

POLLEN ANALYSIS OF SOME PLEISTOCENE SEDIMENTS FROM ILLINOIS

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ABSTRACT.—The pollen content of sediments collected in a strip mine south of Canton, Illinois tends to confirm the intra-Illinoian stratigraphic placement of the deposit. High percentages of spruce and pine pollen found in the samples and larch wood are typical of sediments dating from glacial ages. A warming trend may be revealed by presence of deciduous pollen near the middle of the sediments. It seems likely that the sediments are from a late Illinoian interstadial and may be contemporaneous with the Roby silt. The extensive Pennsylvanian deposits over which the glaciers advanced account for the presence of numerous Paleozoic spores in many of the samples.

While attempting to locate and reexamine a peat layer studied by Voss (1939, p. 523), another well developed organic deposit was found south of Canton, Illinois. The deposit dates from a late Illinoian interstadial (Wanless, 1957), and underlies the till bounded by the Buffalo Hart moraine. This report summarizes a pollen analytical investigation of the sediments of this Illinoian interstadial interval and provides some inferences concerning the vegetation and climatic conditions of the subage.

LOCATION OF THE CANTON DEPOSIT

The Illinoian interstadial deposit was exposed, when visited on June 4, 1960 and on May 12, 1963, near the base of the bank of an abandoned strip mine located in the Buckheart Mine less than two miles south of Canton, Illinois. The exposure is near the center of the south line of

N½ sec. 11, T6N, R4E in Fulton Co., Illinois.

STRATIGRAPHY

The organic silt, herein referred to as the intra-Illinoian silt in the Canton section, is exposed in the north bank of an old strip mine near the mouth of a north-trending gully. The exposure is near the west edge of the Mine Haulage Road, one mile north of the State Aid Road intersection. During the three years intervening between the visits to the site, considerable erosion has occurred, altering the way in which the sediments are exposed. The base of the organic intra-Illinoian silt is only one foot above the surface of the water in the strip mine pit. The silt lies between two tills, with the deeply leached Sangamon Soil developed in the overlying till. The Sangamon Soil is overlain with loess. A summary of the Canton section is given below:

| | Thickness (ft.) |
|--|--------------------|
| Peoria and Roxana Loess, Gray . . . | 10.0 |
| Sangamon Soil, in Illinoian (Buffalo Hart) till, reddish color, pebbles and cobbles near upper contact | |
| Illinoian till (Buffalo Hart), gray blocky | 12.0 |
| Sand, fine above, coarse in lower two inches | 1.1 |
| Silty clay, black; organic (samples 17, 18) | 0.6 |
| Silt, gray with brown organic (?) streaks; wood, up to 1" diameter, in middle; some rounded pebbles (samples 8-16) | 3.0 |
| Silt, brown-black; blocky fracture (samples 4-7) | 1.0 |

| | |
|---|-----------------------------|
| Sand, gray with dark streaks (samples 1-3) | 0.8 |
| Sand, brown with occasional coal inclusion | 0.3 |
| Illinoian till, gray | Base of unit not exposed |

It is likely that the intra-Illinoian silt in the Canton section is contemporaneous with the Roby silt which is exposed in this region and contains molluscan remains (personal communication, W. Hilton Johnson and George E. Ekblaw).

Samples for pollen analysis were collected on June 4, 1960 from those sediments which appeared likely to have organic content, including the gray sand, brown-black silt, gray silt, and black silty clay. Samples 1-3 are from the gray sand, samples 4-7 from the brown-black silt, samples 8-16 from the gray silt, samples 17 and 18 from the black silty clay.

PROCEDURE

Some samples were processed soon after collection, others in 1963. Each was dissolved in 7% HCl, centrifuged, and treated with HF. Samples were then washed in dilute HCl again and suspended in a saturated solution of ZnCl₂ in HCl. The pollen-bearing portion was skimmed off the top of the ZnCl₂ and washed in water and then in glacial acetic acid. Samples were then heated in a solution of nine parts acetic anhydride and one part sulfuric acid. Finally the sediment was washed with water and again with 50% glycerine before embedding in glycerine jelly. Several samples collected in May of 1963 were also processed. They seem to be the equivalent of samples 17 and 18 of the 1960 collection and yielded no pollen.

The counting was done under 100X magnification and identification was confirmed under 420X or 1,000X under oil. Of the samples which contained much pollen a minimum of five slides was counted and at least one slide of the other processed samples was examined (samples 10, 12, 14, 16 and 18). Samples 9, 11, 13, 15 and 17 were not processed. Many spores were found, some resinous and others not clearly so, which closely resemble spores found in coal (see Fig. 1, G and H). Most of them are very unlike what would be expected in Pleistocene sediments, but one type has not been distinguished from the modern spores of *Selaginella*. These spiny tetrahedral spores which were occasionally found in tetrads may represent *Selaginella* in the local flora, but since *Selaginella* spores are not usually found in large numbers it is suspected that the palynomorph is from the coal flora and it was omitted from the percentage calculations (see Fig. 1, E). The number of other spores was only approximated. They are presumed to have been derived from erosion of the nearby coal beds at the time of deposition. It is possible that there was also some secondary deposition (rebedding) of conifer pollen; some of these grains are in perfect condition, whereas the rebedded ones are so badly battered that they are barely identifiable. Since the latter are found in numbers proportionate to the numbers of Paleozoic spores, they are considered to be of secondary deposition and are disregarded.

RESULTS

Several pieces of wood, measuring up to six inches long, were found

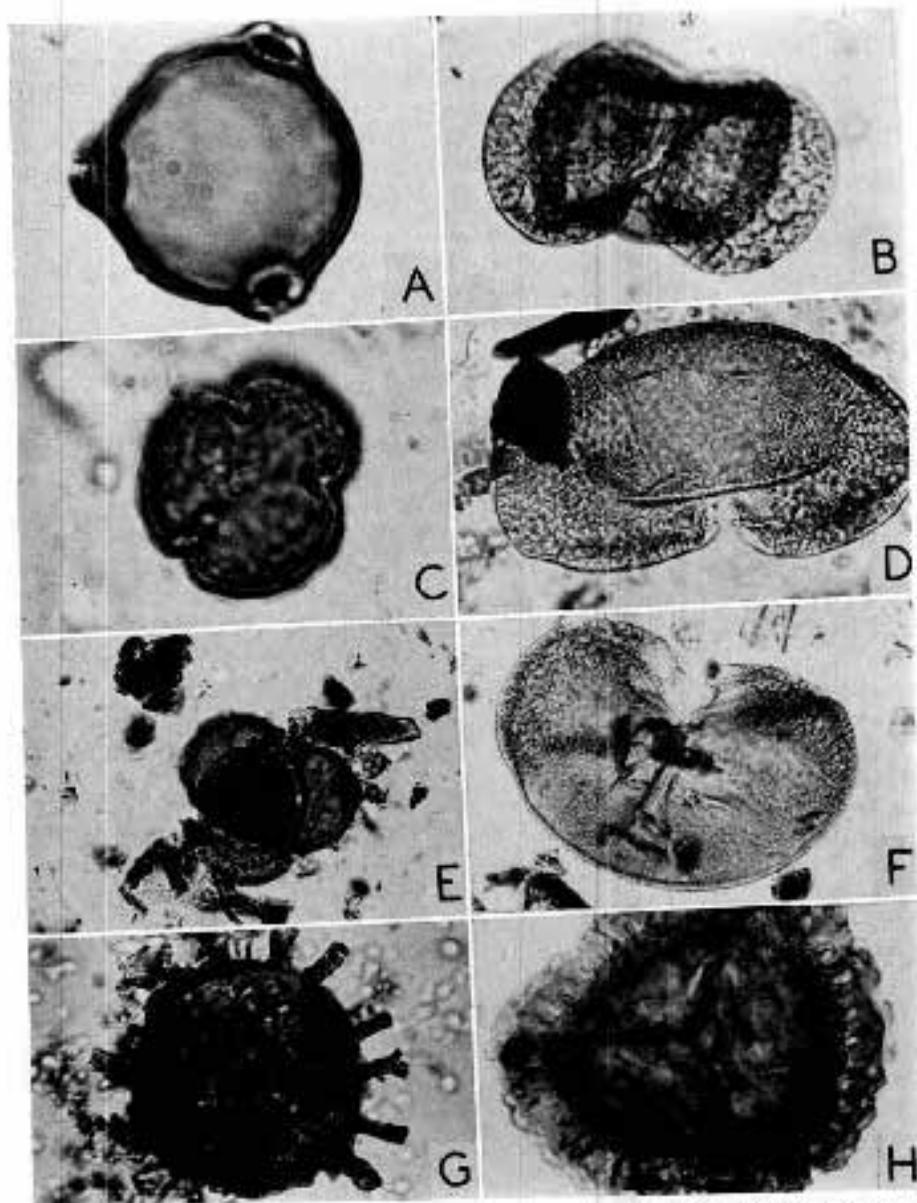


FIGURE 1.—Several pollens and spore types recovered from the Canton deposit. A. Birch (*Betula*) pollen, $39\ \mu$, 1000X. B. Pine (*Pinus*) pollen, body length $45\ \mu$, 420X. C. Oak (*Quercus*) pollen, $37\ \mu$, 450X. D. Large *Picea* (*spruce*), body length $83\ \mu$, 410X. E. Tetrad of *Setaigella*-type spores, 420X. F. Small *Picea* (*spruce*), body length $65\ \mu$, 420X. G. Paleozoic spore, $45\ \mu$, 450X. H. Trilete Paleozoic spore, $66\ \mu$, 1000X.

three feet above the basal till in the gray silt. They were identified by microscopic examination as larch (*Larix*) wood. The samples taken near this wood, however, yielded little pollen; significant amounts were obtained only from the gray sand and brown-black silt in the lower portion of the section. Table 1 summarizes the percentages of each type of pollen found in samples 3 through 8, and lists the total num-

ber of grains counted in each sample. Spruce and pine account for the greatest percentage of each sample and the preponderance of conifer pollen is even greater in terms of absolute numbers since the samples yielding the most pollen also have the highest percentages of conifer pollen. The spruce pollen in these samples was found in two size ranges, one group about 80 μ (body length) and the other group about two-thirds

TABLE 1.—Pollen From the Intra-Illinoian Silts of the Canton Section. Percentages are computed on basis of total pollen and spores counted.

| | Sample Number | | | | | |
|--|---------------|-----|-----|-----|------|-----|
| | 3 | 4 | 5 | 6 | 7 | 8 |
| Coniferous Trees | | | | | | |
| <i>Larix</i> (larch)..... | 2% | 6% | 7% | 3% | 16% | 7% |
| <i>Picea</i> (spruce)..... | 48% | 43% | 12% | 31% | 6.5% | |
| <i>Pinus</i> (pine)..... | 40% | 46% | 30% | 63% | 45% | 76% |
| Deciduous Trees and Shrubs | | | | | | |
| <i>Betula</i> (birch)..... | | | 2% | | | |
| <i>Carpinus-Ostrya</i> (blue beech-ironwood)..... | | 1% | 2% | | | |
| <i>Carya</i> (hickory)..... | | | 8% | .5% | | |
| <i>Juglans</i> (walnut)..... | .5% | | 6% | | 3% | |
| <i>Myrica</i> (sweet gale)..... | | | 1% | | | |
| <i>Quercus</i> (oak)..... | 1% | | 18% | | 16% | |
| <i>Tilia</i> (basswood)..... | | | | | | 3% |
| Herbaceous Plants | | | | | | |
| <i>Ambrosia</i> (ragweed)..... | | | 5% | | | |
| <i>Gramineae</i> (grass)..... | 1% | | 4% | | | |
| <i>Solidago</i> (goldenrod)..... | | | 1% | | | |
| Ferns..... | 6% | 4% | 4% | 2% | 12% | 13% |
| Total Pollen Counted..... | 194 | 99 | 102 | 208 | 31 | 29 |

as large (see Fig. 1, D and F). Pollen from deciduous trees is encountered in each sample represented here, but occurs in substantial amounts only in sample 5, in which it accounts for 37 per cent of the pollen counted (see Fig. 1, A and C). The notable exception to this is the oak pollen in sample 7, which accounts for 16 per cent of the pollen in this sample. Fern spores, of the smooth reniform type, were found in these samples, along with variable numbers of spores resembling *Selaginella*—from 3 in sample 8 to 77 in sample 6. The latter were omitted from Table 1 for reasons stated above.

The amount of pollen in the samples drops sharply above sample 6, samples 10 through 18 yielding only occasional conifer grains. Sample 18 yielded Paleozoic spores exclusively. Of the samples shown in Table 1, those yielding the most pollen also contained the most spores and degraded pollen grains.

DISCUSSION

The general preponderance of spruce pollen indicates that the climate at the time of deposition was much cooler than it is now, which is to be expected during a glacial interstadial. We have speculated that the large spruce pollen may represent *Picea rubens*, the red spruce which occurs now in the Appalachian Mountains. The percentage of pine pollen, although higher than the percentage of spruce, probably represents fewer pine trees, since each pine produces excessive quantities of pollen. The scarcity of herbaceous pollen suggests that the surrounding vegetation was a closed forest. The Illinoisian interstadial

forest which contributed the pollen assemblage was probably dominated by spruce, and to a lesser degree, by pine. Deciduous trees, notably oak, were found either intermixed with the coniferous forest on certain sites, or the pollen was derived from surrounding regions by wind dissemination. The general trend of climate seems to be warming up to the time period represented by sample 5. In this sample the number of pollen grains of deciduous trees nearly equalled the number of conifer pollen grains. This appears to have been followed by a cooler episode, although it may have been warmer than the initial period, judging by the higher ratio of pine to spruce pollen.

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