ARCHAEOBOTANICAL LAB REPORT # 11

FLOT PROCEDURE : 1989 PROYECTO WILAJAWIRA

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This is an account of procedures for flotation followed during the 1989 season at Tiwanaku, Bolivia. This was the first season that samples taken by Proyecto Wilajawira in previous seasons (from the sites of Lukurmata and Tiwanaku) were floated, and the first time that a systematic sampling procedure was established for current and future Project excavations. During the summer of 1989, over the course of 8 weeks, 709 soil samples were processed with the use of a slightly modified SMAP flotation machine, which was built under the supervision of Prof. Christine Hastorf upon our arrival in Bolivia.

Selection Procedure

Samples were selected for flotation based on the prioritization of provenience : Lukurmata and the area east of the Akapana had highest priority, then Putuni, and then the Akapana proper. Consequently most of the flots processed in 1989 were from the first two locations. Additionally, the newly developed sampling strategy called for two types of soil samples to be taken from each excavation unit (each cuad, rasgo and nivel) : a pinch sample and a bulk sample. Given our limited time in the field, it was decided to process the bulk samples first, and to return to the pinch samples in future seasons if lab analyses proved it necessary.

Recording

Upon selection, the samples were each given a unique flotation number which was written (with indelible Sharpie pen) on the sturdy outer tag ("ficha") which had a reinforced hole and string at one end. For those lacking fichas, tags were made for them and tied on the bag. Total information was then recorded in the flot log : flot#, site, cuad, nivel, rasgo, unidad, specimen (bag) number, excavator and date excavated. Any additional information from the tag was noted under "comments" in the flot log.

The volume of each sample was estimated as a fraction of a full bag by comparison with a marked, graduated example of a full bag. There were 2 bag sizes : 6.3 liter and 2.6 liter, coded as "L" (large) and "S" (small) respectively. So volumes would be noted in the flot log as ".8L" or ".6S", etc.

Flour sacks, which had been cut in half, were marked (again with indeible Sharpie) with the flot number, site, and bag number; one sack for each sample. These would be used to dry and contain the heavy fractions.

All of this preparation was done the evening before the next day of floating.

Processing Control

One sample was selected at random each day and fifty burnt poppy seeds (precounted in gelatin capsules) emptied into it, to test for recovery rates. In the beginning, for the first six days of floating, we also put 20 large charred umbell seeds, to test for recovery of larger items, but found we were getting consistent 100% recovery on them, so we discontinued the practice. The umbell seeds were large enough to be clearly visible during the flotation process, providing a visual marker of which bag was that day's test sample. We wanted to eliminate the inevitable temptation to treat the test sample differently from the others, in order to get an accurate assessment of recovery rates, so we discontinued use of the umbell seeds. The number of the selected sample was noted in the flot log.

Flot Procedure

In the morning, the flot machine, pump, and ancillary equipment were wheelbarrowed out to the flot site, along with 20-30 samples, with their flour sacks for the heavy fractions and pieces of chiffon for the light fractions. Oil in the pump was changed after every 2 full days of floating. The air filter was checked once a week and washed when necessary. The pump was filled up with gasoline approximately after every 8 samples; on an average day, we used 5 liters of gas.

Samples would be evaluated by look and feel, and if necessary set to soak in buckets either with plain water or a mixture of water and hydrogen peroxide. Soaking in water was for those samples with large, non-friable clumps of non-clayey soil; water and hydrogen peroxide were used to break up clumps with a high clay content. Samples without large clumps, or ones that broke apart easily, were not soaked. The method of soaking, if any, was noted under the "comments" column of the flot log for each sample. Not all the samples were set to soaking at once, to avoid waterlogging the samples. Optimum soaking time depends on the particular soil, but was never more than an hour, and usually closer to 20-30 minutes.

The small bucket for catching the light fraction had carbuerator screen in the bottom and 2 stacked geological sieves inside. A square of chiffon, size approximately 50cm X 50cm, was draped in the bucket, resting on the screens, and the edges clothes-pinned to the bucket sides to secure it. This way the light fraction spilled directly into the chiffon, which was also used to hang the samples to dry.

Once the machine was filled with water, and inner barrel and outer bucket in place, the sample was poured SLOWLY into the machine. The inner tag from the sample bag, if any, was placed on the waiting flour sack; the outer tag ("ficha") placed to the side to await the light fraction. If a soaked sample, the sludge was sprayed from the bucket into the flot machine with a hose. The rate of water flow was constantly adjusted and readjusted throughout the floation process.

The silt was encouraged to pass through the screen at the bottom of the inner barrel, and lumps encouraged to break up, by gentle handling. As soon as enough silt had passed to make it practicable, the inner barrel was agitated using a few short up-and-down strokes, followed by lateral shaking. The water flow was usually shut off during agitation to conserve water, as our source was limited. After agitation, the flow was resumed. Most samples required only one agitation, but some required two, and a few 3 or 4 times. It seemed to be primarily the samples from east of Akapana (AKE) which usually required more than one agitation.

When the sample was relatively clean and no more carbon was floating to the surface, the water flow was shut off and the light fraction bucket removed and put on the ground next to the machine. The gravel siphon was then utilized, "vacuuming" up carbon floating just above the bottom of the inner barrel and spewing it into the light fraction bucket. During the siphoning, one of us stood by with a tea strainer and scooped up any carbon which rose to the top. When no more carbon was coming out, or the siphon was starting to pick up too much small gravel, the siphoning was ended, and the water level brought back up to the top. The water was stopped again, and we waited to see if any more carbon would levitate. Any that did was scooped with the tea strainer.

When no more carbon was rising, the bucket was replaced and the water turned on again. After emptying previously collected carbon into the light fraction, the tea strainer was passed through the water in the inner barrel (while it was running) to test for any additional carbon left in the sample. When the strainer came up clean, the sample was done, the water turned off, and the light fraction bucket and inner barrel removed.

The light fraction in the chiffon was gently rinsed from the outside to encourage everything to congregate in the middle of the chiffon; it was then removed from the bucket and tied shut with the ficha and placed out of the sun. Later it would be hung on a clothesline in the patio to dry. A new chiffon was draped on the bucket, secured with pins, and dampened to encourage it to be securely attached to the bucket, ready for the next sample.

The heavy fraction from the bottom of the inner barrel was carefully emptied onto the properly numbered flour sack, using a hose to clean the barrel and capture everything. The heavy fractions were laid out to dry in the sun, and the inner barrel thoroughly rinsed and replaced in the machine for the next sample.

Problems

On some occasions the light fraction bucket would become clogged with paja and/or silt and threaten to overflow. When this happened, the water flow was cut, the bucket removed, the the light fraction gently rinsed to encourage the silt to pass. If there was too much paja, often a second, or even third, chiffon was required. Generally I would rinse once, and if it threatened to overflow again, I would get a fresh chiffon.

Post-flotation Processing

At the end of the day, the machine was taken apart, the light fractions collected, the heavy fractions tied up into little bundles, and the whole kit-and-caboodle wheelbarrowed back to the house. The heavy fractions were piled (sometimes not carefully enough) in the patio for the sorters to work on, and the light fractions hung to dry. At night the light fractions were brought inside to hang on an indoor line, if not yet dry. Those samples that were dry were carefully emptied into ziplock bags. On the outside of the bag was put a sticky label with (minimally) the flot#, site, cuad, unidad, and date of excavation. Inside with the sample was put the ficha. The samples were then placed in a cardboard box (which, when full, were mailed home) and a check was made in the "lt frac" column of the flot log. The heavy fraction sorters kept their own log, which was periodically cross-checked with the flot log, and the samples sorted were checked off under "hvy frac". The "restos botanicos" category of the heavy fractions (if any) was collected, as was the <2mm portion of the heavy fraction (although not all of the latter have been shipped back to the states).