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APPENDIX B DURANGO-ZACATECAS PALYNOLOGY: A NOTE ON RESEARCH

Schoenwetter & Frields

To our knowledge the 14 samples submitted to the SIU Museum pollen laboratories are the first to have been collected for pollen work in Mexico north-west of the Federal District. Our objective in processing and analyzing these samples was simplistic: to discover if techniques which have proved successful in other regions had a reasonable chance of success and to see if differences between samples did occur. If both questions could be answered in the affirmative, an expanded sampling program could be undertaken by Dr. Kelley with some justification.

Somewhat over 70% of the samples were productive, indicating that an extensive sampling program was likely to yield some information, and samples collected in stratigraphic sequence did yield significant differences, indicating that a pollen chronology for the region might well be expected.

The results themselves have little direct value other than as indications of what ways the method can be expected to be of value. Having so few samples, and most of those not representing absolutely dated cultural phenomena or uncontested uncontaminated sediments, we are scientifically limited to a simple discussion of prospects and are unable to deduce much in the way of paleoecology. It must be kept in mind when reading the following interpretations of the results that the sampling is so small that inaccuracy is undeniable. We offer these conclusions--even from such poor evidence--for their value in pointing out some of the advantages of the technique.

Samples were collected in stratigraphic sequence at La Atalaya associated with sherds and structures. The various samples all yielded significantly different pollen spectra, indicating that the deposit was built up fairly slowly. This in itself is of importance in the archaeological record, since it relegates to a high probability the hypothesis that sherd association in a given level is a function of temporal conjunction. The surface sample at La Atalaya is quite distinct in pollen content from the samples below. Since we know that the modern environment is such that dry farming is possible we are immediately suspicious that a less desirable (from the agriculturalist's point of view) environment was associated with the prehistoric occupation. If the interpretations of pollen spectra from Arizona similar to those of La Atalaya are applied one would conclude that during occupation the ecology was effectively more arid than at present. It appears that the relationship between summer and winter rainfall was different then, with heavier summer rains than at present causing arroyo cutting and necessitation irrigation due to lowering of the water table. — 115
Antevs would dispute this interpretation, maintaining that these pollen data have no relevance to rainfall.

Samples from La Cofradia were collected in stratigraphic sequence but are from a sediment known to be mixed in origin. It is not at present possible to determine whether the pollen these samples contain was redeposited from older materials along with the formation of the fill or whether this pollen represents the pollen rain during the deposition of the fill.

In either case, it is of interest that most of the La Cofradia samples gave results dissimilar to those from subsurface levels at La Atalaya but similar to that from the surface at La Atalaya. Since the source of sediments at

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Cofradia can be no younger than the period of filling. It seems evident that since the pollen spectra from the two sites are dissimilar, the La Cofradia pollen record is primarily of a period earlier than La Atalaya. How much earlier is unknown; it may be the period of occupation or it may be earlier or later than occupation, but in any case the supposition that Cofradia is earlier than La Atalaya developed on archaeological grounds is supported by the meager pollen results.

There was one sample from La Cofradia, a sample taken from a hearth, that was similar to samples collected subsurface at La Atalaya. This could mean that the hearth is as late as certain levels at La Atalaya or that the hearth is earlier than the other samples from La Cofradia and represents a time when conditions similar to those which occurred at La Atalaya also occurred earlier. The problem cannot be resolved by stratigraphy, since the hearth may or may not be associated with intrusive burials which are of later date (how much later is indetermined) than the occupation at Cofradia.

The remaining two samples analyzed came from the site of Cerro de Moctehuma. One, associated with a sculptured offering in an altar, gave a pollen spectrum almost the exact duplicate of the 120 cm subsurface level in stratigraphic test #4 at La Atalaya. The other, collected from the top of the structure I fill, gave results more like those of the 180 cm level at La Atalaya. This apparent reverse stratigraphy remains an unresolved difficulty due to the few samples.

If one were to use these meager data to develop the outlines of a pollen chronology, the result would be similar to this:

The present conditions, which allow dry farming, show respectably high percentages of Compositae and Pinus pollen. Stratigraphically below this at La Atalaya (50 cm) is a zone wherein both pine and composite pollen values are very low and chenopod-amaranth pollen is high; this would be interpreted as a period when the effective moisture (the moisture available to plants during the growing season) rate was lower due to a lowering of the water table as the result of aridity and arroyo cutting. By comparison with pollen records from Arizona, this second zone should date after 900 A.D.--probably after 1200.

Below this (120 cm at La Atalaya) is a pollen zone where chenopod-amaranth values are dominant but composite and grass pollen percentages play a statistically relevant role. This zone may be also recognized in the altar sample from Cerro de Moctehuma and the hearth sample from La Cofradia. It seems to show environmental conditions somewhat ameliorated--by comparison with the zone which follows it in time--but still harsh enough to require some form of irrigation for crop plants. By comparison with the Arizona pollen chronologies this zone should date after 900 A.D. also, but probably before 1200. The archaeological data gives a contradictory absolute date, but does agree in placing Cerro de Moctehuma on a time level equivalent with part but not all of La Atalaya. Since the hearth at Cofradia may be a late feature associated with the intrusive burials, dating the hearth to this period is archaeologically acceptable though tenuous. The same criticism may be aptly applied to dating the hearth to this period by its pollen spectrum.

The sample from the 180 cm level at La Atalaya also is dominated by chenopod-amaranth pollen, but has significantly higher pine and lower composite

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values; the gross values are similar to those of the 120 cm level. This seems to indicate a period which was no less arid than present in terms of total rainfall but was a period of less effective moisture due to erosive lowering of the water table. Irrigation may not have been necessary in most years to get a crop but would have been a valuable insurance to maintain a given standard of yield. This zone should also date after 900 A.D. on the basis of palynological comparisons, and this absolute date is also unacceptable on archaeological grounds.

At La Cofradia the samples from the fill are of poor value as ecological markers since we do not know whether they do or do not represent mixing of pollen of different environmental periods. Even if they do represent mixing, however, the fact that none of them have high chenopod-amaranth values indicates that they come from different, earlier, period (s) than the La Atalaya samples. On the basis of palynological comparison such period (s) would date before 900 A.D. and be similar to the present in its potentialities for dry farming. The relationship of total annual rainfall to effective moisture during this period(s), however, must remain a problem unresolved until undeniably unmixed samples are available in stratigraphic sequence.

It seems evident that an expanded program of palynological research in Durango would yield good results and a plithora of paleoecological data which could be utilized for cultural ecological reconstructions of no little value. Our suggestions on future pollen sampling are five-fold:

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(1) Arroyo profiles should be collected to give a stratigraphic record uncontaminated by inadvertant cultural selection for certain pollen types. In such collecting a drawing should be made of the sedimentary section showing the number of beds evident, a rough description of each bed should be made (brown sandy silt, pea gravel, etc.), and the exact location of each sample shown. The sampling interval may be 5, 10, or 15 cm depending on the complexity of the sediment profile. If datable, cultural debris is evident in the sedimentary profile (sherds, charcoal) pollen samples should be taken in good association so that an independently datable point will be available in the sequence.

(2) Samples should be collected from strat tests at reasonably close levels, depending on the depth of the test pit. They should especially be collected where there is evidence that the sediments have been slowly built up in natural sequence (as at La Atalaya) rather than built up by fill washing in from surrounding areas.

(3) It would be useful to know whether the pollen spectra of fills built up by washing-in (as in the La Cofradia courtyard) can be considered as reliable stratigraphic markers. It should be possible to test this in the following way: a series of stratigraphically collected samples from such a fill could be compared with a series of house floors and platform bases known to have been laid down in a certain time sequence. If the pollen spectra from the fill do not match those from the floors, it can be assumed that the pollen in the fill is deposited as the fill accumulates after occupation and is not redeposited material washed in with the accumulating debris.

(4) All floors and platform bases should be sampled and a record kept of artifacts associated with the floors sampled for pollen analysis. Where superimposed rooms are available the fill between floors should be sampled stratigraphically at whatever sampling interval seems most reasonable.

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(5) Any artifact type or charcoal sample which can be reliably dated should have a pollen sample collected in association for aid in building the pollen chronology.

(6) It should be kept in mind that pollen is destroyed by oxidation and thus burned areas have a low probability of giving results if sampled for pollen analysis. Also, deposits which accumulate quickly, such as pits which were constructed and then filled, are unlikely to trap much pollen and so are poor sampling areas. The same principle applies to arroyo sediments; gravels and sands build up fast and the size of the grains of sediment is larger than the size of pollen. Such sediments thus make the poorest of pollen traps, while silts, clays, humus lines and peats make the best traps. Old humus lines in arroyo profiles also may be radiocarbon dated if too many rootlets do not penetrate and thus contaminate the layer. Such a zone would contain good pollen and if such can be found in the arroyos they should not be missed when pollen sampling in the area.