expense. The Forest School of the University of Montana, as well as some other western schools where logging is being effectively taught, also has models of logging machinery as well as samples of logging tools, internal combustion motors, etc., which have been donated to them by the manufacturers.

Attempts of students at logging. More than that: crawler tractors have been donated at forest schools, and even free instruction has been given in their use and care. Groups of students who specialize in logging engineering, when free, take small logging jobs working as lumberjacks, and in some cases they use the school tractor free of charge. Such experience during their vacation, while still in training, certainly develops and well adapts them for the work they have to do after graduation.

Practical knowledge of logging—key to respect of woodsmen. The bush is inhabited by loggers and lumberjacks. To put across his silvicultural ideas and plans a forester must mix with them, understand them, and command their respect. He has to understand logging technique and the bush; without this he will be helpless and will be compelled to practice his silviculture on paper only. Many fine men among woodsmen are more or less hostile to the foresters who have had only theoretical training. To illustrate: several years ago I went to the camp of a lumber company in Minnesota as a visitor, with a letter from the main office, to see some logging methods in which I was particularly interested. On arrival I was met very rudely by a walking boss, an oldtimer, with this greeting: "Hey, are you one of those

damned foresters who fool around and count rings in trees?" I retorted suitably but much regretted the hostility of this man, whom I knew to be an excellent logger and from whom I wanted to learn a good many things. He would not speak to me. After a meal I joined in the discussion at the camp office, and switched the subject to details of logging sleighs and of sleigh-road construction with which I happened to be familiar through my work in the logging camps. I took care to display my knowledge. Shortly after that the walking boss came to me and apologized; later he took me around and went into detail in explaining their logging methods; and he was amiable even in discussing silviculture with me. We parted good friends.

Professors have to see a great deal of woods operations. It is obvious that to train the student successfully for bush work with the companies, the professors have to see bush work frequently themselves, and yet often they fail to do so. This is not intended as an accusation, rather as an informal invitation to them, to visit logging camps as frequently as they can. I think that most of the companies in the membership of our Association would welcome the members of our forest-school faculties to their camps; in fact, I know that a good many such invitations have been extended but rarely accepted. By keeping away from the bush, the professors of forest-schools put themselves at a disadvantage in many ways. True, they are very busy men, and sometimes means are lacking, yet in all probability satisfactory arrangements could be made.

Contact men on the faculty. If it were possible from a financial viewpoint, it would be highly advisable to have on the faculty of each forest school, a contact man between the school and the industry, to help the faculty in correlating its instruction with the needs of the industry, to furnish such up-to-date information on new developments as cannot be obtained through other channels, to help the students to get in closer contact with the bush and the woodsmen, and to be active in the solution of their employment problems. If the school cannot afford such a man, perhaps some member of the present faculty could more or less take his place, combining this with some of his other duties.

Industry should facilitate bush training for students. Wood-using industries should be active through individual companies and through their associations in co-operating with forest-schools in an endeavour to fit young foresters better for the work of the industry. They should be, and I hope are, willing to give forest students a chance to learn about bush conditions and practices by means of temporary work in logging camps. Of course, this should be so organized that the student is not a burden to the host company. Details of such arrangements could readily be worked out through the joint efforts of the schools and the industry.

Organized volunteer lecturing by men from the industry. It would be very beneficial in many ways if foresters from the industry, with wide bush experience, would lecture now and then to the students, particularly on logging and engineering as well as finance and accounting. They could explain the problems they are facing, give a good deal of practical advice, and, of course, of practical knowledge of the kind which a professor—no matter how good a man he is—is not apt to possess. This would greatly strengthen the contact between the school and the bush. It is not a new idea; in fact, an effort to do this was made by the Toronto Forest School a few years ago. I have no doubt that more vigorous effort would meet with good success, especially if advantage is taken of co-operation of the organizations representing the industry. It is my personal belief, for instance, that our Woodlands Section would be willing to do its share through some of its members without putting the forest-schools to a considerable expense, if indeed any. Knowing fairly well the leading men in the woods departments of the pulp and paper companies, perhaps we could help the schools to make suitable arrangements. Such lectures or discussions could be given occasionally at regular lecture hours or in the evenings at the meetings of school forest clubs.

If the schools show sufficient interest, they could probably be furnished with some literature from the industry on important problems of woods operations with which the companies are concerned.

Bibliography on woods operations, and need of a proper index. Bibliography on logging technique adaptable for our conditions of woods operations, also on woods business administration and accounting, as well as on relation between logging and silviculture, is rather meagre. The greatest handicap is, however, the fact that our forest-schools as well as other organizations in Eastern Canada, lack the key even to what bibliography there is. Most of the useful information is to be found scattered in professional periodicals. We need a good index of such data, not merely a complete but a serviceable one, since many articles with promising titles contain practically no "meat," and many titles are misleading with regard to the contents of the articles.

Adequate library is needed. I do not know of a library in Eastern Canada that could adequately serve the needs of a student on logging. Such libraries are found, however, at some of the forest schools in the United States. For instance, at Yale, Prof. Bryant prepared a bibliographical index on logging and lumbering, containing approximately 20,000 items, most of which could be found in the library of that school. Provision of this kind is imperative for effective instruction and research. Yale Forest School went to considerable pains and expense to get complete sets of professional periodicals for past years. It would be highly desirable to form at least one forest library in Eastern Canada which could adequately serve the desired purpose. This

would take some money but economy could be effected if an effort were made to concentrate as much as possible at one place the material which now is scattered in many places and frequently as so much dead ballast.

Manual on logging and its relation to silviculture. The text-book on logging by Prof. Bryant is no doubt the best treatise on the subject in any language. It is used to great advantage in all our schools; yet it does not wholly answer our needs.

Perhaps the book needed most of all is one on the adaptation of our logging methods to silviculture. Its preparation would be indeed very difficult, but it would serve as a bridge over the gap separating loggers from silviculturists, and silviculture on paper from that feasible in the woods. I hope that there may be found in Eastern Canada men big enough to undertake such a treatise successfully; and I hope that the industry, the forest schools and the government will take notice and appreciate the importance of this, and will combine in their efforts to enable suitable men to produce this much needed work.

Trends in research work. Much of our research work in forestry is too academic. In my article on "Logging and Silviculture" which was published in several of our periodicals slightly over a year ago, I stressed the necessity of building up from the ground instead of down from the sky in the attempts to introduce silviculture. This applies to both the research and the practice of forestry.

Our forest schools should attract more trained young men with practical bush experience, as post-graduate students, and should conduct through them as well as by the faculty more research on problems of special interest to the industry. Recently when times were good, the schools could probably have obtained enough money for research fellowships from the government and the industry. They should not miss the next opportunity when it comes.

"Roots" of silviculture deserve more attention. If our forest-schools and our foresters were compared with those in Europe, it would be rather conspicuous that insufficient attention is given here to the understanding of the underground life of a forest. Our foresters will be baffled by many silvicultural problems until they concentrate their attention and acquire enough knowledge, not on exposed parts of trees only but particularly on the properties and the life of forest soil and the roots. Of course, it is not easy, and a good deal of research on this subject is required. Our forest-schools, however, could advantageously put more stress upon the "underground part of silviculture," especially in their training of men for research.

Desirable and feasible cutting method. Considering the present situation in forest schools and the specific present needs of the industry, we have been dealing mostly with forest utilization. It should not be overlooked, however,

that even for the industrial foresters is it essential to possess a sufficient understanding of the principles and practices of forest production. Foresters of this group could get along perhaps with less knowledge of the general biological sciences but their course in silviculture certainly should be made as practical as possible; emphasis should be put upon desirable and feasible improvements in our cutting methods.

Contact between scholars in silviculture and loggers. There is a certain lack of understanding and team work between our scholars in silviculture and our commercial foresters in the employ of private companies. Such foresters if they are graduates of forest schools but are working as loggers only, are sometimes even regarded almost as renegades. Such an attitude of their alma mater is, or usually would be, unjust and detrimental to all concerned. It may be based on wrong ideas about the dangers of our forest depletion. We recognize of course that these dangers, where they exist, must be met, but it will have to be done effectively through the joint efforts of forest experts and woodsmen producing logs.

Education of lumberjacks in fundamentals of silviculture. Some time ago I pointed out the great need for educating plain lumberjacks in the fundamentals of silviculture. I wish to recall and emphasize this important need to you and to ask to be allowed once more to refer those who are interested in this problem to the contents of my article on "Logging and Silviculture."

Joint committees or board on forestry education. I quite agree with W. A. Delahey, who suggested that forest schools should endeavour to organize small committees of their graduates who have acquired experience and proficiency as foresters and loggers,—such committees to work with school faculties in a consulting capacity.

If I were more optimistic I would extend this suggestion and would advocate a forestry-education board for Eastern Canada, with greater powers, composed of representatives from the schools, the government and the industries.

In the absence of such an agency I can only urge on all who are sincerely interested in the greatest effectiveness of forestry education, the immense value of co-operation between the school and the industry in every possible case. The existing neglected opportunities, some of which I have indicated, should be exploited to the fullest. Such co-operation would serve to vitalize these inter-dependent provinces of theory and practice.