by the National Association for Tuberculosis in this country. A committee of that association has invited a group of workers in the different fundamental sciences to cooperate with them in an extensive study of tuberculosis; and this committee is showing the most far-sighted spirit of cooperation in putting the work of each division to the advantage of all the rest. It might be a matter of interest to us as anatomists that three of those who have been chosen for this work are members of this association.

Another most interesting example of such a correlation is to be found emanating from the chemists who have been studying rickets. The chemists have obtained cooperation of both histologists and clinicians with the greatest possible advantage to the solution of their problem. So many other examples could be found in the various institutes for research as to demonstrate quite conclusively that one of the most striking features in the research of our time is the development of cooperation.

The nature of joint research introduces a new factor to the problem of the training of students to become investigators. In my judgment the most successful method of training students in research in the past has been to start a student with a problem in which he could work by himself, could make his own specimens and analyze them; in joint research each one has to be a cog in the wheel during the time of the experiment; to put a student into such a group, to let him work with you on the general problem is really the time-honored method of the apprenticeship. That an apprenticeship has worked well in the arts, numerous examples of the student who has surpassed his master demonstrate, but I can not but feel that, though the method must often be accepted on account of the necessities of our problems, it calls for extra safeguards lest the student become a mere technical assistant and get no start in independent work himself.

There may be, of course there will be, personal difficulties in joint research, but certainly they will be no worse than our old scientific controversies. I have had some experience with scientific controversy, and in my judgment it is a poor technique. The flaw in it is this, that in controversy one seeks to convince one's opponent by argument and evidence that one's own theory is right and his theory is wrong. Now this is the exact thing that is not worth doing; because as long as a subject is growing, or in order that it may grow, it is of the utmost importance that people should be working on different theories. The worst effect of controversy is on the individual who takes part in it, because it tends to force him into contracting a marriage with his own theories; assuredly he should be in love with his theories, but he should never promise to remain so. Controversy is entirely different in spirit from the stimulating discussions between different workers that are the real basis for the formation of scientific societies. Herein lies a subtle difference in quality which may perhaps be expressed as follows: discussion stimulates while controversy depresses.

I offer then two topics for your consideration, liberty of thought in education and cooperation in research.

FLORENCE R. SABIN
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RESTORATION OF THE OLDEST KNOWN FOREST

RESEARCH work carried on by the geological staff of the State Museum at Albany under the direction of Dr. John M. Clarke has resulted in the opening in that museum, on February 12, of a unique and remarkably realistic exhibit of a restoration of a forest of late Middle Devonian Age. Occupying a central alcove about 35 feet long, 30 feet high and 25 feet in depth, this exhibit has been rendered possible by the great wealth of fossil trees that, during the past four years, have been collected in the vicinity of the little village of Gilboa, N. Y. In 1869 a very heavy autumn freshet in the upper valley of the Schoharie creek in the Catskill mountains exposed a number of fossil tree stumps in the bed-rock close to the creek. The fossils collected at that time by Professor James Hall were submitted for investigation to Sir William Dawson, then principal of McGill University and the leading paleobotanist of his day. When one considers the character of the material he was called upon to examine, his observations were remarkably accurate, although he was unable to establish in detail the true nature of these trees.

Since 1920, excavations by the New York Board of Water Supply for the construction of a dam on Schoharie creek near Gilboa have exposed three horizons of erect fossil tree stumps within the sandstones and shales of that locality. At no other place in the world has there been discovered in rocks as old as these any approach to a similar abundance of fossil trees in such a remarkably complete state of preservation. From these three horizons, each of which is separated from the one next above by 60 feet of barren sandstones, there have been collected sixty or more stumps and many portions of the trunks, branches and roots of these trees, as well as their foliage, seed-bearing capsules and sporangia-bearing organs. At each horizon the more or less bulbous stumps, up to three feet in diameter, rise from black shales representing the rich soil in which the trees grew; in fact,

from some of the stumps, branching roots and rootlets have been found extending laterally within the shale for more than six feet. From this abundance of plant remains and the mode of their appearance in the enclosing rocks, it has been possible to vividly portray not only the trees as they were when living but also the character of the landscape they clothed.

In the leaflet prepared for distribution on the occasion of the opening of this exhibit, Dr. Clarke writes:

> They were majestic trees, simple in structure, resembling closely the tree ferns of the present tropical jungles but singularly enough an advance in structure over these tree ferns by virtue of their seed-bearing devices. The Gilboa forests grew along the low shores of the western Catskill mountain region, facing the interior sea which at that period covered all of Central and Western New York. They grew in marshes or jungles along these lowlands which were easily covered by the rise of the tides. Their swollen roots were anchored in soft black muds, and the streams running down from the land found a meandering course among them out to the sea. The atmosphere of these coastal marshes must have been dank and heavy, and the rays of the sun sifted down among them only with softened light. They were places where the vegetation grew rank. Along with these Gilboa trees, which have now been given the name of Eospermatopteris, grew a few other plants, some simpler ferns and a strange lycopodium tree, Protolepidodendron, or the Naples Tree, as it has come to be commonly known.

The foreground of the exhibit illustrates the manner in which the fossil trees occurred at Gilboa, and shows fifteen of the tree stumps distributed along the three successive horizons of dark shales with intervening sandstone beds. In the background, full-size restoration of the trees in various stages of their growth blend with a beautiful panorama of the forest as it must have appeared in Devonian times. Water trickling down the cliffs in the foreground gathers in a pool which gives continuity to the swampy conditions depicted in the vista of the background. As a geologist views this masterpiece exhibit, his thoughts are those of satisfaction that so vivid a picture of a forest, earlier than any hitherto discovered, has been won from the record of the rocks, mingled with the hope that further discoveries may be made which will dispel the mists of the background and reveal the vegetation of even earlier periods of the earth's history.

In vividly portraying the life and conditions which existed during the Devonian period, Dr. Clarke has carried the torch forward far in advance of its position in Sir William Dawson's day, yet, "as a memorial of the admirable service rendered by Sir William Dawson to the science of paleobotany, and as a record of his personal association with the original discovery and study of these trees," Dr. Clarke has generously and appropriately chosen "to dedicate this exhibit as a testimonial to him."

J. AUSTEN BANCROFT
McGILL UNIVERSITY

JOHN VAN DENBURGH

1872–1924

DR. JOHN VAN DENBURGH, distinguished herpetologist and curator of herpetology in the California Academy of Sciences, San Francisco, died in Honolulu, October 24, 1924.

He was born in San Francisco August 23, 1872. His father, Dr. Daniel Van Denburgh, was of Holland Dutch stock that came to America at an early date, settling in New York state. His mother was Elizabeth Douglas Turrill, eldest daughter of Judge Joel Turrill, who was for several years United States consul at Honolulu. Elizabeth Douglas Turrill Van Denburgh was of English descent, her ancestry going back through ten generations to John Mather, of Lowton, Winwich Parish, Lancashire. The first American ancestor was the Reverend Richard Mather, who came to America in 1635.

Soon after their marriage at Syracuse, New York, in 1863, Dr. Daniel Van Denburgh and his wife came to San Francisco, where he was, up to the time of his death in 1911, a prominent dentist.

Early in John's childhood the family acquired a country home at Los Gatos, Santa Clara County, California, some 50 miles from San Francisco. It was there that the subject of this sketch spent his boyhood years and grew to manhood; and it was doubtless there in the beautiful environment of forest, hillside chaparral, mountains and wide expanse of valley that his interest in natural history developed rapidly and enduringly. Like many another boy who in manhood attained eminence in some field of zoological or botanical science, John Van Denburgh's first interest was in birds and their nests and eggs, his first published paper, which appeared in *The Oologist* in 1888 when he was scarcely sixteen years old, being entitled "Two large sets of quail eggs." His interest in ornithology and oology continued more or less intermittently all his life. While a student in the University of the Pacific in 1890 he, with three other congenial associates, organized the Cooper Club devoted to the study of birds, their nests and eggs. When Stanford University opened in 1891 most of this group (including Van Denburgh) entered that institution and the Cooper Club ceased to exist, temporarily at least, until June 22, 1893, when it was reorganized by W. H. Osgood (now Dr. Osgood, curator of zoology in the Field Museum, Chicago), and a few other boys interested in birds.