Illinois, which last was about as illy advised and unconvincing a performance as the history of science can show.

The Gilboa trunks representing an old forest at several levels have been imperfectly known for over 50 years, and were quite incorrectly described as Psaronius by Sir William Dawson. Recent collections by the New York State Museum have brought together in that institution a remarkable collection of stumps, roots, fronds, seeds and microsporangial organs. It is true that these have not been found in organic connection, but the circumstantial evidence is rather convincingly in favor of such a relationship and of the restoration which forms Plate 1 of Miss Goldring's contribution.

These Devonian seed ferns are referred to a new genus known as Eospermatopteris and the various classes of remains are described and illustrated in great detail. These trees had slender tapering trunks, that give evidence of secondary thickening. One of the largest is three and one half feet in diameter at the greatly expanded butt. The standing trunks are all broken off some three feet or less above the base, but broken portions up to twelve feet in length have been found, and the actual height is estimated as at least 30 to 40 feet. Bases of the fronds are found attached to the trunk in one specimen. The roots are unattached but common in the underclay in which the stumps are rooted. The fronds are tripinnate, six feet or more in length and with finely divided laminae of the Sphenopteridium type.

The seeds were borne in pairs at the summits of modified pinnules, distally on the fronds. They are somewhat ovate in form and completely invested by cupules. The microsporangia are likewise borne at the tips of forking branchlets. They are compared with those of Crossotheca, and are funnel or saucer-shaped with scars supposed to mark the places of attachment of the sporangia.

It is no secret that the state museum is engaged in the formidable undertaking of a life-sized group restoration of the Gilboa forest, thus blazing the way for paleobotanical groups, which method of representation has been so successfully exploited by them in connection with invertebrate fossils, and by most large museums in connection with fossil mammals as well as with recent mammals and birds.

There can be no doubt of the very great value of such a group both to scientists and laymen, and paleobotanists are to be congratulated upon the wisdom and energy with which the director of the New York State Museum is supporting the study of the remarkable Devonian flora of that state, a field hitherto scantily tilled in this country.

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THE INFECTION OF TOBACCO PLANT BEDS BY SPITTING

RECENT observations by the writer have brought to light an important means of infection of tobacco plant beds with bacterial leaf-spot diseases, which has been overlooked heretofore. The facts should be of general interest because of the peculiar relationship existing between man, a plant and disease-producing organisms, and of special interest to the tobacco pathologist because the observations suggest the possibility of a very simple means of control of two very serious tobacco diseases. The diseases in question are the angular leaf-spot (*Bacterium angulatum* Fromme), also called rust in the Burley section of Kentucky and black fire in the dark tobacco sections of this and neighboring states, and wildfire (*Bacterium tabacum* Wolf and Moss).

Two methods of control have been suggested for these two very similar diseases. One of these—seed treatment, with other sanitary precautions—has aimed to prevent the introduction of the bacteria into the bed, and the other—spraying or dusting—has aimed to prevent the spread of the bacteria after they have been introduced. The latter method is objectionable as it is expensive and adds an entirely new practice to the tobacco industry, and, further, it aims to prevent diseases the sources of which are not fully understood. The former recommendation has largely failed, in Kentucky at least, where it has been widely tested, due to some previously unknown source of infection.

The past spring, in trying to explain the presence of both wildfire and angular leaf spot in a bed where all known precautions had been taken to prevent these diseases from entering, the writer observed that the tenant who tended the bed was incessantly chewing tobacco and spitting. He admitted that he often spit into the bed while weeding it and stated that he chewed natural leaf from the previous year's crop. It had been positively proved by others that the causal organisms of both these diseases live over winter in the cured leaves. Following up this lead, records were obtained on about 35 beds before weeding and a much larger number after weeding. All the beds examined before weeding were free from bacterial leaf-spots. The same beds, with four exceptions, were infected with angular leaf spot after weeding. The four beds which were free from infection were tended by men who did not use tobacco; whereas in every case where infection occurred, tobacco of the previous year's crop, often supplemented by commercial tobacco, was chewed by someone who had worked in the beds or had loitered around them at some time. Angular leaf-spot was present the past year in over 90 per cent. of the

tobacco fields in Kentucky, but an occasional field was found which was entirely free. In each of the latter cases investigated the grower did not use chewing tobacco. The writer has a considerable amount of other evidence indicating the importance of chewing tobacco as a source of plant-bed infection.

Although nearly all the evidence gathered so far points to chewing tobacco made from the natural leaf of the previous crop as the chief source of plant-bed infection, it is possible that commercial tobacco, either raw or manufactured, may have played an important part in the rapid world distribution of the wildfire organism.[1]

By properly protecting the seed heads from infection by the use of paper bags, pouring the seed from clipped seed pods, and proper sanitary precautions with respect to the seed beds, it should be possible to control these two destructive tobacco diseases without the use of either seed treatment or dusting and spraying.

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MERCURIC CHLORIDE AS A PREVENTIVE OF CERTAIN DAMPING-OFF FUNGI

IN the course of a series of experiments for the control of the root maggot in cabbage seed-beds, a clear-cut relation has appeared between certain of the treatments applied for the maggot and the amount of damage done by soil-infesting fungi, as the Rhizoctonia and Plasmodiophora.

For the last three years it has been repeatedly observed that the plants in different plats showed a marked difference in susceptibility to such diseases. Some of the treatments used, while thoroughly effective in maggot control, actually increased the liability to loss from such fungous troubles, while others, notably mercuric chloride, very largely prevented the diseases.

In these experiments the mercuric chloride was commonly used at the rate of 1–1200, although dilutions considerably greater than this appear to have distinct value. A series of from one to six applications was ordinarily made in each plat, at intervals of a week or ten days, beginning shortly after the plants appeared through the ground.

Careful examination of such plats showed that while one application gave but little protection, two, and especially three, gave excellent control for Rhizoctonia. Under the existing conditions nothing appeared to be gained by a greater number of applications.

This treatment is being tried out on a number of soil-infesting fungi and on different crops, and it seems probable that this method may have a much wider application in controlling diseases of this character on other crops than cabbage.

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[1] Since writing the above, the writer has been informed by Mr. Temple Smith, of Victoria, Australia, that these two diseases are unknown there and that he has rarely if ever seen an Australian tobacco grower chew tobacco. He stated that every three or four years they obtain a new supply of seed from the United States.

SCIENTIFIC BOOKS

An Elementary Treatise on Frequency Curves and their Application in the Analysis of Death Curves and Life Tables. By ARNE FISHER. Translated from the Danish by E. A. Vigfusson. With an introduction by Raymond Pearl. New York, The Macmillan Co., 1922. XV + 240 pp.

NOT many readers of SCIENCE will read Fisher's book; it is not the kind that is read. It is original and arithmetical—two items against it, particularly when taken in conjunction. It has been received both with enthusiasm and with contempt by specialists in its line—two items in its favor. The book undertakes to show that one can construct a life table from a record of deaths at attained ages without knowing the numbers alive. In a variety of worked illustrations of the method, in some of which the author could not have known the numbers living, he has set up a life table that has been shown to be good in so far as the numbers of the living could be ascertained and a computation made in the ordinary way. The working hypothesis is biological in the sense that it is assumed that the different causes of death or groups of causes take their toll of life in a regular or lawful way—that we have diseases and deaths of early, middle and late life. This is not any foolish hypothesis; everybody knows it. But it remained for Fisher to show that what all know he can use in a strictly quantitative way to set up a life table. The technical method of analysis is the Charlier system of frequency curves for handling statistical material, except that Fisher determines the coefficients of the expansions by the method of least squares instead of by the method of moments.

The best review of the book is Pearl's *Introduction* in which the relation of Fisher's work to biological and actuarial science and their intimate relation to each other is exhibited leading to the conclusion that this is *fundamentally* the most significant advance in actuarial theory since Halley. True, doubtless, but how terrifying. What with Einstein making the first fundamental advances in mechanics since Newton, and Mrs. Eddy the greatest religious leader and organizer