Tom Bailey
April 1988.

This summary paper fulfills the requirements for the completion of AnSt 8300, taken in the Spring of 1985 for 2 credits, and AnSt 8300, taken in the Fall of 1985 for 3 credits. These Directed Researches were held in conjunction with Directed Readings under the rubric of Paleoethnobotany. The particular research project that I was involved with concerned initiating a comparative collection of modern charcoal wood from the Mantaro Valley, Peru. The project consisted of two aspects: burning modern wood samples and SEM phototography. I will describe the procedures that were undertaken, the problems encountered, and possible solutions. I will conclude with a short discussion of why a comparative collection is beneficial to archaeology.

The wood samples selected for this project were limited to those collected and identified by Prof. C.A.Hastorf(see Table 1.) during previous field seasons in the Mantaro Valley. The most important criteria for selecting a sample for charring was size. The modern comparative wood needs to be of adequate size in order to delineate all of the features of the wood sample. This is critical for the purpose of comparative analysis. It enables the analyst to note the variation of features that may be present within particular samples. Additionally, it is neccessary to have an ample amount of charred material to carry out comparative research in the future. Given these conditions, I was able to select 20 samples for processing.

Ambrosia arborescens(163)	Hesperomel escuneata(144)
Baccharis floribunda(119)	Lupinus mutabilis(74)
Baccharis salicifolia(3)	Puya raimondi(85)
Berberis sp.(245)	Pirus(154)
Budd leja(298)	Polylepsis racemosa(30)
Caesalpina tinctoria(21)	Prunus cappolin(45)
Cassia latopeliolata(44)	Sambucus peruviana(47)
Chenopodium(131)	Schinus molle(260)
Colletia spinosissima(138)	Solanum hispidum(33)
Fraxinus(153)	Solanum lycioides(157)

Table 1. Modern Wood Samples. ***'s in ( ) refer to UMARP** **ID/collection number **

All of the wood samples had to be charred on an individual basis. There were two primary reasons for this decision. First, since there was a wide range of wood types, as well as sizes of samples, I could not be assured that burning multiple samples would require the same amount of time. Secondly, the facilities used for the charring process dictated the treatment of one sample at a time. Therefore, the procedure utilized consisted of imbedding individual samples of modern wood into a coffee can partially filled with sand. The sand was then heated over a bunsen burner in a fume hood. If too little sand is used, then the sample is subjected to too much heat, resulting in the sample being reduced to ashes. Therefore, using too little sand is not very effective. If too much sand is used in the charring process, then it takes a longer amount of time to complete the charring process. Therefore, using large amounts of sand is not very efficient. By repeating the charring process many times, with varying amounts of sand, I determined that I got best results when there was approximately 5 cm of sand below the sample, and 3 cm above it. These conditions maximized both efficiency and effectiveness.

The general procedure for burning the modern wood samples was very time consuming as well as frustrating. The trick was to char the wood without reducing the sample to ash. The charring of wood samples often had to be attempted 3 or 4 times. This was in part due to the wide range of wood materials being sampled. Initially, I would burn a sample for 2 hours. If the sample was not completely charred, then I would take a fresh sample and repeat the process and increase the amount of time. If, however, the sample was reduced to ashes after only 2 hours of burning, then I had to repeat the process with a fresh sample ina less amount of time. Some species could be charred within a half hours time, whereas others would take 4-5 hours(see Appendix 1). A contributing factor could be the fact that I had no means to consistently control the firing temperature.

The second phase of the project consisted of taking SEM photographs of the charred modern wood specimens. A minimum of four photos were taken of each specimen, with magnifications ranging from a power of 50 to 1000. All negatives and prints are on file at the Paleoethnobotany Lab(see Appendix 2 for listing of photos and magnification). The SEM photos were taken for the purpose of providing a tool for wood comparison and identification. Specifically, the photos provide a means to study the types of porosity,

tracheid vessels,and ray classification. These SEM photos enhance details that can not normally be seen under a low power light microscope.

The establishment of a modern wood comparative collection is just the initial step for the analysis of wood within an archaeological context. The data can be used to answer a variety of questions concerning cultural activity. Possibilities include: a comparison of the degree of variability from hearth to hearth; are specific species utilized for a particular purpose; wood usage over time; patterns/associations of other artifacts with wood types; hearth evolution/maintenance. Charcoal can also be used as a paleoenvironmental indicator. For an analysis of this type it would be neccessary to sample the entire population of a species, ie., all stages of development. This may allow an anlysis of the immediate environmental conditions,eg., wet/dry, hot/cold cycles as determined by growth rings.

One of the major limitations to using the data from comparative for interpretations is the fact that the modern samples are often collected from only within immediate localities, ie., regions/valleys. This is problematic because researchers must assume that the distribution of modern wood species does not correspond with the prehistoric flora. However, it may be possible to use indirect data, eg.,pollen,seeds,nuts, to infer species of prehistoric woody trees and shrubs. Therefore, one could acquire a comparative collection from elsewhere in the region.

Appendix 1. Firing times for modern wood samples.

SAMPLE	TIME FIRED(HRS.)
Ambrosia arborescens	.75
Baccharis floribunda	2.5
Baccharis salicifolia	1.75
Berberis sp.	2.50
Budd leja	5.25
Caesalpina tinctoria	1.00
Cassia latopeliolata	.66
Chenopodium	2.33
Colletia spinosissima	1.00
Fraxinus	2.25
Hesperomel escuneata	4.50
Lupinus mutabilis	1.66
Puya raimondi	1.20
Pirus	1.75
Polylepsis racemosa	2.25
Prunus cappolin	2.50
Sambucus peruviana	.75
Schinus molle	1.75
Solanum hispidum	1.00
Solanum lycioides	1.00

Appendix 2. Cataloque of SEM Photos. **photo #'s are located in upper** **left hand corner of print **

PHOTO #	SAMPLE	MAGNIFICATION
1	Ambrosia arborescens	120x
2	Ambrosia arborescens	140x
3	Ambrosia arborescens	250x
4	Ambrosia arborescens	1K
5	Baccharis floribunda	36x
6	Baccharis floribunda	100x
7	Baccharis floribunda	100x
8	Baccharis floribunda	100x
9	Baccharis floribunda	300x
10	Baccharis salicifolia	120x
11	Berberis sp.	140x
12	Berberis sp.	300x
13	Berberis sp.	600x
14	Berberis sp.	100x
15	Berberis sp.	200x
16	Berberis sp.	400x
17	Berberis sp.	120x
18	Berberis sp.	240x
19	Berberis sp.	500x
20	Budd leja	100x
21	Budd leja	210x
22	Budd leja	1.0K
23	Budd leja	120x
24	Budd leja	450x
25	Caesalpina tinctoria	110x
26	Caesalpina tinctoria	220x
27	Caesalpina tinctoria	100x
28	Caesalpina tinctoria	330x
29	Cassia latopeliolata	120x
30	Cassia latopeliolata	400x
31	Cassia latopeliolata	130x
32	Cassia latopeliolata	430x
33	Chenopodium	130x
34	Chenopodium	100x
35	Chenopodium	100x
36	Chenopodium	500x
37	Colletia spinosissima	140x
38	Colletia spinosissima	430x
39	Colletia spinosissima	130x
40	Colletia spinosissima	140x
41	Fraxinus	90x
42	Fraxinus	200x
43	Fraxinus	420x
44	Hesperomel escuneata	100x
45	Hesperomel escuneata	1.5K
46	Hesperomel escuneata	100x

PHOTO #	SAMPLE	MAGNIFICATION
47	Lupinus mutabilis	50x
48	Lupinus mutabilis	140x
49	Lupinus mutabilis	150x
50	Lupinus mutabilis	450x
51	Pirus	140x
52	Pirus	610x
53	Pirus	200x
54	Pirus	140x
55	Pirus	300x
56	Polylepsis racemosa	120x
57	Polylepsis racemosa	300x
58	Prunus cappolin	200x
59	Prunus cappolin	480x
60	Puya raimondi	70x
61	Puya raimondi	310x
62	Puya raimondi	150x
63	Puya raimondi	510x
64	Puya raimondi	2.4K
65	Sambucus peruviana	90x
66	Sambucus peruviana	340x
67	Sambucus peruviana	120x
68	Schinus molle	140x
69	Schinus molle	430x
70	Schinus molle	140x
71	Schinus molle	410x
72	Solanum hispidum	140x
73	Solanum hispidum	310x
74	Solanum hispidum	130x
75	Solanum hispidum	430x
76	Solanum lycoides	85x
77	Solanum lycoides	260x
78	Solanum lycoides	65x
79	Solanum lycoides	170x