

METHODS OF INSTRUCTION IN THE FOREST
SCHOOL.*

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The work of the American forester is (and will be) primarily concerned with the management of commercial timberland. There are many problems not directly commercial which are also properly within his field, but it is clear that the successful development of forestry in this country turns on the ability of foresters (or whoever handles the forests) to perpetuate the forest industries. Lumbering has got sooner or later to become forestry, but its progress toward that end is fundamentally controlled by economic limitations.

These facts, though commonplace enough, underlie the determination of methods of instruction in the Forest School, and indicate one of the prime needs of the forest student. Any one who has had a few years experience of forest work in a particular region cannot fail to have realized that the successful lumbermen owe their success largely to a knowledge of executive and mechanical detail, from the efficiency of labor to the varieties of saw practice, that has taken years to acquire, and which has crystallized into a large and complicated organization. It is businesses of this character that the forester is expected to prescribe for, to improve, and sooner or later, as conditions change, to reorganize. How, then, should the Forest School prepare him for his work? It should plan its teaching on the assumption that just as medical practice is based on the anatomy and physiology of the body, so forestry must be based on a no less thorough grasp of the lumber business, that is, the mechanical and administrative principles which are involved in the harvesting of timber. Whatever degree of sustained productiveness a forest may attain, its manager will still have to make roads, organize crews, and get logs to market—in other words, control the machinery by which forestry is to be carried on.

In planning the training for this purpose, it is apparent that

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within the usual limits of a forest curriculum not all American lumbering can be effectively studied. The best scheme would seem to be thorough instruction in the methods and conditions of some one typical region, with a more general consideration of the business over the rest of the country. This involves on the part of the Forest School the possession or control of a large tract of forest land in which lumbering operations on a scale typical for the region can be annually carried on. If possible the forest ought to be so situated, with regard both to composition and value, as to make a high degree of intensiveness in management possible. In that case it can be organized under a working plan, the operation of which may involve and exemplify a variety of scientific methods. The forest then becomes, as far as its business development will permit, the backbone and background of professional instruction, and the key to the understanding of problems in other fields and regions. In its relation to the school it has the following functions: First, it offers a field for thorough grounding and practical experience in a representative lumber business. Second, it furnishes the laboratory for training in technical forestry. Third, through the accumulation of records, both those connected with the operations and those arising from research, it becomes an instructive experiment station.

With the demonstration-forest in its possession, the school ought then to correlate the various courses and organize its teaching so that lumbering on the one hand and technical forestry on the other, while developed in their elements and principles separately, should enlarge and illustrate each other. In other words, the science of forestry as developed in practical instruction should be under constant test of applicability, first to the particular business in question, and later to those typical of other regions. This is not in any way to limit or narrow the highest technical training or the inculcation of the broadest ideals of forestry, but rather to aid the student in remembering by connecting principles with their uses. The arrangement and sequence of courses, while admitting of a good deal of variation, fall naturally into a number of parallel lines, each including, in logical order, those subjects which grow out of each other. The main and central line would be lumbering,—logging, transportation, sawmilling, market, and manufacturing, in detail for the home operations, more generally for the business elsewhere. The other lines of development,

based whenever possible on forest work itself, are (1) Dendrology, Silviculture and Protection, (2) Forest Survey and Mensuration, Management, Administration, and Policy, and (3) Wood Structure, Technology and Products. As a means of instruction the order here indicated ought, at least roughly, to be followed.

When it comes to the actual teaching and how to do it, there may conceivably be as many ways as there are good teachers. Yet leaving aside the personal gift, and assuming a complete and logically arranged curriculum, it is possible to indicate a method of developing subjects, imparting information, and accomplishing training which is more or less applicable to all parts of an education in forestry, and which is already proved and established in other professional schools, such as those of medicine or mining. This is a method resembling both the "case system" in use at many law schools and the clinical system in medicine. It has been the experience at Harvard (and it has strengthened our belief in graduate instruction for the scientific professions) that the professional attitude of mind can be awakened best by requiring some initiative on the part of the student, making him do some of the teaching himself. Thus, in many professional courses, the work consists primarily of a series of cases or problems from which the student is expected, in some degree, to derive the principles himself, and on which the instructor's lectures may be as much quiz and comment as regular exposition.

In adopting such means in the teaching of forestry judgment must of course be exercised in fitting them to the subject in hand. Such necessary modifications would naturally occur to any instructor who was well grounded in his subject. So far as the method is applicable to forest education in general, it consists, first, of lectures so given as to develop the subject logically and make the student himself think and assimilate; second, regularly assigned exercises or problems, arranged so as to follow the evolution of the course, and the results of which, especially the principles involved, have to be embodied in reports; and third, as far as it exists, both text-book and collateral reading. A few examples will show how the scheme works out in particular cases. In silviculture, for example, general lectures on the factors governing forest distribution and the association of species, supplemented by reading, are accompanied by connected field

exercises as follows: Topography over an extensive area and classification into distinct features or sites; soils, identification and physical analysis as related to formation and site; local forest distribution as related to soil and site and separation into types; the single type, its composition in detail; the silvics of the species as indicated by the life history and form of the stand; and so on through a more or less coherent series of assignments leading up to extended practical work, such as marking for various kinds of cuttings, and independent silvical studies. In a similar way instruction in lumbering is developed. The class is put to work in each part of the operation as it occurs, divided up among the regular crew, beginning with felling and ending with mill work. In each process the aim is to make the student find out by sufficient experience not merely average costs (which are misleading at best), but the actual factors which affect efficiency, economy, and cost. Thus, to illustrate by the work in felling, he is expected to learn and to set down in his report, not only the ordinary mechanics of cutting down a tree and the capacity of a standard crew per day, but such points as the relative loss or gain, in money and per cent. of volume, depending on the angle of the undercut, the position of the saw cut, and the height of the stump. Forestry, in its execution, can not differ essentially from other woods work in being largely a matter of good organization and small economies; and it is points like these that train a man's executive judgment and open his eyes to the needs and chances for better and better methods. With a knowledge of such details and the principles underlying them, the professional student has, for one type of business, something resembling the practical lumberman's hard-won insight. This should serve both as the groundwork of later instruction in general lumbering and forest engineering, and as a guide and help to the prompt understanding of essentials in any new region. If throughout the whole of his technical education, no less in silviculture than in logging, the student is thus made to deal with facts and cases, to derive principles, and to show his own results, he will have acquired some of the capacities which his future work will demand.

As far as instruction and training will suffice, the Forest School should have trained a man upon graduation to the possession of certain definite and necessary qualities or abilities. In the first

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place, he must like and understand how to live rough a fair share of the time. Forestry is not a refuge for the unfit, and for their own sakes as well as that of the profession, such men should be weeded out early in their course. In the second place, he should have executive understanding of the organization of all important branches of woods work. Many lumbermen of no technical training are already making some of the very improvements in method that forestry should be able to furnish, and if the forester is to win his place in such work, he must first know the business in question, and have some idea how it is controlled. Third, he must be able to make investigations of scientific value, whether on the business or the technical sides of his work. Involved in this are the power of quick and accurate observations, and of being able to record them in clear and workmanlike reports. The command of writing constitutes almost the only advantage of the forester over many experienced cruisers, who are often able to estimate timber more cheaply than he can, but lack the training to make an intelligent statement of facts. Finally, he should have the broadest outlook on the relation of forests to national economy that the fullest technical training can give him. It should not be enough that he should prove useful in some of the immediate problems of present day lumbering, although that will often be the test of his success: he must be equipped for a scientific development of forestry which, though it may be difficult to forecast in detail, is none the less certain to come.