

above West Chester Pike, Delaware County, June 2, 1912, *B. Long* 7094; Wawa, Delaware County, May 23, 1909, *F. W. Pennell* 2072; Frazer, Chester County, June 21, 1909, *B. Long* 980; Lancaster, Lancaster County, June 22, 1909, *B. Long* 1033, 1034.

Specimens of all these collections are in the Herbarium of the Philadelphia Botanical Club, with the exception of that from Milford, New Jersey, which, together with some of my own numbers, is in the herbarium of K. K. Mackenzie. A specimen of the Wawa collection is also to be found at the New York Botanical Garden. All the material cited has been critically examined by Mr. Mackenzie.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

## IS FORESTRY A SCIENCE?

BY ROLAND M. HARPER

In an interesting paper entitled "Darwinism in forestry," in the *American Naturalist* for September, 1913, Raphael Zon discusses a few contributions to pure science that have been made by foresters, and makes this statement: "*Forestry as a science is nothing else but the study of the laws which govern the struggle for existence.*" Prof. Henry S. Graves, in an address made before the Washington Academy of Sciences on Dec. 3, 1914,\* on "The place of forestry among natural sciences," expresses some of the same views as Zon, and also goes considerably farther in describing the contributions of foresters to science. He points out, as Zon did, that forests are the highest expression of plant life, and states that forestry is tree sociology, or the science of tree societies. He acknowledges the debt of foresters to taxonomists, physicists, chemists, geologists, soil investigators, pathologists, entomologists, etc., but mentions that Darwin's theory of evolution was anticipated by a writer on forestry, and that Warming, Schimper, and other pioneer

\* Printed in *Journ. Wash. Acad. Sci.* 5: 41-56. Jan. 19, 1915; *Science* II. 41: 117-127. Jan. 22, 1915; *Monthly Weather Rev.* 42: 671-672. Mar. 16, 1915 (abstract); and in *Smithsonian Report* for 1914. (in ed.)



ecologists borrowed many ideas from the foresters. Among the notable contributions to science enumerated are the significance of the gregarious habit of trees, the relation of different species to light and shade and humus, the death rate of trees, differences in longevity and productivity of different individuals of the same species, the discovery of a constant ratio between certain measurements of a tree and its volume, regardless of the species, investigations of the properties of wood, the value of forests as soil indicators, the influence of trees on each other and on climate, runoff and soil, the classification of forest types, and the study of the laws of distribution.

But whether forestry is a science or not depends on the definition of forestry and of science. The prevailing idea of forestry, as admitted by Graves, and to which perhaps no one can reasonably take exception, is that it is the *art* of utilizing forests to best advantage. There are many more or less different conceptions of science, but apparently the only one that does not confuse it with other things is that science is the study of the laws of nature. The mere fact that some foresters have worked out new laws does not prove forestry to be a science, any more than the discovery of some of the laws of physics and human physiology by engineers and physicians proves engineering and therapeutics to be sciences. (It is the scientist's business to know *why*, and the artist's or artisan's to know *how*.) Most arts, other than the very simplest, are based on one or more sciences, and *every science is distinguished from others by laws peculiar to it*.\*

Forestry is based mostly on the botanical sciences, and the supposed laws of forestry really belong to one or the other of these sciences. For example, the physical properties of wood are matters for the taxonomist to take cognizance of in describing trees, the ratio between dimensions and volume is a principle of morphology—even though the morphologists may not have thought of it before—and the relations of forests to soil and climate are matters of ecology, climatology, etc. Forest mensuration, one of the most important parts of a forester's work, is not a science but an art, which however can be made very useful to scientists, as will be explained farther on.

\* See Science II. 38: 817. Dec. 5, 1913.



Probably the most important science for the forester is plant sociology, which has hardly been recognized as a distinct science as yet. (In schools of forestry it is commonly taught along with tree physiology and ecology under the name of silvics.) The fact that scientific forestry involves something not adequately provided for in existing classifications of science is doubtless what led the writers referred to to claim recognition for it as a science. As the forest is the highest and most complex expression of social plant life, and consequently the phenomena of plant sociology are best exemplified in a forest, as both Zon and Graves clearly recognized, it is quite natural that many of the laws of this nascent science should have been discovered some time ago by observing foresters in the course of their work. One of the best popular treatises on plant sociology (though it was not called by that name at the time) was published seventeen years ago by a well-known forester.\*

But the term "plant sociology" cannot be rejected on the ground that it is merely a later† synonym of one phase of forestry, or of silvics. For forestry deals with trees only, while plant sociology deals with vegetation of all kinds. Neither is it a mere branch of ecology; for although the plants surrounding any given plant may be regarded as part of its environment, vegetation types can be studied and classified regardless of environment. It is not the purpose of this paper to discuss the manifold phenomena and problems of the new science, but it will be appropriate to state that probably the most complete and scholarly work on the subject yet published is Clements's "Development and structure of vegetation," which constitutes the seventh monograph of the Botanical Survey of Nebraska, 1904. (This contains abundant references to the literature of the subject, and sketches its historical development. Most of the same ground is covered in "Research methods in ecology," by the

\* Pinchot's *Primer of Forestry*, part 1. Washington, 1899.

† The first use of the term that has come to the writer's notice is by Dr. Charles E. Bessey in *Science* II. 37: 4. Jan. 3, 1913; but he there confused it with ecology. The writer used it in *Science* II. 38: 818. Dec. 5, 1913; *Torreyana* 13: 139; 14: 145, 147; *Rep. Fla. Geol. Surv.* 6: 176. Dec. 1914; 7: 181. Sept. 1915; and contributed a brief note on it to the second edition of the *New International Encyclopaedia* (New York) 18: 705. Feb. 1916.



same author, published about a year later,\* and "Plant Physiology and Ecology," 1907.)

Although our friends the foresters cannot claim the science of plant sociology as exclusively their own, they certainly deserve much credit for the part they have played in developing it. Their practice of measuring timber and estimating the annual growth ought to be extended to other kinds of vegetation. One finds scarcely a hint of volumetric studies of vegetation in non-economic botanical literature, but a few years from now perhaps no description of natural vegetation will be regarded as complete unless it contains an estimate of the volume or weight of vegetation per acre (or other unit area) and the absolute or relative amount of new growth each year.† The annual increment, or birth and death rate, of vegetation, although by no means easy to determine in a mixed forest, ought to bear a fairly definite relation to the sum of all environmental factors, just as crop yields do, and it would be extremely interesting to know whether or not it increases with the progress of succession, for instance.

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## THE ADMIRABLE POLYPORUS IN THE FLORA OF THE LAKE GEORGE REGION

BY STEWART H. BURNHAM

The first specimen of *Polyporus admirabilis* Pk., recorded in the Flora, was found by Mrs. R. B. Van Alstyne, of Troy, at Lake George, in 1900, on an apple tree.‡ Dr. Chas. H. Peck afterwards found it in the flora, July 25, 1906, at Friends Lake, Warren county, on an apple tree, which is recorded in his unpublished notes. I have never found it in the Lake George Region growing on apple trees.

The specimens of *Polyporus admirabilis*, which I have found

\* For references to reviews of these two books see Ann. N. Y. Acad. Sci. 17: 349. Nov. 1906. Other good reviews, published too late to be cited there, are those by Blackman and Tansley in the New Phytologist, Nov. and Dec. 1905, and by Fernow in the Forestry Quarterly, March, 1906.

† For some data of this kind for herbaceous vegetation in the Great Plains region see Shantz, U. S. Dept. Agr. Bur. Pl. Ind. Bull. 201: 81. 1911.

‡ N. Y. State Mus. Rept. 54: 154. 1901.



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