SCIENCE

VOL. LIX MAY 23, 1924 No. 1534

CONTENTS

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.

New York City: Grand Central Terminal.

Annual Subscription, $6.00. Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

Entered as second-class matter July 18, 1923, at the Post Office at Lancaster, Pa., under the Act of March 3, 1879.

THE SCIENTIFIC BACKGROUND OF THE FOREST POLICY OF THE UNITED STATES[1]

THE National Academy of Sciences has played an important part in the annals of American forestry. On February 15, 1896, the secretary of the interior requested this body to investigate and report upon "a national forest policy for the forested lands of the United States." After an extended field investigation in the western states, a report was submitted to the secretary by the academy on May 1, 1897. It bore the names of Charles S. Sargent, Henry L. Abbott, Alexander Agassiz, William H. Brewer, Arnold Hague, Gifford Pinchot and Walcott Gibbs. This report constituted probably the most illuminating summary of the forestry situation in the United States which had been made up to that time, with reference particularly to the conditions on the public domain. It set forth the public value of forest conservation for the flow of streams, the protection of soil and a sustained supply of timber. It summarized the forest administration of leading foreign countries. It described vividly the cumulative depletion of our public forest resources from fire, uncontrolled grazing and timber depredations, with its disastrous local and national effects. It recommended the creation of 13 additional forest reserves, aggregating 21,000,000 acres, together with the Mt. Rainier and Grand Canyon National Parks. And it outlined a complete system of administration for the forest lands in public ownership.

The major recommendations of the academy were almost immediately put into effect. The forest reserves indicated were created by presidential proclamation in 1897. In the same year an act of Congress embodied many of the administrative recommendations of the academy, constituting the first forest code of the United States.

While the investigation conducted by the academy in 1896 dealt particularly with forested portions of the public domain, it is noteworthy that the report visualized clearly the broad outlines of the forestry problem of the entire country. It emphasized the essential relationship between forest cover and regularity of stream flow. It brought out the need for "systematic and intelligent forest reproduction" to supply the demand for lumber and other forest products which is "continuous in civilized nations."

[1] Address before National Academy of Sciences, April 30, 1924.

It referred to the local timber scarcity already threatened, and gave plain warning of the menace to national prosperity arising from the "universal neglect of reproductive measures."

Since the academy made its investigation in 1896, the national forest system which it aided so notably to create has expanded to a total of 157,000,000 acres in 27 states. The original policy of establishing national forests in the public domain has been supplemented by the purchase of forest lands on the watersheds of navigable rivers in the eastern states. About 30 states have launched forest policies of their own, embracing such features as the protection of wooded areas from fire, the creation of state forests and the encouragement of timber planting. And commercial reforestation by private land-owners has begun.

But while the past 30 years have witnessed real progress in forest conservation, they have also brought out in much bolder relief the serious proportions of the problem. The "local timber scarcity" of which the academy gave warning has reached a point where 28 states import a large part of the wood needed by their own population, from sources of supply which are steadily becoming more and more distant. Even our remote areas of virgin timber are dwindling steadily. We are depleting our forests four times as rapidly as they are being replaced. We have already become dependent upon foreign sources for more than half of the paper, or its raw materials, which are consumed in the United States. The timber famine is no longer a distant and theoretical danger; it is here.

Another phase of our forest problem is of well-nigh equal gravity; namely, the idleness of land. Timber crops represent the only productive use of one fourth of the soil of the United States. The idle or partially idle condition of much of this land has already resulted in extensive rural depopulation, in the disappearance of local industries and in land and community bankruptcy. From many economic standpoints, not to mention the need of the United States for generous areas of forest for the sake of their social and recreational value, we are more and more clearly recognizing the accuracy of President Roosevelt's foresight when he referred to forestry as one of the most vital internal problems of the United States.

The most effective action which the nation has yet taken to meet this situation has been the extension of public forest ownership, largely along the lines advocated 30 years ago by the National Academy of Sciences. The national and state forests now embrace about one fifth of the forest-growing soil in the United States. It is more and more apparent, however, that this solution, while effective so far as it goes, can at best prove but partial and inadequate. Nothing short of the productive use for growing timber of all our forest land, the four fifths remaining in private ownership no less than the one fifth which has been acquired by public agencies, will meet our national requirements. Forestry must be made part and parcel of our national scheme of land use. The growing of timber must assume its necessary place, in the use of our soil, side by side with the growing of food crops. Nothing less than this will suffice. And it is encouraging to note that the law of supply and demand is rapidly making the growing of timber practicable as a matter of cold business. There are no fundamental reasons why, with the right technical guidance, the commercial and industrial energies of the country can not enter this field on a large scale.

Passing by many phases of organized public and private effort which are necessary to accomplish this result, I wish to speak particularly of its scientific background and its demands upon the scientific agencies of the United States. We must bring about an evolution in the land practice and forest industries of this country, and we must do so in the shortest possible time. The essence of this evolution is the development and application of technical methods, first in growing timber and, secondly, in utilizing it for the necessities of life which timber alone can supply. It is an evolution that will be halting and inadequate unless a comprehensive scientific foundation can be provided for it. The very variety of our soil conditions and forest types, the very variety of industrial processes for converting timber into the commodities required by a civilized nation, both emphasize the necessity for thorough-going research in order that this development may be soundly conceived and wisely directed.

In the first place, we must create the science of forest culture in America. While certain principles and much in the way of practical experience can be borrowed advantageously from the old world, the silviculture of the United States must be an indigenous product. It must be created directly from the soil, climatic and biological factors with which we have to deal.

The range of problems in this field is enormous. We must know the more or less distinct growth requirements of 200 commercial species of trees. We must master both the scientific laws and the effective practice governing their natural regeneration and their artificial propagation. We must find out what rotations or growth periods produce the most profitable crops; and we must apply this knowledge to commercial products of infinite variety, ranging from the distillation wood of the chemical plant or the pulp wood of the paper mill to the high-grade lumber required by the furniture factory. And we must determine the timber yields obtainable, under an immense number of possible cultural methods, since upon them all forestry practice necessarily is predicated.

The United States Forest Service has set its hand

to this task through the creation of a chain of forest experiment stations dealing with these problems in each of our principal forest regions. Thus far five stations of this nature have been launched with reasonable provision for effective work; but to answer the problems in forest practice which exist on our 470,000,000 acres of forest growing land, embracing almost every combination of soil, climate and biological association to be found in the world, we need at least ten well-equipped forest experiment stations. Already we are unable to answer many questions which land-owners interested in commercial reforestation are asking. Other agencies, particularly a number of universities which offer instruction in forestry, have entered the same field, and there can not be too many of them. We stand at the threshold of a period of rapid progress in timber growing, but it can not be expected that such progress will be either rapid or sound unless the fundamental scientific background is provided.

A second great field of research deals with economy in the use of timber. Wastefulness in the exploitation of America's forests and in the manufacture of their products is proverbial. It is an inheritance from the very abundance and cheapness of our virgin forests. A thousand feet of timber saved in manufacturing processes is equal to a thousand feet of timber grown in the woods; and the necessities arising from a shortage of timber already acute make it imperative that every possible saving be effected. What we already know in this field, if fully and widely applied, would permit reducing the present drain upon our forests by 20 or 25 per cent. without diminishing the volume of useful products obtained from them. More economical use of wood is just as essential a part of forest conservation as the growing of new crops of timber. It is just as essential a part of the evolutionary process we must go through as the development of an American silviculture. Sweden, for example, produces about 3,000,000 tons of paper or paper-making materials annually, almost wholly as a by-product from the manufacture of lumber. This illustrates the sort of industrial evolution which is imperative in the forest utilization of the United States.

Again are we confronted with an enormous range of scientific problems, in chemistry, physics and biology, no less than in the mechanics of timber manufacture. The chemistry of wood offers enormous possibilities, not only in the manufacture of fiber products and distillates, but also in utilizing waste and substituting new forms of wood for old forms which only virgin forests could supply. Large savings can be accomplished through the impregnation of timber with fungicides. There is still much to be learned about the mechanical properties of timber, with their bearing upon economy in the use of wood for structural purposes. There is still much to be learned about the seasoning of timber and other physical properties with their direct bearing upon the elimination of wastes that are now enormous. We are just beginning to secure an integration of different wood-using industries through adapting primary manufacture to the requirements of final fabrication with a minimum of loss, and converting the waste from one industry into useful raw material for other industries.

Research in this field is concentrated largely at the Forest Products Laboratory in Wisconsin, which already has made notable contributions to the conservation of our timber supply, but whose efforts are small enough when contrasted with an annual consumption of about 53,000,000,000 board feet of wood and a preventable waste of fully one fourth of that amount.

Still a third line of research should be mentioned. We can not educate the American public to a full understanding of its forestry problem or provide the background needed both for our national policy and for commercial developments without a comprehensive study of the essential economic facts as to our forest resources and use of wood. We need a much more accurate inventory of the resources available, not only in merchantable timber but in areas of young forest and in potential forest-growing land. We need a much more accurate survey of the essential needs for timber; first, by regions with a view to alleviating regional shortages; second, by industries with a view to promoting the most sound industrial development; and third, for the country as a whole. We need to know currently what is happening in timber costs and values, because of their direct bearing upon reforestation by either public or private agencies. We need to study closely the great transportation problem in its bearing upon timber costs and regional depletion. Furthermore, we are coming to grips with the broad problem of effective use of our land. We must develop a national program of land use, in which timber culture is fitted into its proper place. This can not be accomplished efficiently without a deal of study along the lines of land classification in order that the use of our soil may be soundly and intelligently guided.

These are all relatively new problems to the people of the United States. General concern is now manifest over the evident shortage of timber, which has become so clear that it can no longer be ignored; but we are still far short of a national comprehension of the magnitude of our forest problem and particularly of the necessity of a sound scientific approach to its various phases. As always under such circumstances, the public is impatient for immediate results. Something must be done right away; and the average American has the idea that an immediate cure for these pending ills can be accomplished through the enactment of some law or another. In the impatience

for immediate action, that is bound to increase rapidly as the pinch becomes harder, there will be a very inadequate comprehension of the need for a vast amount of painstaking research before sound progress can be assured; and there will be but inadequate support for the basic scientific work that is essential. One of the most urgent requirements in solving our forestry problem is a national policy, or program, of forest research, conceived not for the needs of the moment but for the needs of the future, well supported and sustained without interruption.

The National Academy of Sciences aided effectively 30 years ago in placing before the country the main lines of action which were essential at that time. I believe that the academy could now perform a national service of equal value if it could resurvey the forest problem of the United States as it presents itself to-day; and particularly if, as an impartial and authoritative scientific body, it could direct its survey primarily toward the scientific background, or foundation, that is so essential to an effective solution of this problem. It would be a splendid undertaking if the academy could review the present status of forest research in the United States, point out the essential phases in its future development, and in some measure at least, outline what our national program of forest research should be to cover adequately the needs of the situation. It would also be a splendid thing if the academy could bring to this program, as a sustained national undertaking enlisting all the agencies available, the support of its recognized leadership in the scientific progress of the country. It is hard for me to conceive of any more useful function in the furtherance of national welfare and in line with its own traditions that this organization might assume.

W. B. GREELEY

U. S. FOREST SERVICE

LUTHER EMMETT HOLT

L. EMMETT HOLT was born at Webster, N. Y., on March 4, 1855. He prepared for college at the Webster and Marion Academies, and entered Rochester University at sixteen years of age, graduating with honor in the class of 1875. He taught for a year in the Riverside Institute at Wellsville, N. Y., then began the study of medicine at the Buffalo Medical College, continuing his course and in 1880 securing his degree at the College of Physicians and Surgeons in New York. After serving his interneship in Bellevue Hospital he began the practice of medicine in New York City, choosing the diseases of children as a promising field.

Dr. Holt began the practice of medicine in those wonderful years when physics and chemistry and biology were entering a new period of enlightenment, and medicine, under the new conceptions of infection and its incitants, was pressing forward into fresh fields of study and achieving thrilling conquests of disease.

He early realized the importance of pathology and out of the opportunities offered by his services at the Northwestern Dispensary, the New York Infant Asylum, the Foundling and the Nursery and Child's Hospitals, he won, first hand, much of the knowledge and experience making possible the creation of his masterly treatise on the diseases of infancy and childhood, which so greatly contributed to the establishment of pediatrics in this country on a firm foundation, and won for him a high place in the science and the art of medicine.

At the Babies' Hospital, which he was so largely instrumental in developing, he was for many years physician-in-chief. Here a long series of studies on infant nutrition was carried forward under his direction and many contributions of value in many subjects relating to pediatrics witnessed the high standing and the exceptional efficiency of this remarkable institution.

After eleven years of service in the faculty of the Polyclinic Hospital, in 1901 Dr. Holt became professor of the diseases of children at the College of Physicians and Surgeons, succeeding Abraham Jacobi. This chair he held for twenty years, securing, through his remarkable knowledge, his capacity for marshalling in simple phrase the gist of complex conditions and processes, his enthusiasm, his unfaltering devotion to his work and aims, the admiration and loyalty of his many students and his place among the great teachers of his time.

Dr. Holt was a member of the original board of directors which in 1901 organized the Rockefeller Institute for Medical Research and served as its secretary until his death in 1924.

As secretary of the board of scientific directors and of its executive committee Dr. Holt cherished a keen interest in the progress and affairs of the institute and brought to its service his large experience as a practitioner of medicine and his devotion to the advancement of science. His leadership and his high attainments in the field of pediatrics have been of great value in the councils of the institute in such of its researches as relate to the various diseases and handicaps of child life. The maintenance of child health to which in so large a measure Dr. Holt devoted his later years kept him in touch with those aspects of child hygiene in which the institute maintains a continuing interest.

In the lulls, if such there were, of his busy life as practitioner and consultant, Dr. Holt found time and opportunity for many forms of public service. He was concerned in the affairs of the New York