the year is the establishment of a thoroughly organized medical department under the direction of a veterinarian and a well-known human pathologist. A pathological laboratory is in charge constantly of an assistant, and daily rounds are made by an officer of the medical staff in company with the curators of the respective departments. Full reports are being kept of the symptoms of animals of various types, and of the causes of death. From these records it is proposed to prepare a special work on the habits, care and treatment of animals in captivity. The larger ruminants, especially, are susceptible to gastero-enteritis, and a disappointing feature of the work is the liability to these diseases which has been engendered on the larger ranges. Until the soil and grasses of these ranges have been thoroughly retreated, it appears that better results are secured by keeping the animals in enclosures than by allowing them free range. After a number of experiments, entirely successful methods of feeding for the prong-horned antelope and for the caribou have been discovered, and these animals are in fine condition. The western varieties of deer, the moose, the buffalo, and to a certain extent the wapiti, are still being studied.

A feature of the management of the park is the appointment of scientific curators instead of keepers in principal charge of the animals. At present the director acts also as head curator of mammals. Mr. R. L. Dittmars has recently been promoted to the full curatorship of reptiles, and assists Mr. Hornaday with the mammals. Mr. C. William Beebe has been promoted to the full curatorship of the birds. By this means a continuous series of observations of the habits of animals is being made and recorded. Mr. Beebe has been especially successful in the rearing of birds, and has made a number of valuable discoveries in the medical treatment of birds.

The chief publication of the year is by the secretary, Mr. Madison Grant, on the barren-ground and woodland caribou of the northern hemisphere.

Another function of the society has been duly followed during the year, namely, game protection. The secretary has been actively instrumental in connection with the new game laws of Alaska, Newfoundland and British Columbia, and a special fund of $3,000 has been presented to the society by Miss Stokes, of New York, the interest of which is to be devoted to the protection of birds.

The society has enjoyed the cordial cooperation of Commissioners of Parks of the Bronx and of Manhattan; also the support of Mayor Low and of Comptroller Grout. The relations with all the officers of the city have been of the most friendly character. New York now bids fair to become a model city in the management of its scientific institutions. With Professor Bumpus as Director of the American Museum of Natural History, Mr. Hornaday as Director of the New York Zoological Park, Mr. Townsend as Director of the New York Aquarium, and Dr. Mayer in charge of the zoological division of the Brooklyn Museum, the prospects for the future are extremely bright.

HENRY FAIRFIELD OSBORN,
Chairman of the Executive Committee of the N. Y. Zoological Society.

SCIENTIFIC BOOKS.

Economics of Forestry. A reference book for students of political economy and professional and lay students of forestry. By BERNHARD E. FERNOW, director of the New York State College of Forestry. New York, Thomas Y. Crowell & Co. 1902. Pp. ix + 520. $1.50.

The appearance of this book is timely, though after many years of forestry propaganda in which its author has taken a prominent part, it may be doubted whether the average student, to say nothing of the layman, is yet fully prepared to appreciate the important principles and conclusions herein enunciated. It is written with characteristic clearness and directness by our greatest authority on the subject, and contains much of vital interest at this stage of forestry development in the United States. This review is an attempt to bring out some of its more salient features, in part in the author's own words. Limits of space unfortunately necessitate great condensation and omission of much that is well worthy of careful consideration.

In his discussion of the relation of the state to natural resources the author considers the principle, recognized in all civilized states, of the necessity of protection of the rights of the many from the unrestricted exercise of individual interests, and extends the principle to its widest interpretation by including the rights of the future many. The activity of the state has for its object the perpetuity of the well-being of society, its continued welfare and improvement; it must provide for the future, must be *providential,* hence the economy of resources, much neglected in economic literature, fully justifies the large place accorded to its discussion. "While we are debating over the best methods of disposing of our wealth, we gradually lose our very capital without even realizing the fact. Whether we have a high tariff or no tariff, an income tax or head tax, direct or indirect taxation, bimetallism or a single standard, are matters which concern, to be sure, the temporary convenience of the members of society, but this prejudicial adjustment is easily remediable. But whether fertile lands are turned into deserts, forests into waste places, brooks into torrents, rivers changed from means of power and intercourse into means of destruction and desolation—these are questions which concern the material existence itself of society; and since such changes become often irreversible, the damage irremediable, and at the same time the extent of available resources becomes smaller in proportion to population, their consideration is finally much more important than those other questions of the day."

Considering the forest as a resource, it is shown that wood supplies are, and unquestionably will continue to be, an indispensable requirement of our civilization, almost like water, air and food. In the appendix statistics are cited which show that all the industrial nations have, during the last forty to fifty years, increased their per capita consumption of wood materials greatly, in spite of the increase in the use of substitutes. The money value resulting from the mere conversion of the products of our woodlands equals at present annually a two per cent. dividend on the entire wealth of the nation, yet, owing largely to wasteful methods, hardly more than twenty to thirty per cent. of the material in the felled trees is utilized, and by the process of culling the valuable kinds the lumberman gives the advantage to the weeds in tree growth, with no reference whatever to future supplies. In Germany, on the other hand, the forest resource represents, in round numbers, a capital value of $180 per acre, paying a constant revenue of three per cent. on this capitalization, producing a constant annual gross revenue of $190,000,000, and this, too, from soils that, for the most part, would otherwise be unproductive. It is apparent that we are bound to exhaust our own stores in less time than they can be replaced, and that we are living not on interest merely, but are rapidly attacking our wood capital. Our per capita consumption is nearly nine times that of Germany, and twenty-five times that of England, a fact that suggests the possibility of a far more economical use of our timber resources.

Under the business aspects of forest production certain striking facts are presented. Thus it is stated that Saxony has taken in about $200,000,000 during the last fifty years from a small area of rough mountain land, not half a million acres, a tract half the size of many a county in the United States, and that without diminishing, but rather increasing, its earning power. In Prussia the average price of wood per cubic foot nearly doubled in the thirty-five years from 1830 to 1865, and

from 1850 to 1895 it rose nearly fifty per cent. None the less no business realizes more than the forestry business that time is money, and time is what the small capitalist does not have. Since the crop is so long making—75 to 150 years—it is a business for the state and large corporations, rather than for the individual, in most cases.

The natural history of the forest is clearly and instructively discussed in the light of certain well-known factors influencing tree growth, and emphasis is laid on the capital fact that the whole art of forestry, in its technical as well as its financial results, is based upon the knowledge and application of the laws of accretion. The growth of the individual tree, as well as the growth of the whole stand of trees, in quantity and form is subject to laws which can be formulated. The statement of these laws and their application is of much interest, but must be omitted from present consideration, as must the subject of silviculture from its professional standpoint. This latter, however, includes various important suggestions which should be heeded by the would-be reformer, among them measures for reducing the danger from fires.

The chapter on principles and methods of forest policy is one that it will well repay, not only the student, but every thoughtful citizen to read and ponder. It is shown that the forest cover bears a peculiar relation to national prosperity, and that its continuity calls for specially active interest by the community at large, and by its representative, the state. This is apparent when it is considered that the forest is a natural resource which furnishes in very large quantities materials almost as needful as food, and that it forms a soil cover which influences, both directly and at a distance, conditions of water flow, soil and local climate, thereby affecting in a most intimate way the financial, sanitary and social interests of the commonwealth. Since, then, the private capitalist is interested primarily in getting the largest present profit, the care for the future necessarily devolves on the state, and the state must interfere, wherever the interests of the future clearly demand it.

But what form shall this interference take? The answer, according to Dr. Fernow, will vary according to our conceptions of government functions, according to practical considerations of expediency, and according to the character and location of the forest areas. The exercise of *providential* functions on the part of the state is regarded as a self-evident, logical sequence of the state idea everywhere, but the manner and extent of exercising these functions must vary. In the densely populated monarchical countries of Europe, with relatively scanty resources, a much more direct and strict interference is called for than in a country which has still plenty of elbow room, with plenty of resources; here it may be expedient to leave adjustment to future consideration and action, there expediency calls for prompt and vigorous assertion of state rights and obligations.

But taking conditions and ideas as we find them, it may be accepted as a general principle that as far as forest areas serve only the one object of furnishing supplies, and form the basis of industrial activity, we may, for the present, allow our general modern policy of non-interference to prevail, based as it is on the theory, only partially true, that self-interest will secure the best use of the means of production. There is, however, one great generic difference between the forestry business and all other productive industries, which places it on a different footing as far as state interest is concerned; it is the time element which brings with it consequences not experienced in any other business. In ordinary cases the law of supply and demand coupled with self-interest can be trusted to bring about a proper balance, but in the forestry business, where the time element is so great, the balance of supply can not be maintained in this way; hence even with regard to supply forests the position of the state may properly be a different one from that which it would be proper and expedient to take toward other industrial activities.

This is much more the case when protection forests are involved. Here, in exercising a protective function, the state performs merely the primary logical duty of its existence, namely, securing for each of its members the

maximum opportunity to do for himself, preventing interference, direct or indirect, by others; it is not doing for the individual what he could have done for himself, and is not liable to the charge of paternalism.

There are three different ways in which the state can assert its authority and carry out its obligations in protecting the interests of the community at large, and of the future against the ill-advised use of property by private owners, namely, by exercising educational functions, by restrictive measures, that is police control, and lastly by direct control involving ownership and management by its own agents.

The choice of method in the United States will naturally, and rightly, be in the order named. As a general principle, only when persuasive and promotive measures fail or are insufficient, recourse is to be had to restrictive measures; only when these are inefficient or inexpedient is the state to own and manage properties.

As to educational measures, the author holds that universities have the advantage over special forestry schools and frankly expresses the view that the introduction of the subject into the primary public schools, as advocated by some propagandists, is not desirable nor expedient except incidentally. The endowment of scholarships, however, and the establishment of experimental stations are earnestly recommended, the time element involved in forestry experiments being ample justification of state aid in this direction. The dissemination of statistical information is also emphasized as a means of aiding rational legislation, and the rational conduct of private business as well. These would include estimates of the extent of absolute forest-soils and their cultural conditions, composition, age and character of timber, in short the facts which a legislature needs in order to act intelligently and the private operator must have as soon as forestry advances beyond the stage of mere lumbering.

In considering the attempts that have been made by various state governments to aid private endeavor, particularly by means of bounties, the fact becomes apparent, curiously enough, that paternal methods have found much more favor and are more extensively used in our country than in European countries, and that these methods, though seldom entirely successful, are still urgently pressed upon our legislators. The timber culture acts of 1873–1874 have proved quite ineffectual, yet as late as 1897 in Pennsylvania, and 1899 in Indiana, the same idea has been embodied in legislation designed for the encouragement of forestry, years after the crude law of the general government had been repealed because of its abuses and lack of satisfactory results. The method of encouragement recently inaugurated by the federal government, namely, to give to private owners specific advice as to the management of forest properties, has much to commend it, though it can hardly be expected that, in the absence of an obligation to follow the working plan, commensurate results will follow.

The taxation of forest property, as now conducted in most of the states, is directly and justly condemned as tending to encourage forest destruction and discourage forest management. The customary method of assessing forest property by including the value of the standing merchantable timber is compared to taxation of farm property assessed not only on the value of land, buildings and machinery, but on the value of the growing crop itself, which would be a most absurd and discouraging procedure. In Wisconsin, for example, taxes on tracts of hardwood lands, from which the pine has been removed, have averaged about ten cents per acre, that is to say, twenty to thirty per cent. of what is probably the year's production must be paid to the tax gatherer. It is safe to say that no other property is so heavily taxed. The natural result is that lumbermen propose to escape from this extortion by stripping the land as speedily as possible, and are not sanguine as to what the state is likely to accomplish in the way of a rational forest policy.

Still worse, perhaps, has been the outcome of tariff regulations, which have resulted in the more rapid cutting of our own forests and the transfer of prosperous industries from the northern states to Canada. Nevertheless, legislation in this direction is not necessarily

pernicious. In Germany there has been protective legislation since 1879, with the result of decreasing importations, but the conditions there and here, where forestry hardly exists as yet, are so different as to render comparisons of little value further than to say that the protection in Germany is given to a well-established forest-management against the competition of exploited natural woods.

The impotency of existing laws designed to prevent forest fires is recognized by every one who has given the matter attention. Under the head of principles to be kept in view when formulating legislation for protection against forest fires the following suggestions are given: (1) There is a necessity of having a well-organized machinery for the enforcement of laws, in which the state must be prominently represented; (2) responsibility for the execution of the law must be clearly defined, and must ultimately rest upon one person, an officer of the state; (3) none but paid officials can be expected to do efficient service; (4) recognition of common interest in the protection of this kind of property can come only by a reasonable distribution of financial liability for loss between the state and local community and the owners themselves.

Passing from restrictive, or police, regulations to the direct supervision and control of forest properties, it is shown that, notwithstanding the necessity of the state's assuming the function of internal improvement in cases of palpable public benefit, as, for instance, in the forcible reforestation of denuded mountain slopes, it is found that control and supervision of private property is an unsatisfactory, expensive and only partially effective method of securing conservative forest management. We are prepared, then, for the conclusion, which seems inevitable, that here, as well as in the old world, it finally becomes preferable in many cases for the community to own and manage forest areas. The ownership may rest either in the state, or in the county, town or other political subdivision which seems most interested in the maintenance of the protective cover, and possession, if it can not be had by purchase, may be obtained by the exercise of eminent domain, a right that may be reasonably exercised when public safety or public utility requires, as is incontestably the case in so many of our states at the present time. In the ideal, most highly organized state, the policy would be for the community to own or control and devote to forest crops all the poorest soils and sites, leaving only the agricultural soils and pastures to private enterprise.

From this clear and forcible presentation of the principles and methods of forest policy the author passes to a résumé of the forest policies of foreign nations, those of France, England (in India), Russia, Austria, Sweden and Norway, and Germany being specially discussed. For the education of the lower class of foresters in Germany and Austria there are some twenty special schools, while for the higher classes not only ten special forest academies are available, but three universities and two polytechnic institutes have forestry facilities. The forests of Germany cover 34,700,000 acres, or 26 per cent. of the entire land surface, a large portion of the forests covering the poorer, sandy soils of the North German plains, or the rough, hilly lands of the smaller mountain systems, and are distributed rather evenly over the entire empire. The condition of the forests depends largely on the amount of control exercised by the state authorities. It is best in all cases in the state forests, it is almost equally as good in the corporation forests under state control, and is poorest in the private forests, particularly those of small holders. In a large part of Prussia, Würtemberg, and Bavaria the corporations provide their own foresters; but these, as well as their plans of operation, must be approved by the state authorities. In Prussia and Saxony private forests are free from governmental interference, but elsewhere in the German Empire private forests are, for the most part, under some state supervision; a permit is required before land can be cleared, devastation is an offense, and in some states a badly neglected forest property may be reforested and managed by state authorities.

From this brief outline it is apparent that

forestry in its modern sense is not a new, untried experiment in Germany, but that care and active legislative consideration of forest wealth date back more than four centuries; that the accurate official records of several states for the last one hundred years prove conclusively that wherever a systematic, continuous effort has been made, as in the case of all state forests, whether of large or small territories, the enterprise has been successful; that it has proved of great advantage to the country, furnished a handsome revenue where otherwise no returns could be expected; led to the establishment of permanent wood-working industries, and has given opportunity for labor and capital to be active, not spasmodically, not speculatively, but continuously and with assurance of success. This rule has, fortunately, not a single exception. It is a highly significant fact, however, that even in Prussia, where the state is exhausting all ameliorative and persuasive means, over 75,000 acres have been deforested by private owners during the last twenty years. The state finally buys these half-wastes, restocks them at great expense, and thus public money pays for public folly in not restricting ill use of forest properties.

It is interesting to note that Japan had a forest policy earlier than any of the European nations, and has now a department of forestry controlling the management of 17,500,000 acres, or thirty per cent. of the total forest area. A forest academy has been connected with the University of Tokio since 1890.

The concluding chapters are devoted to forest conditions and the forestry movement in the United States. An area of 500,000,000 acres represents practically the forest territory of this country capable of timber production, much of it 'culled' forests from which a large part of the merchantable timber has been removed. The forest reservations of the federal government to July 1, 1902, comprise nearly 60,000,000 acres, or about one per cent. of the public domain, including brush lands, grazing lands, and desert. The state of New York owns over one and a quarter million acres and is increasing the area of the state forest, and Pennsylvania has entered upon the same policy; but in the other states forest property is still almost entirely in private hands. It is not to our credit that conservative lumbering is thus far hardly more than a name in the United States, and in most cases the policy of 'skinning,' *i. e.*, culling out the merchantable timber, prevails. It is, however, a hopeful feature of the situation that corporations and wealthy capitalists are beginning to see the financial advantages of the future in forest properties, that sporting associations are also becoming interested in forest preservation, and that the long period of agitation is finally passing into one of scientific study of our resources, with at least here and there commendable and measurably adequate legislation. It has become at last the policy of the United States government to take care of its long-neglected forest lands, but the administration of the forest reserves is still in an embryonic condition under the General Land Office, while the survey and description of forest reservations are conducted under the agency of the Geological Survey, instead of having the whole matter under the one head, namely the Forestry Bureau of the Department of Agriculture, an anomalous condition of affairs that can hardly prevail much longer.

It need hardly be said that this authoritative exposition of the economics of forestry, with the applications that have been made to present conditions and needs in the United States, can not fail to render most important service at a time when the great majority of intelligent citizens freely acknowledge the pressing necessity of a forward movement, but, in nine cases out of ten, are either hopelessly in the dark or extremely ill-advised as to the steps that ought to be taken.

V. M. Spalding.

SOCIETIES AND ACADEMIES.

MEETING OF THE CHICAGO SECTION OF THE AMERICAN MATHEMATICAL SOCIETY.

The twelfth regular meeting of the Chicago section of the American Mathematical Society was held on Friday and Saturday, January 2 and 3, at the University of Chicago. The meeting was presided over by Professor