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Preliminary Notes on the Carboniferous Flora of Nebraska

Roy V. Pepperberg

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Preliminary Notes on the Carboniferous Flora of Nebraska

By ROY V. PEPPERBERG
Preliminary Notes on the Carboniferous Flora of Nebraska.

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About the middle of July, 1907, while engaged by the Nebraska City Commercial Club in examining the geology of Nebraska City and vicinity, the writer was called to the farm of Mr. C. B. James to look at a bed of what was supposed to be fire clay. This proved to be a Carboniferous deposit of stratified micaceous sandstone, interstratified with a fine compact shale, both of which are yellow in color and very fragile when wet.

The exposure is about a mile and one-half northeast of Nebraska City and within twenty feet of the Missouri River. A small creek draining into the river has cut through fifty feet of soil and loess into the underlying shale above described, the thickness of which has not yet been determined, extending as it does below the Missouri water level, (high water).

While examining this bed and taking samples of the same, the writer was much surprised to discover many leaf impressions in the shale. Numerous specimens were collected and brought to the laboratory for study.

The work done up to the present time is preliminary only, and before the Carboniferous flora of this state can be definitely known it will be necessary to make a careful

EDITORIAL NOTE: After completing his studies, and after fulfilling all requirements for the Masters Degree, the writer of this paper submitted the following two-part thesis:
2. Preliminary Notes on the Carboniferous Flora of Nebraska (the present paper).
search throughout the Carboniferous region in all of the southeastern counties of Nebraska.

Since discovering the bed of Carboniferous leaves at Nebraska City, the writer has made two trips to the locality, collecting specimens from Nebraska City and Peru. The flora at Peru was observed by Meek in 1867 and recently by Mr. N. A. Bengtson, Adjunct Professor of Geography, the University of Nebraska. It occurs in a formation similar to, though more arenaceous than the one at Nebraska City. It is best described by Meek as follows:¹

"Less than a quarter of a mile below the village of Peru there is an abrupt exposure of yellowish and light-gray, soft, somewhat micaceous sandstone, with large, round and compressed concretions of arenaceous matter, of considerable hardness. Some of these concretions are oval in form. There are also very curious irregularly and obliquely arranged seams and isolated masses of dark bluish shaly matter and clay. These appear as if the sandstone had been irregularly eroded in places during its deposition, and the shaly matter deposited in the depressions and then more sand upon it again. Fragments of coal were also seen imbedded in the sandstone, along with stems of Calamites, and broken up leaves of ferns. The sandstone can scarcely be said to be stratified, but appears massive with the exception of some oblique marks of deposition, and the intercalated seams of shaly matter. The latter are not continuous for any distance, but often end very abruptly, or in other cases become much attenuated, and again swell out to a foot or so in thickness. They do not appear to conform to the bedding of the sandstone but cut obliquely across it at various angles, and yet their laminated structure, and fragment of plants, show they were deposited in water. This exposure of sandstone rises abruptly from the edge of the river at high water, to an elevation of about 60 to 65 feet. Its position is doubtless nearly the same as the lower

¹. Meek-Kan. D. C. Sc. XVI, p. 72
part of Otoe City (now Minersville) section, though it is more arenaceous here, and perhaps thicker."

It is very difficult to collect leaf impressions from this exposure except from weathered fragments, which cleave readily. The specimens found here are of an entirely different character from those collected from Nebraska City, being composed largely of Calamariae, and stumps of some large tree which is as yet unidentified, but probably a conifer. Only one small fragment of a Neuropteris pinnule has been found so far, but it is very probable that others will appear when extended collecting is done in this bed.

In Nebraska the leaf-bearing bed has not been traced but it probably extends through the Carboniferous counties, that is the extreme eastern part of the state. The only mention we find of its presence, besides the above, are such references as: 1 "Fragments of plants are found in a yellow, micaceous sandstone at Nebraska City" again 2 "Two miles above Rulo fossil ferns are found in a bluish and drab arenaceous clay." Both of these places are in the Carboniferous region and the "plants" and "ferns" referred to are undoubtedly Carboniferous flora.

It is possible that the "fragments of plants" Meek found at Nebraska City were from the same formation as those of recent discovery, however the sections do not agree for he records them as being found sixty-three feet above the Missouri river (high water mark), while the present bed occurs only a few feet above the same. Meek’s section was taken at least three miles south of the James farm and since the dip is toward the southeast it is improbable that the bed sixty-three feet above the Missouri river in this section should be present at all three miles above, for the entire section is not more than fifty feet above the river. This shows that if Meek’s section is correct there are two distinct strata in which Carboniferous plants have been found

at Nebraska City, however the writer saw no evidence of plants in the bed to which Meek refers although a careful study was made of the beds outcropping between Nebraska City and Minersville (Otoe City.)

Meek's Rulo bed is perhaps in the same horizon as the Nebraska City and Peru beds, for indications confirm the supposed dip in that direction, first pointed out by Meek and Hayden and since confirmed by all who have worked over the same ground.

The mention given the Carboniferous flora in 1867 being the only reference the writer has found upon this flora in Nebraska, is deemed important enough to give briefly the sections Meek made along the Missouri River in which he found this flora:

SECTION OF THE BEDS AT THE NEBRASKA CITY
LANDING.²

<table>
<thead>
<tr>
<th>Nature of Strata</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Loess or bluff deposit, consisting of fine light-grayish pulverent silicious and more or less calcareous clay or marl, without distinct marks of stratification; rising back to a height of 80 to 90'</td>
<td>90 0</td>
</tr>
<tr>
<td>D. Yellowish-gray micaceous, soft sandstone, laminated or in thin ripple-marked layers, excepting 12 to 15 inches of the lower part, which is sometimes hard and compact, with fragments of plants</td>
<td>10 0</td>
</tr>
<tr>
<td>C. Drab, ash, and lead-colored, and reddish brown clays, with, near the middle a 9 or 10-inch hard bluish-gray argillo-calcareous layer, weathering to a rusty color</td>
<td>39 0</td>
</tr>
</tbody>
</table>

1. It is possible that there is a local dip to the North although it is not evident.
CARBONIFEROUS FLORA

B. Several beds of hard, light-grayish, and yellowish limestones in layers of from 5 to 20 inches in thickness, with soft, marly clay seams and partings. 12 0

A. a. Lead-gray and greenish clay, 4 feet:
   b. Reddish-brown ferruginous, slightly gritty, indurated clay, 4 feet exposed above high water mark 8 0
   Total below drift 69

SECTIONS OF THE VARIOUS BEDS EXPOSED AT BROWNVILLE.¹

<table>
<thead>
<tr>
<th>No.</th>
<th>Nature of Strata</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Loess rising back with the slope from 30 or 40 to</td>
<td>100 0</td>
</tr>
<tr>
<td>13</td>
<td>Dark-bluish, very fine unctuous clay, becoming nearly black below, and weathering to a drab color</td>
<td>2 0</td>
</tr>
<tr>
<td>12</td>
<td>Yellowish-gray granular or sub-oolitic limestone; massive, but showing a disposition to divide into two layers</td>
<td>3 0</td>
</tr>
<tr>
<td>11</td>
<td>Unexposed</td>
<td>10 0</td>
</tr>
<tr>
<td>10</td>
<td>Whitish, soft argillaceous limestone; 6 to 8 inches thick</td>
<td>0 8</td>
</tr>
<tr>
<td>9</td>
<td>Red, purple, and greenish clays</td>
<td>10 0</td>
</tr>
<tr>
<td>8</td>
<td>Whitish and yellowish impure limestone; rather massive</td>
<td>3 0</td>
</tr>
<tr>
<td>7</td>
<td>Purple clay</td>
<td>1 0</td>
</tr>
<tr>
<td>6</td>
<td>Soft, whitish limestone</td>
<td>6 0</td>
</tr>
<tr>
<td>5</td>
<td>Bluish clay</td>
<td>5 6</td>
</tr>
<tr>
<td>4</td>
<td>Black shale and seams of impure coal, with impressions of fern leaves</td>
<td>1 0</td>
</tr>
<tr>
<td>3</td>
<td>Blue clay, with fragments of coal and iron pyrites</td>
<td>20 0</td>
</tr>
</tbody>
</table>

¹ U. S. G. S. Nebraska 1867, Meek and Hayden, p. 110.
2. Black, hard rock, with crystals calc spar .... 2 0
1. Soft, yellow, micaceous sandstone, with irregular seams and alternating laminae of black and greenish, more or less carbonaceous and sandy material, with fragments of coal. Many broken leaves of ferns, pieces of calamites, etc. Neuropteris Loshii (identified by Professor Lesquereux), and coprolites of some Selachian fish, as determined by Professor Agassiz ............... 57 0

SECTION TWO MILES ABOVE RULO ON THE MISSOURI RIVER.

<table>
<thead>
<tr>
<th>No.</th>
<th>Nature of Strata</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>Loess with perhaps some drift, 70 to .................</td>
<td>80 0</td>
</tr>
<tr>
<td>6.</td>
<td>Massive yellow limestone ................................</td>
<td>5 0</td>
</tr>
<tr>
<td>5.</td>
<td>Gray and yellowish impure limestone and drab clays.</td>
<td>4 6</td>
</tr>
<tr>
<td>4.</td>
<td>Bluish and drab arenaceous clay With Fossil Ferns. Neuropteris hirsuta, and N. Loshii ...</td>
<td>7 0</td>
</tr>
<tr>
<td>3.</td>
<td>Coal ..................................................</td>
<td>0 6</td>
</tr>
<tr>
<td>2.</td>
<td>Indurated clay, called soapstone by the miners (not seen)</td>
<td>0 4</td>
</tr>
</tbody>
</table>
| 1.  | Bluish laminated sandstone, very soft, with thin streaks of black, and looking very much like No. 1 of the Brownville section ....... 8 0

Most of the work on the Carboniferous flora of North America has been done by a few writers and confined to a few states. The forms thus identified are very similar to or identical with European forms, and by means of this flora, the beds of the United States have been correlated with those of Europe at least in a general way. The extreme vertical range, however, of many of the species,

1. U. S. G. S. Nebraska 1867, Meek and Hayden, p. 114.
lessens the usefulness of this flora in determining the exact age of the formation.

Lesquereux's work on the Carboniferous flora of Pennsylvania published by the Pennsylvania Geological Survey,¹ is of a high grade and was found to be the best source of aid in identifying the flora at hand.

The writer has endeavored to correlate the terraines with those of the Appalachian region by means of the flora, but has met with but partial success. The same difficulties are met with as confronted Dr. David White in his work on the "Flora of the Outlying Carboniferous Basins of Southwestern Missouri,"² who says, "Two obstacles are most important in preventing satisfactory determination of the age of plants and the correlation of their containing terraines with others whose stratigraphical position has been determined. The first one is the want of even a single paleobotanical section of the Trans-Mississippi deposits with which to compare our flora, with the exceptions of the flora from near the base of the Lower Coal measures in Henry County, Missouri, and a supposed sub-conglomerate flora from Washington County, Arkansas, the floras of the entire Carboniferous series in the great western regions are essentially unknown. Although plant-bearing horizons have been reported in the different state publications as occurring at various localities in the Lower, Middle, and Upper Coal measures of the Trans-Mississippi states, no one has ever examined them, I believe, nor have we so much as a published list from any fixed horizon."³ Considering these circumstances it is very earnestly hoped that geologists in these states will cooperate in procuring and identifying plants from as

3. "Two apparent exceptions to this are two small collections identified by Lesquereux from Ottawa and Osage City, Kansas; and a few plants from Jenny Lind and James Fork, Arkansas, * * * of very slight correlative value."
many fixed horizons as possible, in order to work out the flora associations and characteristics of the various stages in the different ascertained sections of the Coal-measures, with a view to their final utilization in constructing standard paleobotanical sections of the Carboniferous in those areas.

The second difficulty lies in the unreliability of the recorded geographical distribution of the species and of the geological position assigned to some of the localities, seriously impairing the homitaxial trustworthiness of our Carboniferous flora except within broad limits."

The flora thus far found in southeastern Nebraska, although representing but a single horizon, does not contain a sufficient number of species to correlate it definitely with any horizon in eastern paleobotanical sections, so that even though the above difficulties do not exist, the distance between the sections together with the great vertical range of the species identified, would still make correlation of the beds very difficult.

At the present time Carboniferous plants have been collected from two localities, Nebraska City, and Peru, the character of the flora of each being distinct from the other, but undoubtedly from the same formation and horizon.

The Nebraska City collection represents pieces of over two hundred specimens, more than nine-tenths of which are Neuropterids, which is very remarkable and indicates an upland flora. It has often been observed that the Neuropterids seem to crowd out the other species to a large extent and a few inches of shale or sandstone may separate a bed of these from a flora of entirely different character or facies. This seems to be the case in this horizon, for from all appearances the strata containing the Nebraska City Neuropterids must underlie the bed of Calamariae, etc., at Peru, extending toward the south into Kansas, where Meek and Hayden reported 1 "On the Iowa Reserve, along the Great

Nemaha River in Kansas, just south of Rulo, Nebraska, the rocks in contact with the coal beds are as follows: Underlying the coal beds, a bed of light gray fire clay, full of fragments of plants as fern leaves Neuropteris Loshii, and N. hirsuta, stems of rushes and calamites, and same as occur in the underlying clays of Ohio and Illinois coal fields." At present the Calamariae have not been found at Nebraska City nor the Neuropterids at Peru, to any great extent, but it is very probable that further search will show them to be present at both places.

In the Trans-Mississippi region the flora nearest the one at hand, both geographically and stratigraphically, is the Elsdale flora at Onaga, northeastern part of Pottawatomie County, Kansas, which has been described by David White1 and F. F. Crevecoeur.2 The only species found in common in these two floras is Odontopteris, Asterophyllites equisetiformis Brongn, and Neuropteris Schenchzeri Hoffm, but it is very probable that others will be found in common as the horizon is further developed.

The formation bearing the above flora from Onaga, is placed in Prosser's classification,3 "in the Wabaunsee stage of the Missourian series, beginning about 200 feet below its top." The writer has placed the Nebraska flora in an upper member of the Atchison Shales (Prosser's Wabaunsee) about 100 feet from its top, so that if these classifications are correct, the two floras are probably separated by about 100 feet of shale.

The formations between these places have never been carefully traced nor identified with certainty, but Beede is probably correct in his assumption,4 that the section at Topeka, Kansas, corresponds to a section taken from the bottom of the Minersville section to the top of the Nebraska

City section. This supposition seems to agree with observations made by Meek, Hayden, Prosser and Geinitz.

In any event the Nebraska City beds must belong to the upper part of the Atchison Shales, for the Cottonwood limestone has been unmistakably identified some distance north and west of Nebraska City lying conformably upon these shales.

These conditions would lead one to suppose that the Nebraska City and Peru floras were of practically the same age as the Onaga flora, probably a little younger, however. Dr. White, in commenting upon this flora, says, "I should not be disposed to place it above the Conemaugh, or lowest Monongahela of the Appalachian trough, though it is, of course, possible that further search will bring to light younger forms." The Conemaugh being the middle formation of the Pennsylvanian, it is to be expected that a younger flora will occur in these supposedly Upper Pennsylvanian beds. If, upon further examination of this field, younger forms are not brought to light, we may conclude that these beds belong to the Middle instead of the Upper Pennsylvanian, where they are now placed.

The following is a list of the Carboniferous flora now identified in Nebraska and contains specimens from two orders, four families and twelve species.

**PTERIDOPHYTA.**

**Filicaeas.**

Neuropteris Scheuchzeri, Hoffm.

var. hirsuta, Lesq.

var. angustifolia, Brgt.

N. ovata, Hoffm. (N. Loshii, Brgt.)

Odontoplepis, sp. Brgt.

**Equisetalis.**

Equisetites occidentalis (?), Lesq.

E. sp.

Calamites, Suck.
CARBONIFEROUS FLORA

C. sp.
Asterophyllites equisetiformis (?), Schloth.
Archaeocalamites scrobiculatus (?), Schloth.

**Lycopodiales.**
Lepidostrobus (Macrocystis), Salisburyi (?).
L. sp.

**SPERMATOPHYTA.**

**Gymnosperma.**
Coniferae (2) sp.

**IDENTIFICATION.**

Of the Nebraska City flora, Neuropteris Scheuchzeri is by far the most important and abundant species. In speaking of this species Dr. David White says, "Neuropteris Scheuchzeri is one of the most interesting of American Paleozoic Ferns, with regard to variation in a species. Ranging as it does, from near the base of the Lower Productive Coal Measures, or Alleghany series, to the highest beds of the Permian or Dunkard Creek series, it presents a valuable illustration of the modification of a species found at many horizons in a thick series of probably continuously deposited sediments. So far as my observations have extended in collections from American localities and horizons, it may be noted that, in general, both in the anthracite and the bituminous fields, the earliest representatives of the species, in the lowest coals are prevailing smaller, narrower, and more triangular and pointed, the hairs fine, short and often invisible. A little higher, as for example in the E or F veins, as numbered in the northern anthracite field by the Pennsylvania survey, the narrow, acute forms become rare and the proportion of broader, more obtuse pinnules increases, the pinnules becoming larger at the same time and more conspicuously hirsute, while at the horizon

of the Pittsburg coal and of the higher anthracite coals the leaflets are mostly broad and lingulate, the hairs less plain; and again those pinnules from the Waynesburg and Washington coals, in the so-called Permian are almost exclusively broad, very large, rounded at the top, more broadly articulate at the base, distinctly and rather broadly pedicellate, while the hairs are usually very obscure, if not absent. Thus the sequence from the earliest to the latest form, the series between two types would if considered independently be properly regarded as distinct species, is marked by so many intermediate or transitional phases that it seems at present entirely impracticable to attempt to draw any lines of a specific grade. Yet the differences between the types prevailing at stages vertically distant are great enough to easily constitute varieties, if one does not attempt to carry the varietal distinction all the way through the intervening series. And, since these phases or forms are more or less peculiar to different portions of the vertical section, they possess a stratigraphic and correlative value, and deserve, therefore, some reference term and definitive distinction. Some system of nomenclature will be necessary if the unquestionable geologic utility of these phases is to be rendered available.

Accordingly, for the common early form that is characterized in general by its smaller size, narrow or triangular form, with small auricles squared on the quarter, the median nerve slender, the pedicel short and narrow, the hairs being delicate, often short or found with difficulty. I would use, in a varietal sense, the name "Angustifolia," which was applied by Lesquereux to most of the pinnules of this character from Henry County, Missouri."

The varietal designation as suggested above should be credited to Bunbury.

In this paper the writer has not tried to draw a distinct line between the different varieties of Neuropteris Scheuchzeri as different authors do not seem to agree on the
distinction of the varietal terms, but it seems proper to classify them in a general way into three varieties, namely: angustifolia, hirsuta, and nuda, if sufficient differences can be found between these varieties.

It is probable that more correlative value would be derived from the species of N. Scheuchzeri if it were broken up into two or three separate species with as marked lines of distinction as could be drawn. In this way the extremes of the species would receive a better classification, and the forms just between would lose none of their value by being placed on one side or the other of the line, by different authorities.

"Though N. Scheuchzeri has not yet been reported from below the true Coal Measures, or Alleghany series, in the United States, it is not improbable that representatives of it may yet be found in what has been described as the "Conglomerate series," or better, as the "Pottsville series" or formation."

The following is the list of the geological ages and localities where the species Neuropteris Scheuchzeri Hoffm. is recorded as having been found.

LOWER COAL MEASURES, B. Morris, Murphyboro, Mazon Creek, Colchester, Ill. (Lesq.); Spring Creek, Ind. (Lesq.); Union Co., Ky. (Lesq.); C. Darlington bed, Cannelton, Pa. (Lesq.); Clinton, Mo. (Lesq.); D. or E. Sullivan Co., Ind. (Lesq.); (?) Shirley Knob, Cass Township, Pa. (T. C. W.); R. I. (Lesq.); Ottawa, Ill. (Lesq.); Jenny Lind James Fork, Ark. (D. W.—Lesq.); Ottawa, Osage City, Kans. (Lesq.); Mansfield, Mass. (Marcou).


UPPER COAL MEASURES, G. St. Clairsville, Pom.

eroy, O. (Lesq.); Pittsburg coal, near mouth Redstone Creek, Pa. (Lesley).


ANTHRACITE SERIES, A. Shamokin; C. Ontario coal, Pittston; D. Carbon Hill tunnel; D. or E. Brown's Coll., Pittston; E. Yatesville; F. Wilkesbarre; G. Olyphant, M. Gate Vein, Pottsville, Pa. (all Lesq.).

The following species identified from the flora of the Nebraska Carboniferous are described accordingly to Lesquereux.¹

NEUROPTERIS SCHEUCHZERI HOFFM.

Var. hirsuta Lesq.

Frond bipinnate, tripinmate; primary pinnae very large secondary divisions alternate, oblique, lanceolate; ultimate pinnae trifoliate in the lower part of the branches; becoming simple in the upper part; middle leaflets large, lanceolate, obtuse, entire of undulate; cordate and sessile to the rachis when simple; pedicellate when compound or bearing one or two small round or oval leaflets at the base: lower surface hairy; costa distinct, strong, and ascending to three-fourths of the laminae in the middle pinnules only; veins dichotomous, arched, thin and close, flabellate from the base in the lateral or basilar leaflets, with rarely a trace of a midrib.

Var. Angustifolia Brgt.

Primary pinnae dichotomous, alternately forking in branches of a thick rachis; pinnae very long, in a broad angle of divergence; pinnules simple or trifoliate, the medial ones linear-lanceolate, obtuse, the basilar, small reniform or oval; venation same as in the former species.

NEUROPTERIS LOSHII BRGT.

Frond pinnately dichotomous; pinnae open, linear, slightly narrowed to obtuse terminal pinnule; pinnules ob-

¹ Coal flora of Pennsylvania, Vol. I and II.
CARBONIFEROUS FLORA

long, sub-cordate, very obtuse, more or less enlarged on the lower side of the base, sessile; costa distinct near the base, effacing above; veins thin, close dichotomous.

NEUROPTERIS OVATA HOFFM, (N. LOSHII BRGT.)

Frond pinnately dichotomous; pinnae open, linear, slightly narrowed to an obtuse terminal pinnule; pinnules oblong, sub-cordate, very obtuse, more or less enlarged on the lower side of the base, sessile; costa distinct near the base, effacing above; veins thin, close, dichotomous.

ODONTOPTERIS BRGT.

Fronds large, bipinnate; pinnae opposite or subalternate; pinnules of various forms, generally oblong, obtuse, jointed to the rachis by their whole base sometimes decurrent, either disjointed and separate to the base, or connate to the middle, generally becoming confluent toward the top of the pinnae and gradually effaced in passing to a terminal leaflet; lower pinnules sometimes attached to the main rachis and difform; veins emerging from the rachis, more rarely from a midrib; veinlets thin, dichotomous, diverging straight or in a curve, in passing to the borders.

This genus is intimately allied to Neuropteris.

The Odontoperis in hand is marked by numerous, equal, parallel veins, coming out of the rachis with no midrib and was classified by Weiss¹ as O. proper (Xenopteris).

CALAMARIAE.

Plants arborescent; trunks cylindrical, articulate; articulations variable in distance, rapidly closer toward the narrowed obconical base; surface narrowly ribbed and furrowed lengthwise; ribs equal, simple, parallel contracted or rounded at the articulations; branches nearly at right angles, verticulate like the leaves, which are lanceolate acuminate, simple nerved.

1. Fossil Flora p. 31.
ASTEROPHYLLITES EQUISETIFORMIS, SCHLOTH.

Primary branches long, obscurely striate; cortex thick; lateral branches more or less oblique, simple; leaves linear acuminate, straight or curved inside; costa thick.

EQUISETITITES SCHP.

Plants aborescent; stems articulate; articulations surrounded with more or less distinct costate sheaths, deeply dentate on the border.

EQUISETITITES OCCIDENTALIS, LESQX.

Stems small, narrowly ribbed lengthwise; sheaths long and thick, cut at the margin in short, triangular, acute, large teeth.

LEPIDOSTROBUS AND LEPIDOPHYLLUM.

Strobiles cylindrical or ovate, oblong, conical, variable in length, composed of sporanges (spore cases) sub-cylindrical or clavate, emarginate at the apex, supported in the middle lengthwise by bracts formed of a pedicel attached like the sporanges at right angles to the axis, linear or ob-lanceolate, either simple, not longer than the sporanges or prolonged into lanceolate obtuse or acuminate laminae, curved upwards on the outside of the strobiles and imbricated on their sides, or merely inflated at the outer end and covering the apex of the sporanges by a rhomboidal small shield; spores triquetre on one side, half globular on the other, like those of the Lycopsods, homorphous or dimorphous.

LEPIDOSTROBUS (MACROCYSTIS), SALISBURYI,

Strobiles cylindrical, very long, flexuous; axis broad, marked by long, narrowly oval scar impressions of the base of large inflated linear oblong sporanges, without any pedicel or support.
The following fossils were gathered in the vicinity of the Nebraska City leaf bed, from overlying limestone beds:

1. **Protozoa**
   Fusulina secalica

2. **Coelesterata**
   Lophophyllum profundum

3. **Echinodermata**
   Erisoecinus typus
   Zeoecinus mucrospinus

4. **Molluscoidea**
   Bryozoa and Brachiopoda
   Cyclotrypa (†) barberi Ulrich
   Septopora biserialis-nervata
   Prodjectus semireticulatus
   P. longispinus
   P. cora
   Spirifer cameratus
   Chonetes granulifer
   C. verneuilliana
   Pugnax utah
   Ambcoelina planoconvexa
   Seminula argentea
   Enteletes hemiplicata
   Spiriferina cristata
   Derbya crassa

5. **Mollusca**
   Aviculopecten sp.
   Allorisma subcuneatum
   Edmondia sp.
   Nautilus sp.
   Euomphalus rugosus
   Bellerophon urii

---

1. The writer was assisted in the collection of the above fossils by Edwin G. Davis, and in their identification by Miss C. A. Barbour.
Mr. R. V. Pepperberg,
Lincoln, Neb.

Dear Mr. Pepperberg:

In my last letter to you reporting on the fragments you sent I promised to write you again should anything of interest or value develop from the microscopical examination of the specimens.

Doctor Reinhardt Thiessen, my assistant, to whom I turned over the fragments of partially petrified stems which you sent about three months ago and who examined them at my request, finds that the small, slender, fragment, though not petrified so as to be translucent, is nevertheless preserved in great detail by means of marcasite. The type (Medullosa) which it represents has never, I believe, been found before in North America in the petrified state. It probably represents a new species and it would be of interest if you could secure additional material for study. The larger fragments examined were also found to belong to the same genus but the decay was so far advanced that it is not practical to attempt any further demonstration or description.

Doctor Thiessen, who has been employed in the Technologic Branch of the Survey, is now naturally in the Bureau of Mines, but I take the liberty of leaving the small specimen in his hands and I regard him as competent to undertake its description.

Very truly yours,

DAVID WHITE.

Additional material will be placed in Dr. Thiessen's hands as soon as time will permit and interesting results may be expected.

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FERN PINNULES: NEUROPTERIS.


7, 8. Same showing asymmetrical auriculate and pedicellate base. Nebraska City.

9. A portion of same enlarged showing nervation and short slender hairs. Nebraska City.
FERN PINNULES: NEUROPTERIS.

Neuropteris Scheuchzeri, Hoffm. Nebraska City.
FERN PINNULES: NEUROPTERIS.

Neuropteris Scheuchzeri, Hoffm. Nebraska City.
FERN, BASILAR PINNULES: NEUROPTERIS.

Neuropteris Scheuchzeri, Hoffm.

Round, reniform, and oval basilar pinnules. Nebraska City.
NEBRASKA GEOLOGICAL SURVEY

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FERN PINNULES: NEUROPTERIS.

Neuropteris Scheuchzeri, Hoffm. Nebraska City
FERN PINNULES: NEUROPTERIS.

Neuropteris Scheuchzeri, Hoffm., Portions of fronds. Nebraska City.
FERN PINNULES: NEUROPTERIS.

Neuropteris sp. Nebraska City.
FERN STEMS: NEUROPTERIS.

Neuropteris Scheuchzeri, Hoffm., Carbonized Stems. Nebraska City.
1. 2. Neuropteris ovata, Hoffm. (N. Losshii, Brgt.) (Top and bottom layers). Nebraska City.
3. Lepidostrobus (Macrocystis), Sallyburyi (?). Peru.
4. Lepidostrobus sp. (sporangium of). Nebraska City.
5. Crossotheca (Carbonized and internal sporangial structure visible). Nebraska City.
EQUISETALES: ASTERO PHYLLITES.
FERN: ODONTOPTERIS.
WOOD: GYMNOSPERM IC (LIMONITIC).

1. Asterophyllites equisetiformis, Schloth. Nebraska City.
3 to 5. Coniferae two sps.
Calamites.

1. Calamites Suck, Peru.
2, 3. Calamites sp., Peru.