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## **Ancient Maya Plant Use Activities and Agroforestry at Tikal, Guatemala**

*Interim Report*



**Research Year:** 2004

**Culture:** Maya

**Chronology:** Pre-Classic to Post Classic

**Location:** Guatemala

**Site:** Tikal

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### **Introduction**

The goal of this project is to conduct a paleoethnobotanical study of the plant materials from Tikal, perhaps the preeminent civic-ceremonial site of the ancient Maya. Although

no paleoethnobotanical samples per se were collected during excavations, there were over 1500 samples collected for radiocarbon dating (a purpose for which they are no longer needed), and many of these weigh over 100 g. The PI of this project, Lentz, went to the University of Pennsylvania University Museum in May of 2004 to talk with curators, inspect the Tikal plant materials and arrange for shipment. The personnel at the University Museum were extraordinarily kind in all respects and shipped the Tikal plant remains to the Chicago Botanic Garden on June 20, 2004. The remains arrived without incident and were received in good condition. These samples are composed almost entirely of seeds and charred wood. Unearthed from strata ranging from Pre-Classic (ca. 450 B.C.) to Terminal Classic/Post Classic (ca. A.D. 900+) times and represent an extraordinary opportunity to study the plant use practices of the ancient Maya in the heart of their foremost polity.



Figure 1. Southern Maya lowlands.

### Specific Objectives

The purpose of this project is to gain a greater understanding of the plant use activities and agroforestry approaches employed by the Pre-Columbian Maya occupants of Tikal. Among the fundamental questions to be answered include:

1. What were the species of plants both wild and domesticated, herbaceous and woody, that formed the basis of the subsistence and political economies of Tikal?

2. How were these plants obtained, i.e., were they planted and tended, cultivated, encouraged, or merely gathered from the wild?
3. How were plants used, e.g., were they used for construction, fuel, food, ceremonial activities, or in artifact manufacture?
4. What forest species were exploited and how did patterns of use change through time?
5. What was the impact of closely managed agricultural and agroforestry systems on the trajectory of ancient Maya cultural developments?
6. What was the long-term environmental impact of plant extraction activities at Tikal?

***Two hypotheses in particular are being tested during this study:***

The first is Dennis Puleston's hypothesis that ramón (*Brosimum alicastrum*) fruit was an essential component of the subsistence of the ancient Tikal occupants. Puleston was among the first to assert that Maya subsistence was far more complex than the previously promulgated models of maize-based agriculture indicated. As part of this assertion, he hypothesized that the fruits of ramón, from a tall forest dominant in the Moraceae family, were used by the Tikal inhabitants as a basic foodstuff (1968; 1982). He carried out preliminary surveys of ramón trees and experimented with the underground storage of the fruits in pits (*chultuns*). Others have observed the high density of trees in the vicinity of Maya ruins and have suggested various explanations for this distribution (Lundell 1937; Peters 1983; Lambert and Arnason 1982), yet no one has adequately tested the hypothesis of ancient Maya use by examining the plant remains left by the Maya themselves. Thus far, we have examined over 200 paleoethnobotanical samples from Tikal and no ramón remains, neither wood, seeds nor fruits, have been identified.

A second hypothesis to be tested is that pine wood was associated with ceremonial activities at Tikal and was traded as a commodity as found in evidence at other lowland Maya sites (Lentz *et al.* 2003; Morehart *et al.* 2003). Ethnographic studies of modern Maya groups (e.g., Breedlove and Laughlin 2000; Wisdom 1940) describing pine as a traded commodity and as common element in a variety of rituals help to substantiate these observations. The presence of pine wood or needles in ceremonial contexts supports the hypothesis, especially because pine is not found in tropical deciduous forest, the native plant community that surrounds Tikal today. To date, we have observed pine charcoal in 14 of 200 samples analyzed.



**Figure 2. Seeds and wood samples were further analyzed by the author, David L. Lentz, and students at the University of Pennsylvania Museum, using a scanning electron microscope (SEM) at the Field Museum.**

## **Methodology**

Data required to test the stated hypotheses will follow the three phases of investigation:

1. The first phase involves the rough sorting, preliminary identification and cataloging of carbonized plant remains collected at Tikal during the excavations conducted in the late 1950s, '60s, and early '70s. As suggested above, the samples are voluminous, well provenienced and represent the full range of occupational time periods, from Pre-Classic to Terminal Classic, thus offering an excellent diachronic perspective on the way Maya agricultural and forest management practices may have changed through time. Many of these samples weigh over 100 g. This is an enormous treasure trove of botanical material.



**Figure 3. Pictured is the PI, Dr. Lentz, during his visit to the University of Pennsylvania Museum.**

The first step in this part of the study was to examine all of the radiocarbon samples in the University Museum in Philadelphia. A list of samples deemed appropriate for further analysis was compiled to request temporary transfer of the samples to the Plant Resources Laboratory at CBG. After arrival in Chicago, hundreds of these samples have undergone rough sorting by Research Assistants (Tegan Jones and Rene Pudzicz) followed by preliminary identification with light microscopy by Lentz. Tiny seeds and wood samples have been subjected to further analysis using a scanning electron microscope (SEM) ([Figure 2](#), shown above) at the Field Museum that allowed high resolution imaging with a large depth of field.

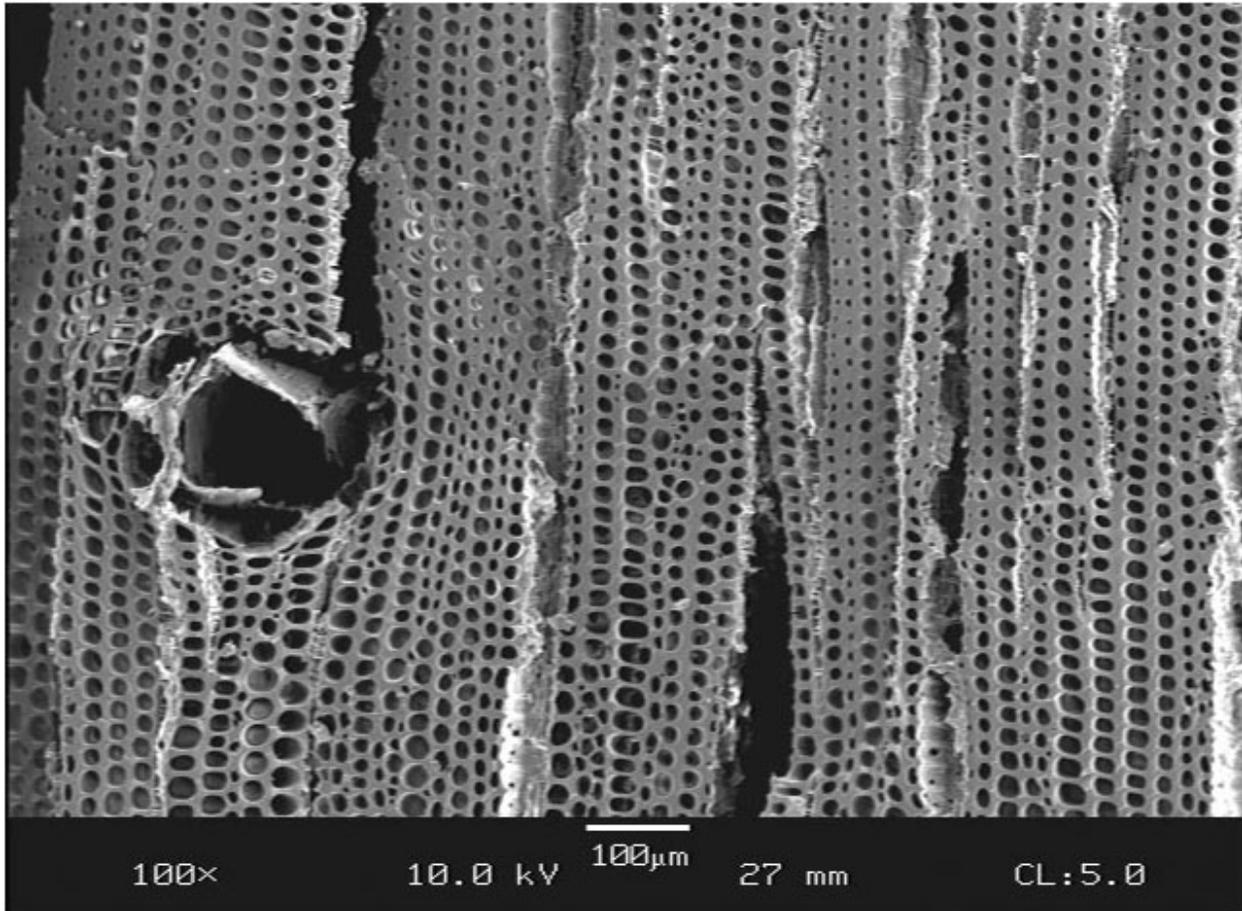


Figure 4. A pine wood micrograph from Tikal.

2. Light and electron micrographs of Tikal plant remains have been compared to the PI's reference collection of Central American woods and seeds housed at the Plant Resources Lab and the Garden's herbarium collection during this final identification phase.
3. The Tikal archaeobotanical data have been stored in Excel files to facilitate statistical analysis of observed patterns in the data. Also, the Tikal data will be compatible with records from other Maya sites in the region, e.g., Copán, Xunantunich, Dos Pilas, Pacbitun, and Aguateca, recorded by the PI, thus allowing for interregional comparisons and meta-analyses.

### **Contribution to our Current Understanding of Ancient Mesoamerican Culture**

Results of the proposed project will provide invaluable information on the economic underpinnings of one of the major complex societies of Mesoamerica: the ancient Maya of Tikal. The first major result will be a complete analysis of the plant materials recovered during the thorough excavations executed at Tikal during the late 20th century. Results will include an identification and documentation of plants used by the

Tikal inhabitants from Pre-Classic (ca. 450 B.C.) to Terminal Classic/Post Classic (ca. A.D. 900+) times. This will represent the first data of its kind from a diachronic perspective for the largest site in the ancient Maya realm. From this we will learn not only what plants the Maya were using, but also how they were using them (determined by context) and how their pattern of usage changed through time.

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