

NEW INTERPRETATIONS OF *SPHENOPHYLLOSTACHYS*  
BASED ON A PETRIFIED SPECIMEN FROM AN  
IOWA COAL BALL

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A specimen of *Sphenophyllostachys* with structure preserved was collected by the writers in coal ball material from the Angus Coal Mine, Des Moines Series, in Iowa. This is, we believe, the first record of an American *Sphenophyllostachys* showing structure.

The specimen consists of a portion of an isolated strobilus. Neither the base nor apex of the strobilus was preserved, so the total length of the fructification is uncertain. None of the vascular elements of the stele remain, and the tips of the bracts are but indifferently preserved. The excellent preservation of the remaining portion of the strobilus makes possible adequate and significant comparisons with previously known specimens.

The strobilus has a maximum diameter of not less than one and one-half centimeters, the axis occupying approximately four millimeters. Attached to this axis are whorls of bracts, the upturned tips of which form the free surface of the strobilus. The bracts of each whorl are inserted upon the axis at a slight upward angle and are adnate for a considerable distance from the axis, forming a cup. The free tips turn sharply upward. Each whorl, composed of approximately eighteen bracts, appears to be directly superimposed upon the bracts of the whorl below, rather than alternating with them.

On the adaxial surface of each bract are borne three sporangia, each attached to the surface by an unbranched sporangiophore. The sporangia are arranged linearly. Thus in longitudinal section of the strobilus, three sporangia are seen on the adaxial surface of each bract. The sporangiophores become free from the bract near the axis but at slightly variable points. The sporangiophores are slender, essentially cylindrical stalks, increasing slightly in size as they approach their respective sporangia, be-

coming greatly thickened near and at the points of attachment to the sporangia, where the sporangiophore bends slightly toward the strobilus axis, and bears a single, pendulous sporangium.

The sporangium is essentially spherical. Its wall is composed of an outer layer of radially elongated cells and two or three inner rows of much smaller cells with thin walls. Spores completely fill the sporangial cavity. They average approximately ninety microns in diameter. The spore wall has a characteristic sculpturing of anastomosing ridges with a rather definite bipolar orientation. Thus in cross-section the spore appears to be spinose. The strobilus is homosporous.

A single vascular bundle traverses the known length of the bract. Its connection with the vascular tissues of the axis cannot be determined because of incomplete preservation. Similarly, a single vascular bundle extends the length of the sporangiophore, ending at the point of attachment of the sporangiophore to the sporangium. The bifurcation of a single vascular bundle into the bundle of the bract and that of the sporangiophore takes place in the outer cortex of the axis slightly below the insertion of the bract. No further bifurcations of either of these bundles occur.

This strobilus is to be compared with those described as *Sphenophyllostachys Dawsoni*, of which the forms *alpha*, *beta*, and *gamma* have been designated. The Iowa specimen agrees in general with *S. Dawsoni* with the important exception of the difference in the number and organization of sporangiophores and sporangia. *S. Dawsoni* formae *alpha* and *beta* have been interpreted variously by Scott and Hirmer, the former ascribing to each bract two (occasionally fewer) sporangiophores, each of which becomes free near the axis and bears a single sporangium; the latter considers that a

single bundle branches in such a manner as to produce two short and one long sporangiophores alternating with two long and one short sporangiophores on adjacent bracts. Each sporangiophore bears a single sporangium. In either instance, a longitudinal section would give the picture of *two* sporangia on the adaxial surface of each bract. In *S. Dawsoni* forma *gamma*, Hirmer describes an elaboration of this branching system to produce *six* sporangiophores and sporangia for each bract, and these arranged in four cycles (a longitudinal section shows four adaxial sporangia per bract).

The Iowa specimen shows none of these conditions. There is no branching of the sporangiophore after it emerges from the surface of the bract near the axis. Three unbranched sporangiophores

arise at slightly different points near the axis, are of different lengths, and each bears a single sporangium placed linearly on the adaxial surface of the bract. A longitudinal section of the strobilus thus shows the correct number of sporangia per bract, namely, three.

It would seem that for a complete understanding of this form genus a reevaluation of the known specimens is necessary. The evidence points toward a separation of the genus *Sphenophyllostachys Dawsoni* formae *alpha*, *beta* and *gamma* into distinct species. The necessity of this is emphasized especially when the correlation of the fructifications with the vegetative plants which bore them is also considered. Consequently, the writers believe that the Iowa specimen itself is best considered as a species heretofore undescribed.

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