

Recent Collections of Pennsylvanian Plant Fossils in Indiana¹

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Combined with other geological criteria, animal fossils, particularly marine invertebrates, have long been used for the correlation of many Paleozoic stratigraphic sequences. This method frequently demonstrates a remarkable degree of precision in the delimitation of strata. However, the paucity of animal fossils in the majority of the non-marine sedimentary rocks in the Pennsylvanian system creates a situation in which the stratigrapher becomes more or less dependent upon the use of plant fossils as indices. As a consequence, paleobotanical investigations of Pennsylvanian age rocks are often of considerable importance in correlation studies by showing the relationships of the coal seams of various coal basins. Although this is no less true of Indiana than of other coal-producing states, the stratigraphic significance of plant fossils in Indiana has thus far not been adequately tested due to a lack of knowledge of this state's Carboniferous flora. Because of this deficiency, it has not been possible to apply the nine Pennsylvanian floral zones proposed by Read (3) to the coal-bearing formations of Indiana.

Aside from the purely stratigraphic aspects, coal flora research contributes: (1) valuable information concerning the floristic composition of the ancient coal-forming forests and its relationship to the properties of various coals; (2) data which add to our knowledge of phylogeny through anatomical and morphological studies; and (3) evidence of the nature of Paleozoic climates.

In 1953, the junior author and J. M. Wood initiated a survey of the plants of the Pennsylvanian system in Indiana under the auspices of the Indiana Geological Survey (5). Twenty-three counties in the southern and western part of the state were covered, with collections being made at sixty of the one hundred and seventy-three sites visited (Fig. 1). The project was continued in 1954 by the present authors, who visited fifteen counties in southwestern Indiana, making collections at forty-eight of one hundred and thirty-seven locations (Fig. 1). Many of these locations were along the Pennsylvanian-Mississippian unconformity in Dubois, Greene, Martin, and Perry Counties. This is an area of particular stratigraphic interest, since the coals found there (termed the Pottsville coals) are near the base of the Pennsylvanian system. As a consequence, the plant fossils found in association with these coals are valuable indices in the correlation of the Eastern Interior Coal Basin (of which Indiana is a part, together with Illinois and western Kentucky) with the other coal basins of the eastern and midwestern United States. David White (4) made the first valid correlation of the Pottsville series of the Eastern Interior Coal Basin with strata in the Appalachian coal basin by means of seven species of fossil plants from the Hindostan whetstone beds of

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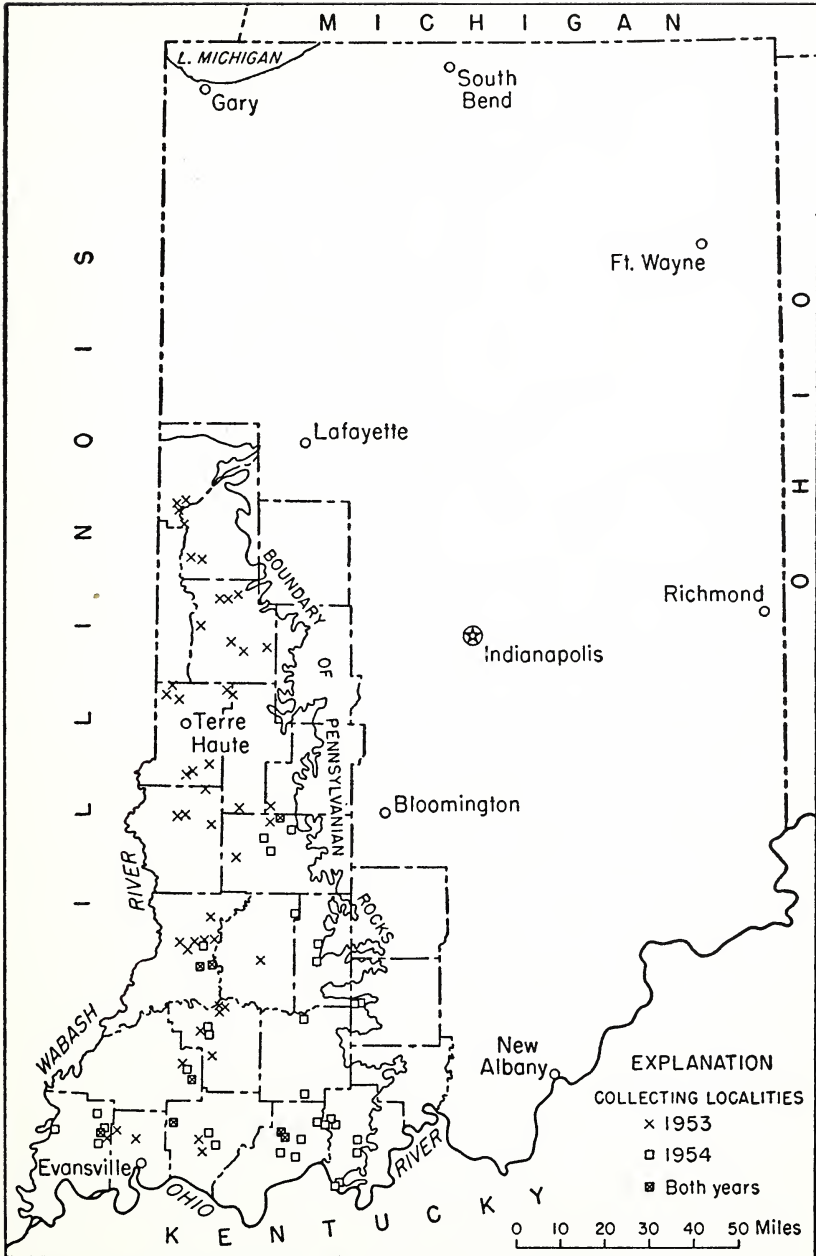


Fig. 1. Outline map showing the eastern boundary of the Pennsylvanian system in Indiana, and the more important sites investigated in 1953 and 1954.

Orange County, Indiana. Continued study of the fossil flora of these strata, as well as other similarly disjunct beds of the Pottsville series, should yield significant correlative data. This is particularly true in the case of the Pottsville coals, since they are found in pockets or lenses, rather than continuous seams, a factor which contributes to the difficulty of their correlation.

Two of the more interesting locations in the region of the unconformity are the abandoned Braxton and Daugherty whetstone quarries west of French Lick in Orange County. Good quality whetstones were manufactured from the fine-grained sandstone from these quarries beginning in the 1870's, although neither is producing at present. The presence of numerous upright (*in situ*) fossil tree trunks (*Lepidodendron*) in the Daugherty Quarry is reported to be one of the major reasons for its abandonment (2). From these whetstone beds the authors collected large quantities of irregularly bedded compressions of *Mariopteris pottsvillea* D. White. Other plants that have been obtained from this region are: *Sphenopteris hoeninghausii* Brogn., *Neuropteris biformis* Lx., *Lepidodendron veltheimianum* (?) Sternb., *Lepidostrobus* sp. Brogn., and *Asterophyllites charaeformis* Sternb. This floral assemblage clearly indicates the pottsvillean age of these beds.

Near Dover Hill, a village in the center of Martin County, the authors chanced upon two sandstone *Lepidodendron* trunk casts being used as ornamental posts at the end of a farmhouse walk. On inquiry it was learned that the casts had been found on the Victor Sims farm (SE $\frac{1}{4}$ NW $\frac{1}{4}$, sec. 35, T.4N., R.4W.). These casts were between two and three feet long, and a third, examined *in situ* near a coal outcrop on the Sims property, was nearly four feet. Two other large casts had been removed previously by Sims. However, most of the external layers of these trunks had been lost, either during the process of fossilization or by later erosion, so that identification as to species was unreliable.

A collecting site of historical interest was the "Old Dam Site" (SW $\frac{1}{4}$ SW $\frac{1}{4}$, sec. 11, T.5S., R.14W.) at the lower end of the Wabash River Cutoff about three miles southwest of New Harmony in Posey County. This was an area in which some of the early geologists and paleobotanists such as J. Sampson, E. T. Cox, Leo Lesquereux, and the Owen brothers, David and Richard, made some of their collections during the latter half of the 19th century. A small portion of some of these collections can still be seen in the Museum of the Workingman's Institute in New Harmony. Unfortunately, the majority of the Owen collections, deposited at Indiana University, were destroyed by fire. Since the plant fossils at the Wabash Cutoff occur in a clayey shale between thin coal seams at the river edge, collections can be made only during periods of low water. Some of the most numerous species found there by the authors are: *Annularia sphenophylloides* Zenker, *Calamites cistiiformis* (?) Stur, *Sphenophyllum emarginatum* Brogn., *Neuropteris scheuchzeri* Hoff., *Sphenopteris elegans* Brogn., and *Mixoneura* cf. *sarana* Bertr.

Four additional coal ball sites were discovered in Indiana during the last field season, making a total of eighteen sites located during the past two summers. These calcified or partially pyritized aggregations of petri-

fied plant remains are now known to occur in at least three coals in Indiana: (1) the Buffaloville coal, a localized lens in Spencer County that lies near the top of the Pottsville series; (2) Coal V, one of the more commercially important coal seams in the Allegheny series; and (3) the Parker's coal of Posey County near the top of the Pennsylvanian system in the Conemaugh series (Fig. 2).

SYSTEM	MIDCONTINENT SERIES	SOUTHERN ILLINOIS FORMATION	EASTERN UNITED STATES SERIES	INDIANA FORMATION	COLLECTING LOCALITIES
PENNSYLVANIAN	MISSOURI	McLeansboro	CONEMAUGH		↖ Z Wabash Cutoff, Posey Co.
				Parkers	← * St. Wendells, Posey Co.
	DES MOINES	Carbondale	ALLEGHENY	Shelburn	
				Dugger	
				Petersburg	← * Coal V (16 localities)
				Linton	
	ATOKA	Tradewater	POTTSVILLE	Staunton	
				Brazil	← * Buffaloville, Spencer Co.
	MORROW	Caseyville	Mansfield		← Dover Hill, Martin Co.
MISSISSIPPIAN					

*Coal balls

Fig. 2. Chart showing the stratigraphic positions of the collecting sites cited in the text, and correlations with three major coal-producing regions. A star indicates coal ball collections.

The plant fossils collected during the two-year span of this project, together with a few earlier collections, are deposited in the Coal Section of the Indiana Geological Survey. This assemblage is accessioned and cross-indexed by number and scientific name, and includes over 575 trays of specimens. All of these specimens have been identified to genus and more than two-thirds to species. To date, sixty-seven genera and one hundred and fifteen species have been determined, the great majority of which have not been reported previously from Indiana. This total does not include species identified from coal ball material.

The large number of fossil plant species collected during the course of this survey, which hitherto were not known to occur in this state, clearly indicates the need for the publication of a Pennsylvanian flora of Indiana (1).

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