"Mexico in Prehistoric Mexico"

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Summarized by Stephen Pitcher

Professor Byrne's research lies in the field of paleoecology, the reconstruction of environmental change and human impact on the environment in premodern epochs. The last 20,000 years have seen many interesting changes, including the domestication of plants, and later animals, about 10,000 years ago, simultaneously and coincidentally in four parts of the globe: Mexico, the Peruvian Andes, the Near East, and South China. Mexican domesticates included both therophytes—plants like wild maize, wild beans, amaranth, squash, and chili peppers, produced by seeds and having a life cycle of one year—and geophytes, like the Irish potato, jicama, sweet potato, and possibly cassava, which develop storage organs in the soil. In the case of annuals, it is the seed, a little package of concentrated energy, that is valuable to people. The reproductive element is also the part of geophytes consumed by humans, but it occurs in a different form—an underground tuber adaptable to seasonal climates, that sits in the ground like "energy in the bank" awaiting the optimal growing conditions of Spring.

Mexico is a land of enormous climatic contrasts, with the highlands of the Sierra Oriental and Sierra Occidental, the Mesa Central, all experiencing widely different weather patterns and seasonal contrasts, especially with respect to precipitation. Much of Mexico is too dry for rain-fed corn: irrigation is required in the north, while the south is too wet for corn. Teloloapan, in the mountainous southwestern state of Guerrero, has four months in the summer during which there is more precipitation than evaporation—apparently a felicitous arrangement for corn, for it was there that *Zea Mays* was first domesticated. The other two members of the Three Sisters of North American Native agriculture, beans (*Phaseolus vulgaris*) and squash (*Cucurbita pepo*), are thought to have been first domesticated in Jalisco and Oaxaca, respectively. There is considerable scholarly interest in determining the wild species most closely related to today's domesticated varieties, with *Cucurbita fraternal*, a wild squash of Northeast Mexico, thought to be *C. pepo*'s closest relative, and research at U. C. Davis on the family tree of *Phaseolus* (more difficult to analyze, because beans are not well preserved in the archaeological record) indicating the once volcanic, now alluvial valleys of the southwest.

Byrne took a memorable trip into the southern part of Mexico with legendary botanist Hugh Iltis, in search of the birthplace of domesticated corn. They believed (and it has since been shown) that corn was derived from teosinte—like corn a wild grass, but with ten or twelve small, less well-developed cobs per plant; the name means "Corn of the Gods" in Nahuatl. Abandoning their Volkswagen in Zinzontla, they headed into the high country on horses, and eventually at 1300 meters in El Rodeo, Manantlán, where Iltis had heard that teosinte grew—they found it. (Byrne showed a slide of teosinte growing at the edge of an abandoned corn field.) While there are several types of teosinte geographically distributed throughout Southwest Mexico, the population of teosinte that gave rise to corn was located in Rio Balsas, east of Jalisco. Professor Byrne theorizes that it was from the

highlands of Oaxaca that corn was taken down into the lowlands, probably by Mixe-Zoque peoples. The estimated expansion rate of a third of a kilometer a year differs sharply from the rate of agricultural expansion in the Middle East, probably due to the adaptation required for corn to move into a far more humid environment as the high-to-low altitude transition took place. Summer, corn's growing season in the highlands, was a period of heavy rains, flooding, and hurricanes in the lowlands, and it is probable that corn became a winter crop, cultivated when the river level dropped in the dry season—a system similar to that in use along the Nile. Such agriculture would have necessitated a "manipulation" of the land, akin to what Alfred H. Siemens, in his *Tierra Configurada,* terms the "configured" landscapes of Southeast Mexico—amazing patterns visible from airplanes when forests are cleared off and theorized to correspond to pre-Columbian grain fields.

Intensive agricultural development was required to sustain the surge of population out of the southern part of the Valley of Mexico into the extremely rain-deprived north, possibly in response to a volcanic eruption about 2,000 years ago, leading to questions of how such urban centers as Teotihuacán, with a population of up to 200,000, provided for the nourishment of its citizenry. One highly significant means of addressing this demand was the development of *chinampas,* raised planting grounds protected by willows and fertilized by *chinamperos* with nutrient-rich silt taken from the bottom of artificially constructed canals. Special "forcing" techniques were used to increase yields in *chapines*, little boxes from which plants were transferred when mature enough into the *chinampas.* A study of the *chinampas* of Lake Xochimilco and Lake Chalco, centers of *chinampa* agriculture in pre-Columbian Mexico, was published in 1967 by Pedro Armillas.

Professor Byrne was struck by the intensity of the relationship between a Mexican farmer and his crop: being asked whether he had ever seen teosinte, one farmer replied in the affirmative and promptly retrieved a small seedling from the edge of his land. Asked how he knew that it was teosinte, he said, "It's simple: I know it's teosinte because I didn't plant it there."

In sum, Professor Byrne commented that most Californian teachers teach many students with family roots in south of the border, and a discussion of Mesoamerican agriculture would be beneficial to these students: *agriculture* is too often simply associated with illegal immigrants in California. It is important to reinforce that really important things happened in Mesoamerica, which should be valued, rather than proscribed.

Q&A

Participant: Is teosinte used as a crop now?
Byrne: it's used as a fodder crop now. The grains are too small and tough [to be used for food]. The farmer I spoke with knew about the teosinte growing in his field and allowed it to grow there because he believes it strengthens the corn—the exchange of pollen with the corn plant increases the latter's resistance.

Participant: There is the implication that people ate teosinte; is that not true?

Byrne: Teosinte has smaller cobs but more of them [so there's food there].

Participant: Is there evidence of contact between these Mexican agriculturists and those in the Andes?
Byrne: There certainly was contact, on the Pacific coast. There was corn ca. 5,000 years ago in Peru, 2,000 years ago in Chile, and going the other way, potatoes and tomatoes introduced into Mesoamerica. (The squashes in the Andes are different.) So there was some connection, but not a very powerful one. The Andes had amaranth-like plants, but not the same species.

Participant: How were *chinampas* constructed?
Byrne: You dig down to excavate a canal, pile up sediment on the sides to reduce the risk of flooding (there are dramatic floods in the summer—don't want that if you're a farmer); raise the ground a couple of meters—too high makes irrigation difficult, but if you do it right you get a planting surface that will solve the flooding problem but allows access to the canal.

Participant: Corn, squash, and beans were grown in the same plot together [as in the "Three Sisters" configuration], which is different from what you were showing as intensive agriculture: you showed planting in rows.
Byrne: The contemporary situation is a mixture, with some western influence; it's not truly traditional. It is the fact that the three were planted together—squash low to the ground to minimize weeds, each plant plays a role, in contrast to Middle Eastern or European agriculture, where it's just one crop like wheat in the field.

Participant: In Guanajuato they have a festival in August where they let water out of the canal before the rains, a ritual every year: *el agua.*
Byrne: Water is of course very important for agricultural in Mexico—rainfall, water management. Guanajuato has a big irrigation system now; the water table is dropping dramatically there.

Participant: I read an article about cassava, tapioca—is that grown there?
Byrne: Not really; in the Southeast though, the Yucatán. It was domesticated in South America; wild members of that group (manioc) were a very important New World crop. It's a tropical crop though, so not cultivated in the highlands.

Participant: Manioc is so much more nutritious than corn, though corn tastes better.
Byrne: Root crops do tend to produce masses of crop but all carbohydrate; corn nutritionally better per unit *and* it tastes a lot better.

Participant: It's difficult to process, too.
Byrne: Yes, and one type is poisonous, it has cyanide: sitting on the ground it needs protection from worms.

Participant: [Many are asking] "Are we going to be able to feed ourselves?" There are lots of arguments about comparative yield using industrial-style agricultural versus

traditional small-farmer. Is the Mexican agricultural community thinking at all about traditional styles—abandoning levies?
Byrne: That's a big issue down there. By the way, the Green Revolution started down there, in the 1940s, with Rockefeller Foundation money. It was that whole movement, the use of hybrid corn, some university studies of traditional methods. A big problem down there is that the population increase has been tremendous—they have to import corn from the U.S.; traditional systems can't support the population.