1a. Fossil maize pollen from Mexico.

Through the kind cooperation of Professor Paul B. Sears of Yale University and Mrs. Kathryn Clisby, research associates, Oberlin College, the authors have had an unusual opportunity to study fossil grass pollen secured from deep cores taken in Mexico City.

In the course of analyzing pollen content of the core samples Mrs. Clisby observed large grass pollen grains of such size as to preclude the reasonable possibility that they were derived from species of native wild grasses yet extant in the Valley of Mexico. Careful study of the material, in particular the very large grains from the 70 meter level, however, suggested to the authors three possibilities for the origin of the fossil pollen: Tripsacum, maize, or the presumed hybrid of Tripsacum and maize, teosinte. If the grains proved to be those of maize, as seemed most reasonable on the basis of size (111.0 - 133.0μ by acetylation method) they would extend the fossil record of Indian corn far beyond presently known evidence. (Mangelsdorf, P. C. and C. E. Smith. New Archaeological Evidence on Evolution in Maize. Bot. Mus. Leaflets Vol. 13: No. 8. 1949.)

In order to obtain a critical basis for identification of the fossil pollen an extensive study was made of the size ranges of the pollen of Tripsacum, teosinte and maize. To sustain a uniformity in the data all preparations were made by the acetylation method and permanent slides prepared with glycerine jelly mounting medium. A total of nine species of Tripsacum, 2 collections of teosinte and three varieties of maize were used for purposes of measuring. It early became evident that very considerable size range exists within each of the three genera. In the case of Tripsacum average values for the long axes of the grain varied between 41.9μ (T. latifolium) and 58.2μ (T. pilosum); in teosinte, 79.2μ and 86.5μ; in maize 117.3μ and 120.6μ. Unpublished data furnished by Dr. P. C. Mangelsdorf, shows that pollen of certain varieties of maize are far smaller than the three varieties of maize measured in this study, and, indeed, fall well within the range of teosinte and even that of the largest Tripsacum grains. It is apparent, therefore, that size alone cannot be utilized for critical identification of presumed fossil corn pollen unless sufficient individual grains can be measured and plotted on size-frequency curves to show statistical probability of one of three possibilities. Owing to the small number of individual grains from the cores, however, this procedure was not possible.

Because of the paucity of structural features and the undistinctive sculpture pattern on the pollen exines of the three genera, it became necessary to utilize some other means of distinguishing the three pollen types. Consideration of the problem led to one other possibility, viz., a comparison of the ratio in size which exists between the pore of the pollen grain and that of its longest axis. In order to demonstrate this ratio, 50 additional grains were measured from each preparation, with respect to these dimensions. The measurements were averaged and the ratios computed from the averaged values for each slide. The results showed unusual consistency, the ratio of pore to axis being an unexpectedly conservative value, and, from the

data at hand, significantly different in the three forms in question. The numerical values computed are:

	Species	Pore:Axis Ratio
1.	Tripsacum lanceolatum	1:3.99
	T. dactyloides	1:4.15
	T. laxum	1:3.89
	T. australe #1	1:4.04
	T. australe #2	1:4.03
	T. pilosum	1:3.97
	T. latifolium	1:3.90
	T. maizar	1:4.10
	T. sp.	1:4.12
2.	Teosinte annual (Guatemala)	1:5.70
	Teosinte " (Guatemala)	1:5.38
3.	Maize; Thayer Flint	1:6.53
	" ; Knobless	1:6.52
	" ; Thompson Flint	1:6.23
4.	Mexican core pollen at 70.3 - 70.5 meters (average of 2)	1:6.6

Although these data are limited to approximately 600 pollen grains the differences are so consistent, both with respect to individual grains as well as with averages of many, that the pore-long axis ratio appears to be a perfectly valid method of distinguishing maize pollen from that of its near relatives. It may be noted also, in connection with this analysis, that teosinte, a putative hybrid between maize and Tripsacum shows an intermediate value both in over-all size, and, more significantly, in the pore ratio. The intermediate value is well in keeping with the postulated hybrid origin of teosinte.

Because of the evidence obtained in this study it is the opinion of the authors that the fossil grass pollen from Mexico City can be none other than that of maize. Future discovery may perhaps modify this conclusion, but from the facts nor at hand it is the only conclusion possible.

Although palynological and geologic conclusions have not yet been drawn as to the actual antiquity of the deeper portions of the Mexican cores, it is apparent that they extend well back into the late Pleistocene. (Sears, P. B. Palynology in southern North America 1: Archaeological Horizons in the Basins of Mexico. Bull. Geol. Soc. Am. 63:241-254. 1952) If this is the case the fossil corn pollen with which we are concerned probably antedates the advent of man in North America, and, as such, indicates the existence of wild maize in the Valley of Mexico during some early stage of the Wisconsin glaciation, if not during the last interglacial (Sangamon).

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