

# A PETRIFIED LEPIDOPHYTE CONE FROM THE PENNSYLVANIAN OF MICHIGAN<sup>1</sup>

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Fossilized remains of the strobili of the Paleozoic Lycopodiales have frequently been reported but usually as flattened impressions showing little or none of the original structure. Of petrified remains structurally preserved, only two discoveries have thus far been reported in America. *Lepidostrobus Fischeri* Scott & Jeffrey (3) is a portion of a petrified strobilus from the Mississippian of Kentucky, and another specimen which has not received specific designation is reported from the Pennsylvanian of Iowa (1). The recently discovered Michigan specimen is an entire cone but neither of the others were complete.

The specimen under consideration was found by Professor H. H. Bartlett in a sandstone layer in a shale pit one mile west of Grand Ledge, Michigan, during the summer of 1929. The formation exposed at this place is considered as belonging to the Pottsville series which is low down in the Pennsylvanian system. Two coal seams, each a foot or more in thickness, are exposed in the quarry and the accompanying shales and sandstones have yielded several species of Carboniferous plants. *Stigmaria ficoides*, the root like organ of the Lepidodendreae, is abundant.

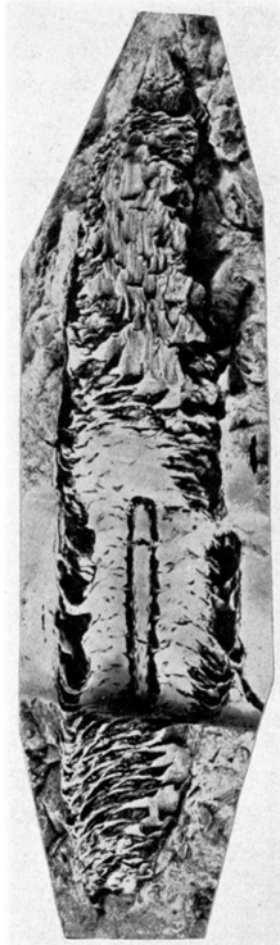
The cone, which measured  $2.5 \times 11.5$  centimeters, had the general shape and dimensions of a good sized cigar (text fig. 1). It tapered rather gradually at both ends and had been flattened to about one-half of its original diameter. Judging from the base of the cone, it was originally borne on a peduncle.

Preservation of the structure is only partial. The xylem strand is intact but the phloem, the cortex, and the attachment of the sporophylls have disappeared. Also the spores had escaped and nothing remained of the sporangia except the crumpled fragments of the walls mixed with the infiltrated siliceous matrix. Since most of the structure of the sporophylls had disappeared and the sporangia had collapsed, very little could be determined concerning the morphology of these parts. However, decay did not take place until the enclosing matrix had partly solidified which resulted in the formation of cavities in the rock mass which were formerly occupied by the bracts. The cavities corresponding to the free upturned laminae on the distal portion of the stipes are well shown on the upper portion of the cone. On the lower portion the outside is broken away so as to show the

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ends of the stipes. The enclosing matrix consists of sand grains cemented together with precipitated silica.

Judging from the areas formerly occupied by sporangia, it appears that the latter were approximately five millimeters long and probably less than half as high. Their width is unknown. The stipitiform portion of the

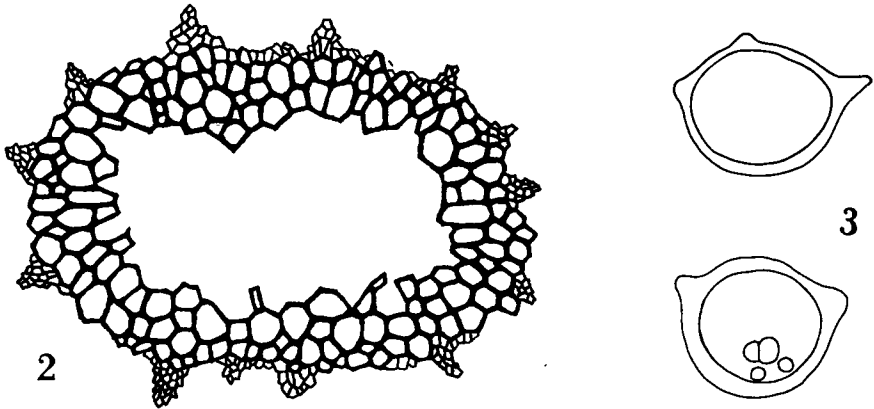


TEXT FIG. 1. Photograph of cone, natural size. The central part was ground away to expose the axis.

sporophyll which seems to have been borne at right angles to the axis appears to be a centimeter or less in length, and the free portion of the lamina appears to have been about the same or possibly slightly longer. The sporophylls are spirally arranged as shown by the dots on the surface of the axis where the sporophyll traces emerged.

The sporangium is attached by a narrow base to the broad upper surface of the sporophyll. Extending upward into the sporangial cavity from the base is the radial plate of sterile tissue which is frequently observed in sporangia of this type. The walls of the sporangia are made up of a single layer of prismatic palisade cells which are characteristic of *Lepidostrobus* sporangia.

Heterospory is indicated in this specimen by remains representing both the megaspores and the microspores. Only two of the former were observed, one of which contains four oöspore-like bodies of a fungus (text



TEXT FIG. 2. Cross section of the xylem cylinder.  $\times 180$ . TEXT FIG. 3. Megaspores. The lower one contains fungous bodies.  $\times 40$ .

fig. 3). In shape, the megaspores are broadly oval and measure about 735 microns along the largest diameter. Two or three low ridges are visible on the surface of the thick wall but they do not bear long appendages as do some lepidodendroid spores. The smaller structures which appear to be microspores are about 20 microns in diameter. They are not well preserved and their identification as microspores is not positive but the presence in the same cone of spores too large to be the spores of a homosporous plant render its heterosporous nature quite certain. Since none of the spores are still enclosed in sporangia it is impossible to determine in what portion of the strobilus the different kinds of spores were borne.

The xylem strand of the cone axis is about one-half of a millimeter in diameter (text fig. 2). The center consists of a pith which is surrounded by scalariform tracheids. The inner zone of rather large tracheids is two or three cells in extent and outside of this is a narrow discontinuous zone of smaller tracheids which is rather sharply set off from the inner zone. Projecting outward from this zone are numerous protoxylem points. It is impossible to determine whether the sporophyll traces depart from these points or from the spaces between.

Concerning the affinities of this fossil, the poor preservation renders comparison difficult. The cones commonly referred to *Lepidostrobus* (the isolated and unattached cones which resemble those of *Lepidodendron*) are characterized by the attachment of the sporangium all along its lower side to the upper surface of the stipe. This feature could not be observed in our specimen. However, there are other features displayed which have much in common with *Lepidostrobus* and which may be tabulated as follows: *a*, the typically lepidodendroid xylem strand; *b*, the apparent heterospory; *c*, the cells of the sporangial wall; *d*, the attachment of the sporangium by a narrow base; *e*, size and external appearance.

Since it is not well to lay stress on the absence of similarities when comparing imperfectly preserved specimens one is often confronted with the problem of whether to multiply species at the risk of duplication, or to refer specimens to species already described but with which they do not closely agree, or to leave them without specific designation. The disadvantage of the latter course is obvious. A specimen not receiving specific recognition and consequently lacking a convenient name is soon lost to science. Williamson (4), when describing *Lepidostrobus Oldhamius*, pertinently remarked:

I have for many years endeavored to discover some specific character by which different *Lepidostrobili* could be distinguished and identified, but thus far my efforts have been unsuccessful. . . . I continue to shrink from giving specific names to examples which, in all probability, only represent forms reappearing in more than one species; but, as in a previous memoir, I still recognize the opposite inconvenience of having no concise means of referring to any object figured. With a distinct understanding as to the meaning and purpose of such names, and since the *Lepidostrobus* under consideration is characteristic of the Oldham deposits, I will designate the type *L. Oldhamius*.

While showing the same general structure as *L. Fischeri* and the unnamed species from Iowa, certain differences are at once apparent, the outstanding one being size. The Iowa specimen, which was complete except for the tip, was 22 centimeters long, or over twice the length of our specimen. It is described as having but one kind of spore, but whether this species was homosporous or merely dioecious is unknown. *L. Fischeri* is described by the author as closely resembling *L. Brownii*, which is quite different from our fossil. The diameter of the axis in our specimen seems to agree fairly well with that of *L. Oldhamius* but there are certain differences in the xylem which seem to separate the two forms taxonomically. Also, nothing is known concerning the length of *L. Oldhamius*. Our species seems to agree also in a general way with the somewhat smaller cone, *L. Veltheimianus*, but this form has a very small pith and megaspores which are different. It might be well to call attention to the impression of the strobilus of *Lepidodendron Sternbergii* Brong. (2), as figured by Lesquereux. While the figure gives no adequate idea of the surface features of the cone, it shows a remarkable similarity in size and shape to our specimen.

It is apparent that there is a general agreement between our fossil and

several of the previously described forms and that it shows no pronounced differences. At the same time it shows details which render its identity with the above mentioned species doubtful. So because of our very meager knowledge on American *Lepidostrobus*, and in order that this specimen be placed on record, it is hereby named *Lepidostrobus Bartletti* sp. nov., after its collector.

The type sections have been catalogued as no. 12862 in the Museum of Paleontology of the University of Michigan.

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