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Fossiliferous Plants of the Pennsylvanian Period From a Selected Area in Macon County, Missouri¹

DONALD F. SPAIN

Abstract: Macro-fossil specimens were collected from eight evenly spaced locations along the face of a one hundred and fifty foot shale exposure. The exposure was located along Sand Creek northeast of Elmer, Missouri, in Macon County. The fossils were all of plant life and consisted mostly of compressions of plant fragments, some plant impressions, mineral replacements, and casts. Specimens of Pecopteris, Neuropteris, Alethopteris, Unidentifiable Fern Types, Miscellaneous Fern Particles, Tangled, Calamites, Sphenophyllum, Sigillaria, Cordaites, Ginkgo, Stigmaria, and two Unknown Carpi were found.

INTRODUCTION

At the suggestion of Dr. Max E. Bell of Northeast Missouri State Teachers College, the investigation of the Sand Creek fossil deposit was undertaken during the school years of 1963-1964. The purpose of the investigation was to systematically excavate specimens from the face of the outcropping and identify them in order to determine the probable population of the area at the time of deposition.

Before beginning this study, an investigation of related material was made by the investigator. It was found that there had not been any significant literature written about the fossil flora of Missouri.

Dr. Maurice G. Mehl furnished the investigator with a list of published material about fossil flora deposits in Illinois (6), Indiana (5), Michigan (1), and three books on the fossil flora of Nova Scotia (2, 3, 4). The books all contain numerous illustrations as well as detailed descriptions of the fossil flora. Identification of the fossil flora obtained at the Sand Creek deposit was based on the information obtained from the above listed sources.

Determination of the age of the exposure, and dating it as Pennsylvanian, was accomplished by consulting Dr. Searight and Dr. Mehl of the Missouri Department of Geological Survey and Water Resources.

METHODS

Four collecting trips were made to the area located along Sand Creek, six-tenths of a mile east northeast of the city limits

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of Elmer, Missouri. The fossils were removed from the face of the exposure at eight locations evenly spaced along the one hundred and fifty foot length of the exposure.

The fossils were mostly compressions deposited in a light gray, loosely consolidated shale with a high-sand content. This made the samples extremely fragile, particularly if there was any significant loss of water from the shale. The desiccated shale would crumble very easily if handled and the desiccated compressions would be disturbed and destroyed by a gust of air.

In order to prevent damage to the specimens, they were wrapped in several layers of slightly damp newspapers, and placed in a polyethylene bag. The polyethylene bag was then twisted tightly at the top, the twisted area was folded double, and the bag was secured with a rubber band.

Each specimen was identified as to the dig from which it was obtained. This was accomplished by inserting a small slip of paper, containing the notation, into the bag before it was sealed. In some cases, the point of origin was noted on the surface of the bag with ballpoint pen.

The bags were then carefully packed into heavy cardboard boxes so that they could be safely transported.

Due to the extremely fragile nature of the specimens, they were photographed. This was done so there would be a record in the event that they became destroyed.

In order to show relative size, the specimens were photographed lying on a grid of one-inch squares. This was made by ruling a twenty-two inch by twenty-eight inch sheet of white poster board with black ball-point pen into one-square-inch squares. The surface was then sprayed with clear plastic spray paint. This was done so the surface could be easily wiped clean with a damp cloth between photographing.

The camera used was a Voigtlander Vitomatic II. The exposure used was one-thirtieth of a second at f5.6. The camera was stopped down from f2.8 to f5.6 in order to increase the depth of field and bring all areas of a rough specimen, plus the background, into a critical focus. The specimens were photographed at a distance of thirteen and three-eighths inches, using a setting of three and one-half feet and a Kodak Porta 2 plus closeup lens.

Lighting was accomplished by the use of one-three-hundred, one two-hundred, and one one-hundred watt bulb placed about two feet from the subject. The three-hundred watt bulb was placed on the side. The one-hundred watt bulb was placed at one end and the two-hundred watt bulb was placed at the other end. This arrangement provided adequate light when plus X pan film was used. The brilliant side lighting brought out the

texture of the fossil such as venation. The end lighting with smaller bulbs provided a fill-in light, thus eliminating harsh shadows.

Use of the Photographic Method enabled the investigator to adjust the contrast of the specimens against the matrix, thus bringing out fine details when possible. The fine detail on many of the specimens was ruined by the sand in the matrix, thus

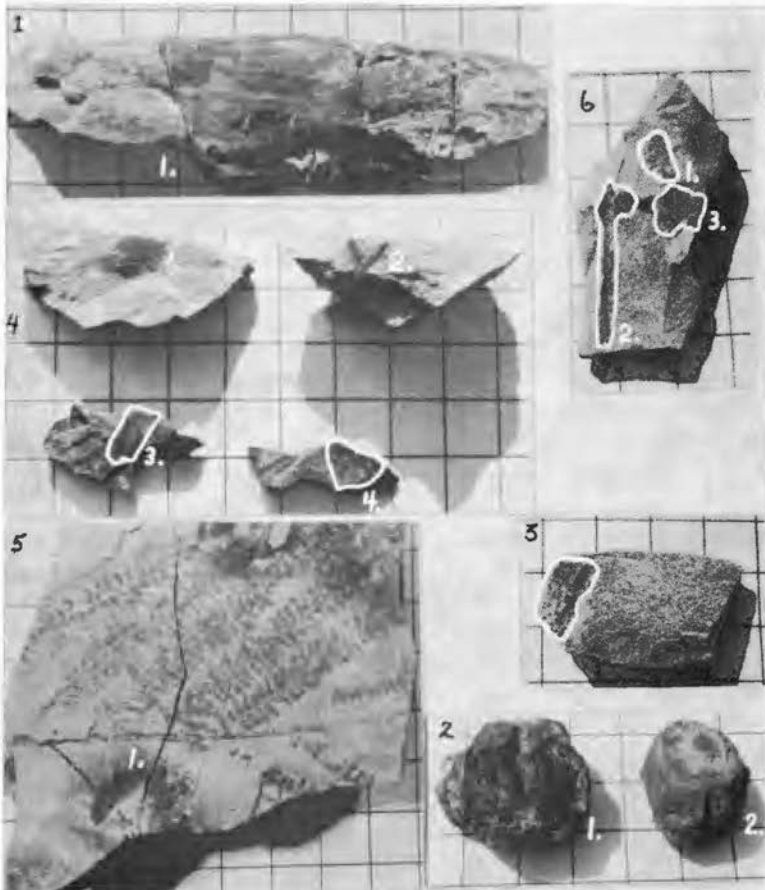


Figure 1. Background squares = one square inch

- 1-1: Cordaites; mostly impression
 2-1: Samaropsis, impression; 2: Cordaiacladus, cast (Note the leaf base attachment scar)
 3-1: Stigmaria ficoids; impression, with some of the compression still adhering to the points where the rootlets were attached
 4-1: Pecopteris, portion of a mature pinna (compression); 2: Dichotomous branching (impression); 3: Neuropteris, base portion of a pinnule (compression); 4: Portion of what appears to be a Ginkgo leaf (compression)
 5-1: Pecopteris frond (Compression and some impression)
 6-1: Sphenophyllum, stem with several whorls of leaves (compression); 2: Sphenophyllum, leaves and stem (compression); 3: Sphenophyllum, whorl of leaves (compression)



Figure 2. Background squares = one square inch
1-1: Calamites and Calamophyllites cast with carbon remains clinging to the exterior;
2; 3: Calamites and Calamophyllites cast with carbon remains clinging to the exterior

many of the specimens were of necessity identified by their general outline.

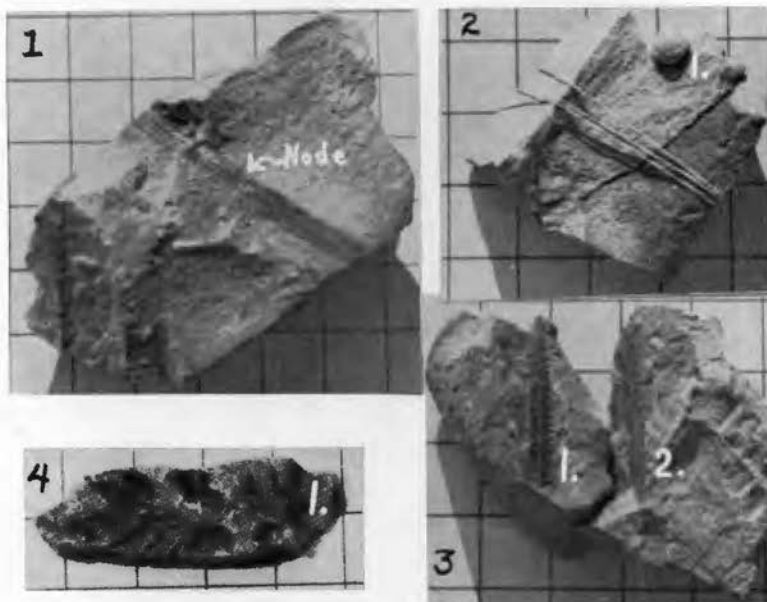


Figure 3. Background squares = one square inch

- 1-1: Calamites, stem (compression)
 2-1: Unknown carpus (cast)
 3-1: Pecopteris, a pinna (compression); 2: Pecopteris, a pinna (impression of 3-1)
 4-1: Annularia stellata, four whorls and branching shown (compression)

FINDINGS

Fern types were the most common fossils found, and were represented in all of the digs with the exception of one. Fern types were divided into their various form genera on the basis of general outline and basal attachment of the pinnules, size, and venation pattern. These particular compressions and impressions did not possess very clear venation patterns in most instances. This was primarily due to the fine grains of sand in the sandy shale matrix in which the fossils were deposited. The sand grains were very hard and totally resisted the imprints of the compressed plant fragments. In fact, they left their imprint on the compressions thereby obscuring the venation pattern in

(Imprint of nodes are indicated); 4: Calamites and Calamophyllites cast with carbon remains clinging to the exterior

2-1: Sphenophyllum cuneifolium, portions of a whorl (compression); 2: Neuropteris, portion of a pinnule attached to a rachis (compression); 3; 4; 5: Neuropteris, portions of pinnules (compressions); 6: Calamophyllites, note node (compression)

3-1: Annularia stellata (impression); 2; 3: Asterophyllites longifolius (compression); 4; 5: Calamariophyllum (compression); 6: Unknown fern type (faint impression with some compression)

4-1: Calamites stem, note the longitudinal ribs on the stem (compression); 2: Sigillaria, partially syringadendron, probably a small branch (compression)

most instances. With the exception of a few specimens, the venation pattern was not too visible to the investigator even when the fern compressions were viewed using a binocular microscope set on low powers. As a result of this the investigator had to base his identification primarily on the general outline, size, and basal attachment of the pinnules to the rachis.

Pecopteris

This form genus was the most common type of specimen found in the deposit. In all, ninety-five specimens of *Pecopteris* were collected and identified.

Neuropteris

This form genus had the largest pinnules in most instances. It was a seed fern. The narrow basal attachment and characteristic lance-like shape made this form genus the easiest to identify. Twenty seven specimens of *Neuropteris* were collected and identified.

Alethopteris

This form genus was identified principally by the characteristic keel present at the base of the pinnule where it attached to the rachis. Thirteen specimens of *Alethopteris* were collected and identified.

Unidentifiable Fern Types

Four specimens were collected that could be identified as fern types, but were not clear enough to be identified by form genera.

Miscellaneous Fern Particles; Tangled

Seven specimens of tangled particles of fern types were collected. These specimens appeared as though they had been tossed about and torn apart by some force, probably water, before they were deposited in the sandy silt that became their preserving matrix.

Calamites

Calamites were fossil trees that grew from twenty to fifty feet tall. They had segmented trunks and branches and bore whorls of thin pointed leaves at the nodes. Most of the fossils of *Calamites* found were stem fragments or leaf whorls. Fifty-nine specimens were collected and identified.

Sphenophyllum

Sphenophyllum was a small shrub-like plant that grew to a height of only a few feet. *Sphenophyllum* like *Calamites* had segmented stems and bore whorls of six short fan shaped leaves at each node. Six specimens of *Sphenophyllum* were collected and identified.

Sigillaria

Sigillaria was a tall tree, often reaching a height of over one hundred feet. Only one specimen of *Sigillaria* was collected and identified. It was a small section of what was judged to be a small branch.

Cordaites

Cordaites was a large tree that attained a height of seventy-five feet or more, and a diameter of not more than two feet. It bore long strap-like leaves which often left scars of attachment. Twenty-three specimens of *Cordaites* were collected and identified. Most of these specimens were leaves.

Ginkgo

One specimen of the *Ginkgo* tree, a leaf, was collected at dig three. It is the only specimen collected that is representative of a non-extinct group.

Stigmaria

Root systems of most of the tree forms were not extensive. *Stigmaria* are the fossilized remains of the roots of the tree forms. It is usually used as a form genus referring to the fossilized remains of the rhizophores of the *Lepidodendrales*. It may be used to refer to any detached fossilized root, or portion of root. *Pinnularia* are *Stigmaria* of *Calamites*. Twenty specimens of *Stigmaria* were collected and identified.

Unknown Carpus

Two specimens of unknown *Carpi*, or seeds, were collected.

Unknown Stem Fragments

Six specimens of unidentifiable stem fragments were found. The investigator believed that they were fern fragments, but no pinnules were attached to them.

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Identification of a Carboxyl group at the Active Site of Barley Malt Phosphatase¹

Biochemistry 512 Class of 1965²

(D. J. GRAVES³, Instructor)

Abstract. The dependence of the maximal velocity, V_M , with pH for barley malt phosphatase has been studied from pH 4.0 to 5.4. The data show that an ionizable group in the enzyme-substrate complex with a pK_a of 4-4.6 is important for enzymic activity. These results suggest strongly the involvement of a carboxyl group of a glutamic or aspartic acid residue at the active site of this enzyme.

INTRODUCTION

To understand the mechanism of enzymic catalysis, it is essential to determine what amino acid residues of the enzyme are involved in the interaction with substrate and to delineate how this interaction results in the formation of free enzyme and product. Although we know rather little about the latter, much information is presently being accumulated about the nature of amino acid residues at the active sites of various enzymes. One approach to this problem is through the study of enzyme kinetics and the pH dependence of the kinetic parameters, K_M and V_M . The particular advantages of this probe are that pure enzyme is not essential for this study and the experi-

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² This work was completed during the tenure of the Biochemistry 512 laboratory class, March 9 - May 28, 1965. Coauthors on this paper are: F. X. Aheme, G. A. Bennett, D. L. Berner, M. E. Burke, N. E. Busch, W. Carrothers, V. K-P. Chan, A. R. Conradie, J. D. Daniels, F. L. Dunn, T. L. Fisher, L. T. Frobish, M. W. Ganfield, M. E. Hallahan, D. C. Hills, L. A. Hodgins, J. R. Howard, D. J. Hume, J. L. Huntington, R. R. Husted, J. W. Isenhardt, R. J. Johnson, W-H. Kao, P. J. Killos, R. D. F. Lachica, J. C. Linden, D. K. Nelson, S. C. Patnode, M. C. Qureshi, R. S. Rambo, L. F. Richardson, R. J. Rose, R. A. Sair, S. Scharffenberg, M. L. Shonka, R. L. Smith, F. B. Stifel, G. E. Treadwell, Jr., Y. Tsuda, J. L. Wise, Jr., M. Feider.

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