

## Some Paleozoic Gymnosperm Seeds and Their Evolution

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Early in my collecting of fossil plants in Illinois, I was struck by the abundance of Gymnosperm seeds throughout the entire range of Pennsylvanian strata. The seeds belonged primarily to the orders of Cycadofilicales, and, in some instances, of Cordaitales. Both groups were assumed to have disappeared at the end of Permian time. In September, 1934, I had a chance to examine the type material of G. R. Wieland's Bulletin 31 of the Instituto Geologico de Mexico, in which he describes the Flora Liasica de la Mixteca Alta from the state of Oaxaca, and also of the Bulletin 34 by E. D. Lozano on the Liassic plants of Huauchinango, in the state of Veracruz. These so-called Liassic floras contain an abundance of typical Cordaites leaves and Trigonocarpus seeds. The Cordaites go mostly under the name of Noeggerathiopsis, but are typical Eu-Cordaites. The Trigonocarpus and Rhabdocarpus were allowed to keep their genuine names. I found also a number of seeds which seemed to me to be typical Cordaites seeds, but which were called Cycadospermum. I called upon Dr. Carl Burckhardt, retired Geologist of the Mexican Survey, who had published a most complete treatise on the Mesozoic of Mexico. He assured me that the floras of Mixteca Alta and Huauchinango were not Liassic but Dogger. These identifications prove that the Cycadofilicales and Cordaitales can be traced to the Middle of the Jurassic. It would be extremely interesting to follow this clue and to try to establish the connection between these Cycadofilicales and the Cycadophytes which latter form the bulk of the fossil floras of Mixteca Alta and Huauchinango.

A good impression of Codonospermum from coal No. 2 at Spring Valley near LaSalle in Illinois, was published in my Bulletin 52 of the Illinois State Geological Survey, and a beautiful Trigonocarpus seed was found protruding from a coal ball collected near Booneville, Indiana, in the coal seam No. 5 of Illinois-Indiana. It has not yet been cut, but a similar Trigonocarpus seed from another coal ball which had been cut showed practically no structure, but had a little Pecopteris leaf under its sclerotesta. A great many seeds found in coal balls have been sectioned and we are able to see, in many of them, the megaspore membrane, the pollen chamber, the tapetal layer of the nucellus, also the pollen in the pollen chamber, but no embryo has yet been found, although we sincerely hope that that may happen some day.