though well acquainted with foreign languages and a writer of good English (as proved by his contributions to the *Zoological Record* from 1872 to 1878, and by his admirable article on Steenstrup in *Natural Science* for September (1897), he preferred, as a rule, to publish in his native language. This, while a benefit to the Danish school, has not prevented foreign zoologists from recognizing the value of Lütken's work; abstracts have appeared in many English and other journals, and honors have been showered on the author. His death causes a vacancy in such societies as the Royal, Linnean and Zoological Societies of London, the Imperial Academy of Sciences of St. Petersburg, the Imperial and Royal Zoological and Botanical Society of Vienna, the Boston Society of Natural History and a vast number for whose names we have no space.

Lütken was a tall and handsome man of the fair Danish type, with a keen blue eye. His upright and somewhat stiff demeanor might be a reminiscence of his military service. But his reserve did not prevent one from seeing the thorough worth and single-mindedness of his life and thought, nor did it check his really kind disposition, as experienced not only by his family and closer friends, but by every foreign visitor to him in his Museum at Copenhagen, and every correspondent who sought his aid.

F. A. B.

SCIENTIFIC BOOKS.

PROGRESS OF FOREST MANAGEMENT IN THE ADIRONDACKS.*

The recent report of the Director of the New York State College of Forestry and the College Forest in the Adirondacks is a document of more than ordinary interest, dealing as it does with questions that are now engaging the attention of the legislatures of several States and to which much thought is being given by citizens who are interested in the public welfare.

As shown by the report, the number of students has increased from four, the number three years ago, to twenty-five and, in addition to these regular students, there are registered twenty-nine from the Colleges of Architecture, Civil Engineering and Agriculture. The five students who went out from the school last year have found satisfactory employment, three with the Forestry Division of the United States Department of Agriculture, one with a lumberman's firm and one with the Forest, Fish and Game Commission of the State of New York.

In addition to the work of the three professors of forestry, many of the professors and instructors in other Colleges of Cornell University have aided in giving instruction, and lectures on fish culture have been given by Dr. B. W. Evermann, of the United States Fish Commission, and a short course in practical timber-estimating was given at Axton by Mr. C. P. Whitney, a well-known estimator, while courses on marketing the forest crop, as well as special courses in law and engineering, have been arranged for.

The plan of requiring practical work of the junior and senior classes in the College Forest has proved satisfactory and has become a permanent arrangement. The work embraces inspection of logging operations, timber estimating and measuring, surveying and locating roads, nursery work and planting, marking trees for cutting, practical work in the sugar orchard, and excursions to fishing grounds and hatchery.

Aside from this, the distinctively educational work of the College, the problem of the management, development and satisfactory utilization of the forest property — thirty thousand acres in the Adirondacks—with which the College is entrusted has been fairly met. It involves securing a market for the wood, much of it already past maturity and rapidly deteriorating, and the perpetual renewal of the forest by planting or natural regeneration, so as to provide both for future cutting and improvement of the property. The widely different conditions under which European forestry is prac-

* Third Annual Report of the Director of the New York State College of Forestry, Ithaca, N. Y., March, 1901.

ticed make it an impossible guide in the present case, except as to principles, while the manner of their application has taken perforce the form of original experimental study of a most difficult problem.

The director ably defends the policy of harvesting the crop as carried out at the College Forest, a policy made possible by special legislation, which has permitted the entering into contracts for the disposal of the old and decrepit hardwoods forming the bulk of the culled forest. Such contract has been made with the Brooklyn Cooperage Company, under which a stave and heading factory and a wood alcohol plant are being erected at Tupper Lake and connected by rail with the College forest. The prices obtained are fair market rates, better than private owners of similar property in the Adirondacks have been able to get the present year, and the experiment, in spite of an unusually unfavorable winter, promises to be self-supporting. It is expected that about 50 per cent. of the area cut over during the time covered by the report will have to be planted. White pine and Norway spruce will be employed, using both plants and seeds, and adding elm and ash, with a few other species.

Various important questions have arisen in connection with the actual and possible yield of Adirondack hardwoods, and these, together with the ideals and practical limitations of American forestry, are carefully discussed. It is shown that the American market is the essential factor which makes the practice of forestry as a business different in the United States from that of Germany, and that this, again, is due to the difference in density and distribution of population. Accordingly, the German wood market is mostly local, steady and continuous. A sustained annual yield is the best business policy, and a thorough utilization down to the small brush is possible through local consumption by the dense poor population. The American wood market, on the other hand, is essentially continental; the harvest is transported to centers of consumption, and cheap transportation over long distances is the keynote of marketing it profitably. This requirement in many districts rules out a thorough utilization of the product, and inferior parts of the harvest must be left unused. Hence a realization of the theoretically 'normal forest' with a so-called 'sustained yield' is at present impracticable in America from a business point of view. And, moreover, unfair systems of taxation discourage the attempts at such management that otherwise might be made. The working plan of the College, therefore—carrying out the aim of the management to attain the best that is attainable under existing conditions—is simply to remove the old crop as fast as the market and practical considerations permit, and replace it by a crop of better composition and promise; *that is, to practice silviculture.*

The basis of an American system of forestry is summed up in three primary essentials:

1. Better protection of forest property, including rational methods of taxation—a subject of legislation.

2. More thorough utilization of the forest crop—a subject of wood technology and development of means of transportation and harvesting.

3. Silvicultural methods of harvesting, so as to produce a desirable new crop, or else artificial reforestation—the main concern of forestry.

Planting operations on burnt areas have been continued and there are now ninety-five acres planted, chiefly with white pine, Douglas spruce and Norway spruce, the last named having thus far proved most satisfactory as to cheapness, rapidity of growth and endurance of drought and frost. Two nurseries have been established in which already about a million seedlings of various conifers have been raised for use in planting and for experiments in acclimatization. An experienced forester, whose professional education was had in Switzerland, is in charge of all the technical work, such as supervision of felling, planting and nursery work, conducting of experiments, collecting of data and statistics, and making reports, while the purely business arrangements, such as hiring of labor, purchase and sale of materials, care of property, and the book-keeping and sealing are in charge of a superintendent familiar with such duties. A logging foreman of experience is in charge of the crew and camp, supervising the labor. The College is now in a position to dispose annually of upwards of 15,000 cords of wood for fuel and

the retort, and from 2,000,000 to 4,000,000 feet of logs. The fullest possible utilization of the entire product down to the branchwood, two inches in diameter, has been accomplished, and even the brushwood has been employed to some extent in the production of wood alcohol and in other ways.

That so extensive a series of operations should have been embodied in an actual system of forestry, for which there are no existing models, that a market should have been created and the experiment conducted with good prospect of being self-supporting from the start; that in a country thus far without schools of forestry that could be drawn upon for trained men, and with the practical difficulties attending the importation of foreign specialists, it has been possible to equip and conduct such a school and forest, is sufficient testimony to the ability of the director, who, in the face of extraordinary difficulties, has successfully conducted an undertaking never before attempted, and one of immense importance and promise.

Aside from its value to the State of New York, which has liberally maintained it, the establishment of the school and the College Forest is a matter of great moment to such other States as are immediately concerned with forestry problems and are contemplating necessary legislation. V. M. Spalding.

Zoological Results based on Material from New Britain, New Guinea, Loyalty Islands and elsewhere, collected during the years 1895, 1896 and 1897, by Arthur Willey. Cambridge, Eng., the University Press. 4to. Part IV. 1900. Pp. viii + 174; pls. 20.

The fourth part of Dr. Willey's 'Zoological Results' contains ten contributions covering a wide range of topics. The first is by J. S. Gardiner and deals with a supposed new species of coral, *Cœnopsammia willeyi*. A very full description of the anatomy of this animal is given and some interesting conclusions concerning its germ layers are drawn. The actinozoa are usually described as covered externally with ectoderm, which at the mouth is reflected inward so as to line the gullet. From the inner end of the gullet the ectoderm is continued as mesenteric filaments over the free edges of the mesenteries. The walls of the gastrovascular cavity are usually said to be lined with entoderm. Gardiner points out that digestion does not take place in the gastrovascular cavity of these animals, but in the so-called gullet whose deep end is imperfectly closed by the mesenteric filaments. The cell lining of the gastrovascular spaces, instead of being concerned with digestion is made up of epithelial muscle cells and of genital cells. These conditions have led Gardiner to redefine the limits of the germ layers in the anthozoa. The layer covering the exterior of the animal is the ectoderm. At the mouth the ectoderm is continuous with the layer lining the gullet and giving rise to the mesenteric filaments. As these are the parts chiefly concerned in digestion, this layer is the entoderm. The lining of the gastrovascular cavity, muscular and reproductive in character, is the mesoderm. Thus the actinozoan is not a diplo-blastic, but a truly triplo-blastic animal.

The paper is well illustrated and the two text figures which show the relations of the calcareous skeleton to the soft parts in *Cœnopsammia* will be welcomed by teachers in general as well as by students of the corals.

The second contribution is a report on the insects of New Britain, by D. Sharp. It consists of notes on some fifteen species of beetles, and on several bees, wasps, and flies. One of the wasps collected, probably *Polistes colonicus*, had the strange habit of laying several eggs in a cell, though in the end only one mature insect emerged from each cell. How the supernumerary larvæ were disposed of and whether this habit was an individual peculiarity or a characteristic of the species were not determined.

Borradaile's account of the crustaceans shows that eighty-two species of stomatopods and macrurans were collected and that twenty of these were new to science.

The slugs were studied by W. E. Collinge, from whose work it appears that six species were found, two of which were new. One of these, *Veronicella willeyi*, is made the basis of a full anatomical study.

According to E. G. Philipps sixty-three species of Polyzoa were collected, of which nine were new. L. R. Thornely notes thirteen species of

hydroids, ten of which have never before been described.

J. J. Lister presents an extended report on a peculiar hard white organism found growing on dead coral in thirty-five fathoms of water. It was made up of a continuous skeleton of solid polyhedral elements penetrated by a system of anastomosing canals; these were lined with soft tissue and were open to the exterior. The soft tissue contained here and there what seemed to be large unsegmented eggs and other masses which had the appearance of parenchymular larvæ. Taking all these peculiarities into account, the author believed the organism to be a sponge, but of so unusual a structure as to justify the erection of a new family for its reception. The species is called *Astrosclera willeyana*, and the family Astrosclerida.

A series of embryo mound birds and one hatched nestling are reported on by W. P. Pycraft. The feather tracts of the embryo and the nestling plumage are described in detail. The birds are able to fly almost upon hatching, and this has led to the idea that they were at once provided with adult plumage. Pycraft points out that their plumage is not adult, though it is also not true nestling down.

S. J. Hickson and I. L. Hiles report on certain of the octocoralia, two species of Stolonifera and twenty species of Alcyonaria, three of which are new. The Xeniidæ are described by J. H. Ashworth. Of the sixteen known species of soft corals belonging to this genus, Dr. Willey's collection contained representatives of four, as well as material upon which the description of a new species is based.

G. H. PARKER.

The Austin [*Texas*] *Dam.* By THOMAS U. TAYLOR. Water-Supply and Irrigation papers of the United States Geological Survey, No. 40. Washington, Government Printing Office. 1900. Pp. 52, pl. xvi.

In this publication Professor Taylor, of the Engineering Department of the University of Texas, gives an account of the inception, building, and failure of the 'Austin Dam,' a municipal undertaking for the purpose of controlling the water supply of the Colorado River.

The first foundation stone was laid May 5, 1891, and the disaster, due to an unprecedented flood, occurred April 7, 1900.

As remarked by Mr. F. H. Newell, in his letter of transmittal, "There are many useful lessons to be drawn from the history of such an enterprise, for it often happens that failure is more instructive than success. Throughout the United States many communities are now discussing the utilization of water power for irrigation and other industrial purposes, and they may be saved from mistakes or be led to adopt precautionary measures by a clear understanding of the causes of the disasters which have occurred through the neglect of certain precautions."

The scope of the paper may be seen from the following general headings: Introduction, Preliminary Projects, Construction of Dam, Leak under Head Gate, Flow of Colorado River, Economic Aspect, Silting of Lake McDonald (the body of water back of the dam), Failure of the Dam. The illustrations are both numerous and excellent, some being from photographs taken immediately after the accident.

Among the errors pointed out are the following: That the minimum flow of the river had been greatly overestimated, hence the power developed upon the completion of the dam fell far short of that hoped for; that evaporation as a factor had almost been lost sight of, that the engineers in charge of the work of construction (the dam cost $611,345.29) had been hampered and interfered with in the prosecution of their labors; and that the geologic conditions prevailing at the site had been ignored. To these errors are attributed the failure of the enterprise to meet the expectations of the public and its failure as an engineering feat.

While Professor Taylor's paper is of the greatest interest to the engineering profession, there is much of value in other lines, as, for instance, the carefully conducted investigation of the silting up of Lake McDonald.

FREDERIC W. SIMONDS.

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SCIENTIFIC JOURNALS AND ARTICLES.

THE *American Geologist* for January contains an article by S. E. Bishop on 'Brevity of Tuff