National Geographic Archeobotanical Final Report- Christine Hastorf and Julie Near (University of California-Berkeley)-December 1997

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The excavations directed by Ian Hodder began in 1995 with Christine Hastorf overseeing the archaeobotanical work at the site. Some of the major paleoethnobotanical goals are to gain a detailed understanding of use and distribution of wild and domesticated food plants, the range of wild plant use, the symbolic nature of plant use at the site, especially for food, to study the small scale changes of plant deposition by comparing context related variability within and between middens, hearths, and ovens, inside to outside samples from buildings and specific contexts, as well as to track temporal and spatial shifts in plant domesticates. In the field season of 1995, Ann Butler (UCL) built and operated a motorized water flotation system to process the systematically collected soil samples from every excavation unit. This first machine was designed based on a modified Siraf style flotation machine, using a motor to move water the separates the charred plant remains from the soil matrix (French 1971). A 3 horsepower motor was attached to a 55 gallon oil drum. In 1995 the goal was to collect 60 liters of soil from every excavation unit in bulk, point-provenienced collections, although some excavation units produced less than 60 liters. This strategy was to learn about the archaeobotanical densities across the site. Approximately 200 soil samples were collected from the excavations in 1995. Ann Butler processed approximately 90 soil samples in 1995. Ann Butler took the Mellaart samples back to University College London's archaeobotany laboratory, while the north sector building 1 samples went to the University of California-Berkeley archaeobotany laboratory, where Julie Near began to study them.

In 1996, beginning with the National Geographic Grant, a new level of processing and analysis was initiated. The goals of the archaeobotanical methodology have been fourfold 1) to determine the effectiveness of the sampling strategies employed to this point at the site as well as gaining a systematic sense of the range and densities of the botanical material on the site, 2) to develop and implement a protocol beginning in the 1996 field season that could collect a representative sample of that data from all contexts and time periods, 3) to analyze the macrobotanical samples recovered from the 1996 season that will provide a systematic overview of the excavation areas, and 4) to develop a data base that is flexible enough for many different questions to be asked of the material as well as to connect with the other datasets from the site the and the overall database.

Before we began at the site in 1996, the most important question was what the target soil sample size should be such that all samples would be large enough for statistical analysis while conserving excavation and processing time. Also, we needed to learn what the plant density variation was to determine the frequency of sampling necessary to pick up density and taxa variation across space. Looking at the analyzed counts from 30 1995 samples, we concluded before the 1996 field season that a target size of 40 liters, decreased from the 60 liter size in the 1995 season, would be sufficient. Approximately 85 percent of the samples will have 500 botanical items and many would have more than the needed 500. For the denser samples we can subsample in the laboratory. This allows us to collect the rarer taxa as well. The second issue is the

density of remains between samples. Our analysis thus far showed that the density of remains was variable over space in some potentially significant ways. The highest densities are not associated with any feature, but are in the north area of space 70 (the smaller section of Building 1).

The 1996 Field Season

The 1996 August-September excavation season archaeobotanical program had Dr. Christine Hastorf (University of California-Berkeley) and Julie Near (University of California-Berkeley) overseeing the archaeobotanical research and collections at the site and in the laboratory. The same blanket (systematic) sampling strategy was maintained, but with either 40 or 20 liter samples taken from every excavation unit. These samples were from discrete locations, called bulk samples. We dropped from 40 liters to 20 liters due to various field pressures that season. But by the end of the season we returned to 40 liters, concerned about our sample counts. In some smaller contexts however, samples of only several liters were collected, especially within the structure 1 in the north sector where there was very little matrix in the excavation unit. We also requested that the excavators collect a second soil sample collected throughout the excavation unit from certain midden and fill contexts. These are called average samples. These average samples were taken primarily in the Mellaart area that uncovered quite a bit of midden dumping in 1996. In all, 750 soil samples were floated during the 1996 field season, ranging in size from .5 to 60 liters. These processed samples also included the remaining 120 samples collected in 1995. All flotation samples were sent to the University of California-Berkeley Archaeobotany Laboratory for analysis.

To keep up with the excavations, a second, larger pump-driven water flotation system was built in 1996. This system was based on the SMAP machine plans, but was built to larger specifications than normal flotation machines, holding 100% more water than the first machine (Watson 1976). Like the earlier machine we also had two large holding tanks built to reclaim and reprocess the water. The filters on the recycled water were .5 mm, restricting our control of a clean less that .5 mm fraction. We also purchased a more powerful motor to aid in soil processing. This strategy was done in order to process larger samples. Our normal operations had the smaller machine floating the smaller samples and the larger machine processing the full-sized samples. Both machines used a .5mm aperture to recover the heavy residue (fraction) and a .17mm aperture for the light residue (fraction) floated material. These two machines were in use full time with the help of 3 workers, one Turkish student, Maria Mangafa, a Greek archaeobotanist, and ourselves.

In the North area building 1, the floor contexts were excavated as a continuous cultural unit rather than divided arbitrarily over space. We decided that soil should be collected and floated every half meter not to lose data from these important contexts. Secondly, in certain areas where large midden or fill contexts were excavated, two types of samples were collected. The first was the point provenienced-bulk sample, while the second was an average-scatter sample, taken by grabbing material at intervals across the whole excavated area. The hope is that the different collection strategies provide a more

thorough view of the material that was deposited in that context (Lennstrom and Hastorf 1992).

A second major methodological implementation was the set up of a large scale heavy residue (fraction) processing system at the field house. The heavy residue portion of the flotation samples were collected and sorted by a team of two trained students and 8 in the 1996 field season. We processed the dried heavy residue through .5, 1., and 2. mm sieves, extracting small and large animal bone, lithics, ceramics, beads, figurine fragments, egg shell, insects, ochre, shell, in addition to the botanical remains. Charred botanical remains are common in the residues and are typically of a range of the more dense materials (charred wood, pulses, chaff and mineralized remains). Finds were weighed and distributed through the finds labs to the various specialists. In all 475 samples were processed this year.

The 1997 field season

In this season, 525 soil samples were processed using the two machines. While many field strategies remained in place from the previous year, we did adjust the soil sample size, based on more analysis. The sampling strategy for the 1997 season was to collect a bulk soil sample from all units (samples taken from one discrete location), targeted at 30 liters when possible. In units containing midden or other secondary, mixed soil matrices, a scatter sample was requested in addition to the bulk sample. Due to a change in the excavation procedures, in certain excavation units that spanned a large horizontal space, (primarily floor contexts) several bulk samples from the same unit were collected for flotation. These were taken at one meter intervals across the unit. The heavy residue procedure was ongoing, now with 11 local women sorting. Some remaining residues from 1995 and 1996 samples as well as the 1997 samples were completed. In all, over 800 heavy residue samples were sorted this year. Botanical material was also systematically collected from the 4 mm sieves that received all excavated soil matrix. In addition, units with special botanical material were sampled individually after consultation with us.

Although the majority of the samples will be processed in the laboratory at U. C. Berkeley, some preliminary sorting was carried out during the field season as quick sorts. From this analysis it is possible to discuss particular units with other specialists in the field. Sample densities varied dramatically from unit to unit, ranging from 1-250 mg botanical material per liter of sediment. The diversity of taxa was also variable and it is hoped that further analysis of these samples will result in the observation of patterning related to various contexts.

Data Analysis

Analytically, we have spent time on three aspects. First the data base development, second the infield quick sorting of recently excavated and floated samples to be able to offer interactive feedback to the other specialists and excavators, and third, more detailed phases of plant analysis. The archaeobotanical analysis has been set up to be done in stages: Phase 1 consists of a description and presence-absence of the categories

of remains. Phase 2 is the sorting, counting, and weighing of remains into plant part categories and some taxa identification. Phase 3 consists of the identification of the charred plants, down to species when possible, with the aid of comparative collections and other reference material. Phases 1 and 2 are being conducted at the site as well as UC Berkeley, while phase 3 was initiated in July, 1997, using the excellent Anatolian plant collections at the British Institute of Archaeology in Ankara, Turkey.

To complete the quick sorting procedure during the field season, we had specific soil samples flagged for immediate flotation, once dry we took the light fraction directly to the site microscope after sieving and scanned the various fractions, noting the plant taxa presence, the condition of these pieces, and their densities. During the 1997 field season, when this procedure was initiated Julie Near completed 45 quick sort samples.

At Berkeley, laboratory work has focused on the 300 priority samples that were selected by excavators and specialists for both years Analysis thus far has included approximately 225 samples from both the Mellaart and North areas of the excavation although there are significantly more priority samples from the North area.

The first phase is carried out for two reasons. First, this is a fast way of dealing with a sample, providing a basic level of knowledge. Secondly, the information is useful for other team members who need to easy access the material. It is possible to see general data at a glance. In the field a phase 1 sort is conducted on all priority samples as soon as they are identified. This provided data for the onsite discussions during the excavations. As this is the time when face to face discussion of interpretations can occur most easily it has been important for the palaeoethnobotany team tohave results.

Second phase sorting which includes the pulling and identification of general types of materials as well as weights and counts of such materials has been carried out primarily in the laboratory. This level of analysis provides more detailed data on samples and can be accessed by excavators through the data base. Statistical analysis ranging from density calculations to more complex computations such as cluster analysis can be conducted with phase 2 data. First of all, context related questions such as 'what activities areas can be seen within this structure', 'how is the use of space changing over time', and 'are there any patterns of plant usage that can be seen within similar contexts' are better addressed using phase 2 data. Issues of plant domestication, processing, and the use of wild versus domesticated plants are also better dealt with using phase 2 sorting. Finally, while phase 2 sorting is conducted, materials which need to be sent for further analysis (phase 3) are separated out.

Results

Thus far in the analysis, we find quite a diversity in densities of plant remains as well as taxa present. Clearly, the different contexts in the site will yield very different frequencies of plants. All of the major domesticates associated with the Neolithic in the region are present, but their distribution is very nonrandom. Lentils, peas, and cereals are regularly present. Wetland, wild taxa also are common. Especially interesting are the middens of the Mellaart area. In these middens, we found dense and large wood concentrations with likely animal and human dung, also burned occasionally.

More samples have been analyzed from the North area where the most occupation surfaces have been exposed. Analysis of North area archaeobotanical samples in combination with data from heavy residue analysis have provided a detailed view of the use of space within this structure over time (Figure 1). While interpretations of this space are still ongoing, some interesting patterns are noted. First of all, the floor surfaces are clean. Thus, the use of larger material artifacts to determine activity areas is not successful. Small artifacts like those that come from heavy residue and flotation have revealed that space 70, where the largest hearth is located not only contained a greater density of plant remains and were more diverse. This supports the idea that this was a food preparation area where more plantfood was prepared and possibly even processed. In space 71, a storage bin contained a solid layer of well preserved lentils. This is the only food storage context we found. These seeds were extremely clean, with out much chaff or other wild taxa. Gordon Hillman has noted that Neolithic Anatolian domesticate storage is exceptionally clean; cleaner than modern farmer storage (Hillman pers. comm.; Helbaek 1964), The lentils covered most of this bin of about 1 by .5 m, and were about 5 cm thick. They were clearly burnt in situ but in an indirect atmosphere, due to there extremely well shaped and preserved condition. While it has not been conclusively shown that this area of the north building was burned intentionally, much of the data seems to lead us to this interpretation. If the fire was intentional the lentil bin is a curious situation as so much, apparently consumable food material was left to burn. Could this be an example where plant remains have been symbolically or ritually left to be destroyed?

One intriguing discovery, near the western fire installation of building 1 was an acorn cache on the floor of phase 2. There were about 40 nuts within this one concentration. This seems to have been a bundle of nuts that was probably hanging from the roof or on a peg in the wall, and fell while burning.

In building 1, several post holes also have been excavated. In one, the sample was almost completely void of botanical remains except for a small "handful" of barley (*Hordeum*) grains, while in another, a small cache of wild weed seeds (*Lithospermum* type) were found, again in an otherwise clean sample. The hypothesis could be made that such samples are the remains of small post preparation rituals. Finally, in building 1, below the floor levels we found unusually clean preparation matrix. Most fill on the site is composed of a mixture of many types of plants at relatively high densities. In contrast the North preparation matrix appeared to be cleaned of their botanical remains, possibly by sieving. If this is the case, a question is raised as to the reason for such careful building preparations where even seemingly benign botanical remains would be painstakingly removed.

During the 1995 and 1996 excavations and through much of 1997 Mellaart area samples were primarily from middens and fills. Investigations of these samples show that, while they are generally denser that other types of contexts, there is a wide range of variability in their density and contents. Middens at the site are complicated and investigations will continue to address their uses, differences and relationship to the

inhabitants. So often midden is left as the catch all category, but here at Catal we have high resolution sampling that we can use to discern and interpret the differences.

Finally, work at Catal, both in the North and the Mellaart areas has shown that certain types of wild resources have been seriously overlooked in the early interpretations. First of all, underground storage structures of plants such as tubers and rhizomes are abundant at Catalhoyuk.. In addition, material from marshland plants such as *Phragmites* spp and other wild plants, sometimes found in great numbers, are common. These remains are found in both flotation samples and screened botanical material. Their high ubiquity shows us that these wild resources were important to the inhabitants and will be given more attention in future palaeoethnobotanical investigations.

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