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“Patterns of Worship at the Temple to Hecate at Lagina”

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Abstract

During the 1999 field season, soil samples were collected from the site of Lagina near Turgut in southwest Turkey. Samples were taken from above, within and below the plaster floor of the original temple to Hecate, which predates the destruction by Quintus Labienus in 40 BCE. Following collection, the samples were sent by Dr. Ahmet Adil Tirpan of Konya University, the project director, to the pollen laboratory at the University of San Diego.

In January of 2000, a pilot palynological study was undertaken to ascertain if pollen was recoverable from them. The results of this study netted a spectrum of twenty distinct pollen types representing a pollen signature that the author contends, portrays the temple culture at the site in the guise of its tithes and offerings in the period preceding the destruction by Labienus in 40 BCE.

Introduction

In the summer of 1999 the author revisited an “unexcavated site” in southeast Turkey that he had been interested in for close to twenty years. Much to his surprise, Dr. Ahmet A. Tirpan and his team of graduate students from Konya University had extended their work from nearby Stratonicia and unearthed key elements of the sacred city of Hecate, these to include the propylon, adjacent altar, and the temple proper. Needless to say the author’s services as an archaeobotanist were immediately tendered. Initial efforts along these lines, however, met with difficulties. Previous successes with such structures had involved recovery of fossil pollen from plasters underlying marble floors within temple structures or from the interstices of cobbles of storage structures within temple complexes (Geyer, 2001). The floors of the propylon, altar and temple at Hecate represent the remains of an impressive secondary construction composed of large limestone building stones. This constituting a reconstruction undertaken in Augustus reign around 27 BCE after the original temple was sacked circa 40 BCE in the aftermath of the Roman Civil Wars by his adversary in this conflict Quintus Labienus (Bean, 1971). These foundations had subsided in subsequent earthquakes allowing more modern contaminated soil to replace the original building material of the interstices. With nothing meaningful to sample, this put any efforts at palynological investigation at Hecate on hold. In affect, we were being frustrated by the very magnificence of the structure that we would attempt to interpret.

Returning to the site at the end of the summer season, the author discovered that the excavations within the area of the temple pronaos had progressed down through the stones of the central floor of the secondary structure to the plaster floor of the original temple. Samples from this initial temple structure were taken from above, within and below the floor plaster. Soil sampled from above the floor is in most cases less informative than that taken from the capped levels within and below. Upon destruction this soil becomes part of a mixed context containing the rubble from above and more modern contaminates from outside. Experience shows that it would be better to substitute a modern surface sample in place of an uncapped floor sample, if this were possible. In the case of Lagina, it wasn't. Modern agriculture completely encircles the site and erosion from the surrounding fields has not only inundated it, but has in some areas covered it. The level above the plaster floor of the original temple was comprised of ash and as such was deemed to represent a destruction layer. One sample was taken from this ash layer.

Procedures

In order to identify the pollen present in a soil sample, a chemical separation from the sediment matrix, to which the pollen has bonded over time, must be performed. This pollen separation was accomplished using a series of slightly modified, standard palynological procedures (figure 4). To be successful these procedures have to be adapted to the particular soil type encountered (Schoenwetter, 2000). Briefly stated, sedentary agricultural deposits (to include coprolites) are rich in humic acids and are less resistant to strong base chemicals, while desert soil deposits are primarily alkaline and are thus less resistant to strong acids. The development of such a customized extraction procedure for the temple of Hecate samples was the primary focus of the initial pilot study. After two attempts pollen was extracted from the five samples taken from the plaster floor of the temple structure at Lagina in sufficient concentrations to attempt the standard 200-grain counts. These identifications and their tabulations were completed by mid April of 2000 and are represented in the attached pollen table (figure 3).

Results and Analysis

After the pollen was extracted and slides mounted, the pollen was identified and counted using a standard biological microscope set at 400 power. Each sample received a 200-grain count, which is the current acceptable minimum for accurate statistical representation of pollen present in a palynological study. Since neither Anatolian pollen keys nor reference materials are currently available, identifications of individual grains were based solely upon comparison to a widely used European pollen key (Faegri and Iversen, 1989) and the authors reference drawings of common eastern Mediterranean pollens.

Twenty pollen types were identified (figure 3), although not all species were present in all five of the samples. This number also includes results, which were not statistically significant. After the historic use of each of these species was determined (Jones, 1998), the pollen was categorized as tree, food, herb, disturbance or wetland pollen. During analysis, it became clear that many of the species had several historic

usages, and were therefore placed in the category for which they were most commonly used. For instance, *Olea* (olive) is an arboreal species, but is also used for food as well as ritual decoration in such a temple setting. However, it is most frequently used as a food source, and was therefore labeled as such. In order to facilitate understanding of the results, the findings of each stratigraphic layer will be discussed separately.

Capped Level

As mentioned above, samples were taken from above, within and below the plaster floor of the original temple to Hecate, which predates the destruction by Labienus in 40 BCE. Samples 1 and 2 represent the capped level below the plaster floor, while samples 3 and 4 represent the plaster floor itself. The destruction layer is represented by the sole sample taken above the plaster floor. The destruction itself may have allowed, over time, for some downward percolation and blending of the pollen spectrum of both the floor and the "capped" layer beneath it. This may be evidenced by certain similarities between samples 1 through 4. Look, for example, at the levels for barley pollen in these first four samples (figure 2), which all hover at or near to 30% (33%, 31%, 33% and 30% respectively). This pattern is repeated for both the *Poacea* (grass) and *Triticum* (wheat) species. However, an alternative interpretation would be that these grain species would be placed upon the floor when they were presented as a temple tithe and thus deposit their pollen residue in a more direct way. Then when the temple floors were periodically washed these pollens would percolate down into the lower levels. *Poacea* (grass) pollen, which shares in this pattern, would come in from the fields mixed with the grain harvests. Let us now turn to a more direct analysis of the results of the extraction from the capped level.

First and foremost it is clear that grain in the form of wheat and barley was being grown in the nearby fields and, in turn, was ending up in the floor deposits of the temple structure. *Hordeum* (barley) makes up on average 32% of the floor cap and 31.5% of the floor plaster, while *Triticum* (wheat) makes up on average 27.5% of the floor cap and 31.5% of the floor plaster. In terms of tithing, this is to be expected. Together with olive and grape, grains were the staple of what is termed the Mediterranean polyculture.

Vitae (grape) pollen was also tithed to the temple. These being made as liquid offerings (libations), upon the temple precincts being washed, they would tend even more than the grains to percolate to the lower levels of the temple floor. This is just what we see when we look at the pollen table. The largest percentages for grape pollen are in the capped areas beneath the temple's plaster floor (10% and 23%), but grape pollen is still represented in the plaster floor in significant percentages (9% and 8%) right up to the moment of destruction that is represented in the layer of ash (where we find the percentage still relatively high at 8%).

Olive, which would be tithed as both a fruit and as oil, would be expected to have a pattern (this is termed "pollen signature") some where between that of the offerings to the temple of grape/wine and that of the bulk offerings of grain. This is evidenced in olive having, similar to grape, higher amounts of percolated pollen in the capped areas beneath the temple's plaster floor, but dissimilar to grape the ratio between the pollen percolated below the plaster floor and that remaining within the plaster floor is smaller than this same ratio for grape.

Looking at the "Arboreal (tree) species" represented in the floor cap samples we gain an idea of just what trees were around at the time the temple came into use. Most of the trees, with the exception of olive (which we have already discussed) and oak occur in small percentages (figure 1). These (to include: tamarisk, pistachio and cedar) would have been blown in or come in from the fields attached to other economic or crop pollens. Thus, they can be termed as more environmental than economic or as background pollen. Such pollen can be used to gauge man's increased or decreased impact on the natural environment over time, but only in the case where sampling of multiple strata representing larger periods of time has been done. Here, in this one sampling, such an analysis cannot be made. Assuming olive was brought into the temple precincts as a tithe, then we can postulate that oak was the dominant arboreal pollen in the area surrounding Lagina.

Wetland species, such as cattail and water lily, occurring together only in the floor cap, indicate the marshy character of the land surrounding the temple complex (figure 3), which is still the case today. There is a pool to the east of the temple precinct that is fed by a spring uphill from it, which in turn (during the period of the temple) supplied water to a fountain within the temple precincts (Bean, 1971). The runoff from these water sources still inundates the low-lying levels of the site.

Plaster Floor Level

The presence of such high concentrations of grains in the temple's floor plaster indicates that these crops were passing through on a regular basis and over a long period of time. The most obvious explanation is that the local farmers were meeting their political and religious responsibilities by making an economic tithe to the temple. Economic plants find their way, over time, into three central depositories: erosion from the fields into nearby streams, collection and storage in granaries and as part of a tithe to the local temple. Of these three the temple structure gives the best representation of the agriculture surrounding an archaeological site, because a tenth of every type of crop is tithed to just one central structure shedding its pollen along the way.

Confirming the tithing of wheat and barley to the temple from the surrounding fields is the accompanying levels of grass and other inedible (and thus undesirable) weeds that proliferate in disturbed or plowed soil (figure 3). These would include *Poacea* (grass), *Tubuliflorae*, and *Chenopodium*. The high percentage of *Poacea* also indicates that the grain fields were periodically left fallow in order to recover their nutrients (Safrai, 1994).

Grain, along with olive and wine, as mentioned above, typify the polyculture of the eastern Mediterranean food supply and all three are represented in the temple tithe at Lagina. Wine would of course come to the temple in ceramic storage containers (pithoi or amphora), which would interfere with deposition of its pollen. This is evidenced in two distinct ways in the fossil pollen record. First, liquid offerings poured out to the goddess onto the floor of the temple, though representing only a fraction of the total amount tithed and containing only small amounts of pollen in their dregs, would over time account for the majority of the grape pollen deposited in the temple floor, but washing of the flat floor would result in higher amounts of grape pollen in the layers below the plaster floor as the pollen percolated downward, which is what we have (figure

3). An argument could be made for regarding pistachio among the economic pollens, but compared to the grape or olive percentages, which are handicapped by their presentation for tithing in liquid form, it would not have been a major tithe. Requiring more of an explanation is the large percentages of oak pollen we find within the temple floor. Three explanations actually present themselves and combined may jointly account for the strength of the signature of oak, which is clearly not an economically tithed plant. First, and foremost, would have been the presence of a "sacred grove" (Bean, 1971) adjacent to the temple, which would have allowed for oak pollen to blow in over long periods of time. Second, would have been the residue of oak pollen in charcoal used in braziers for heating and burning incense within the temple. Finally, would be pollen used in wreaths for festival decorations of the temple. Oak was a tree common to this region in the first century. However, *Salix* (willow) was the tree typically chosen for the Sacred Grove of Hecate. As such we would expect to see willow displacing oak in the pollen signature at Lagina as the sacred grove began to establish itself. Comparing the counts for these two species we see the amounts for willow rising from an average of 4.5% in the floor cap (which in lieu of tithing represents arboreal levels at the time the temple was established), tripling to an average of 13.5% in the floor plaster. Conversely, the amounts for oak drop from an average of 14.5% in the floor cap to a mere 7% in the floor plaster (figure 1). Clearly the data supports an argument for the establishment of a sacred grove of willow within the confines of the temple precincts.

Herbs (to include: anise, *ephedra* and *artemisia*) are present in the temple in concentrations strong enough to bear mention (figure 3). Primarily used in healing, they may have been a requested tithe coming from the temple personnel.

Also, flax is present in a minute amount (figure 2). Usually, any percentage less than 2% can be deemed as statistically insignificant, and this is the case here, but with such an important crop and in the contexts of a temple setting another look may be warranted. Flax was in high demand throughout the Mediterranean as a preferable substitute to wool for clothing in warm climates. It can be grown in place of and in places suitable for grain production, which is the case here. An indication that flax was being used for manufacturing textiles is the presence of another plant: *Dipsacus* (fullers brush). Fullers brush was used to process the tow of the plant into cloth and we also have evidence of it in the pollen record (see pollen table). Linen (flax), prior to its being produced in sufficiently large quantities, was reserved for both the robes of priests or kings (Safrai, 1994 and Geyer, 1998), and that is probably what we have a minute amount of evidence for here. The temple personnel, upon request and in the form of a tithe, were being supplied with a small amount of flax (and fullers brush) for the purpose of making their ceremonial robes.

Destruction or Ash Level

This sample, as stated before, was taken from a mixed context of ash and thus one sample, sample 5, was deemed as adequate to represent what occurred at this moment frozen in time. The concentration of pollen in this sample was higher than that in the ones taken from the floor and beneath it. Though the sample contained a large amount of charred grains (the cedar pollen, for example, were all blackened), few, if any, were damaged beyond recognition. Tar, of course, dominated the background matrix in the

ash sample and was evident in decreasing amounts in the background material of the plaster floor (samples 3 and 4). The results of this study attest, if nothing else, to the resilience of pollen deposited in structural contexts to fire, oxidation and to the very harsh laboratory chemicals used to finally extract them.

Returning to the grains (figure 2), we find one oddity that begs explanation. All of the percentages for the "Grain and grass species" (grains are of the grass or *Graminae* family) average out around 30%, with the sole exception of barley in sample 5 (the ash or destruction layer). A possible explanation for this spike in the tittle of barley might be in their having been a preparation for the coming siege by Labienus in 40 BCE. If the siege occurred in the early summer, it would have been just prior to the wheat harvest, but just after the barley harvest. Thus, barley would have been the only grain available to stockpile in preparation for a prolonged siege. This further suggests that at the end this temple of Hecate (who was associated with Demeter, the goddess of harvest) found its final usage as a wartime granary.

Conclusion

The analysis of the soil taken from these three levels yielded some interesting and unexpected information, especially as it opens a portal into the daily life in and around the temple precincts. However, it could be argued that this study raised more questions than it answered. For example, can we be sure that the sacred grove was composed of willow trees? If such economic crops such as olive, grape and the grains were in fact tithed to the temple, then where were they stored? Does the ash layer signify a complete destruction of the original temple 40 BCE?

It is hoped that, taken together within the context of the entire archaeological record, even further insights can be teased from the data contained here in this the first pollen table assembled for this site, and that a clearer reconstruction of what was actually occurring at the temple to Hecate will be arrived at.

In fact, it is the opinion of the author that only with a complete study of these temple structures, from one end of the Mediterranean Sea to the other, would one be able to confidently reconstruct the lives of these people who inhabited the coasts of the Roman Empire nearly two millennia ago. As of now, we are only able to look at a microcosm of Greco-Roman society. With such a fleeting glimpse back through the ages, one is left with no complete answers, only the desire to continue the research and learn more about how plants were used as foods, clothes, drinks, dyes, drugs, and perhaps even herbal's among the provinces of Rome.

Acknowledgments

Three years have past since the pollen samples at Lagina were first taken. Credit must first go to the principal investigator of the site, Dr. Ahmet A. Tirpan, who seeing its potential for discovery both encouraged and facilitated this research. Special thanks must also go to his team of dedicated graduate students from Konya University who gave so generously of their time and energies. Final acknowledgments need to go to Dr. Angelo Orona, head of Anthropology at the University of San Diego, who found the funds to establish USD's pollen laboratory and continues to work for its betterment.

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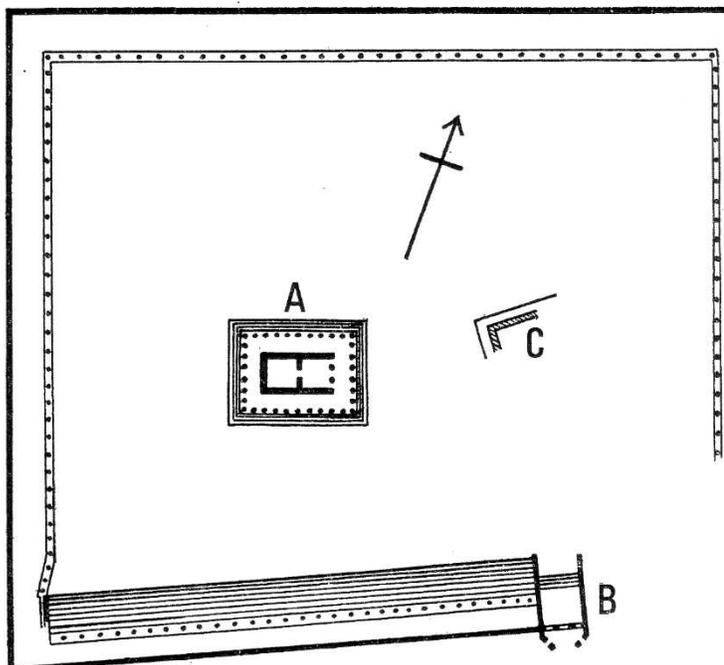
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Hecate Site Plan



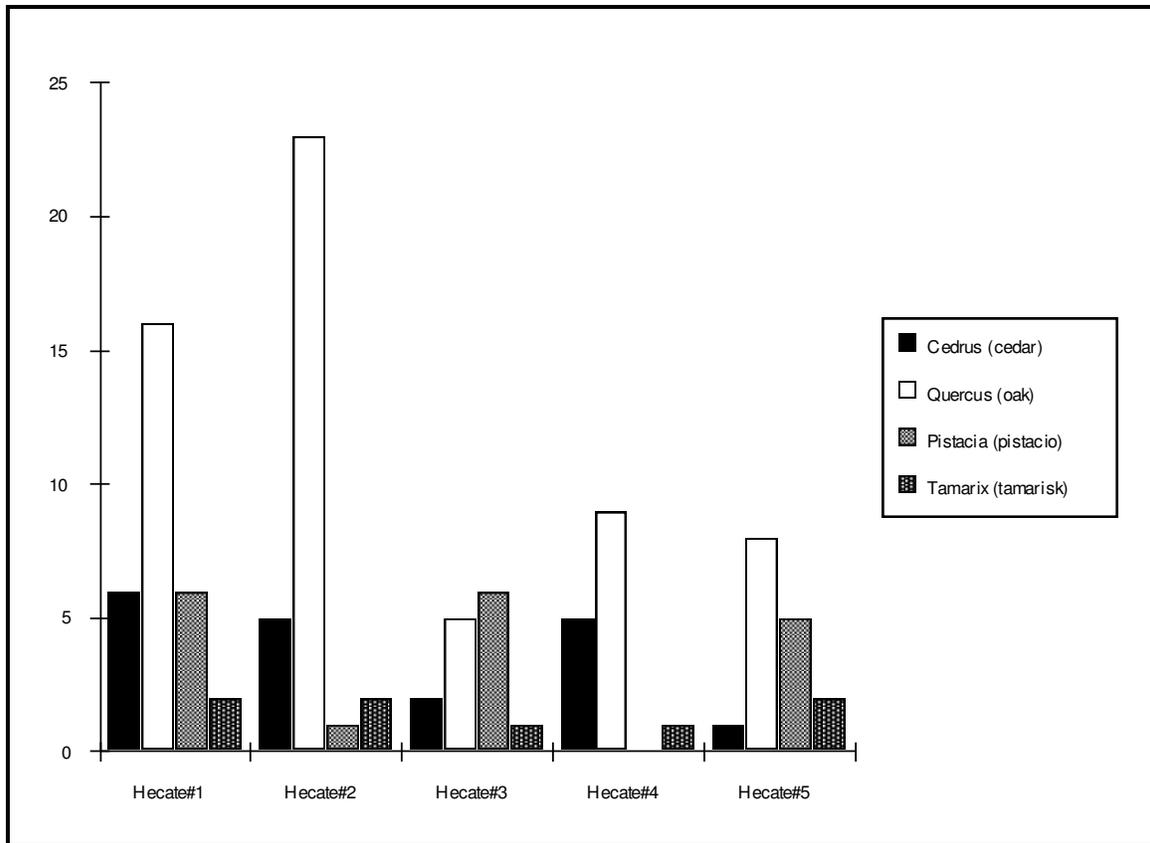


Figure 1: Lagina-Hecate Temple Arboreal (tree) species

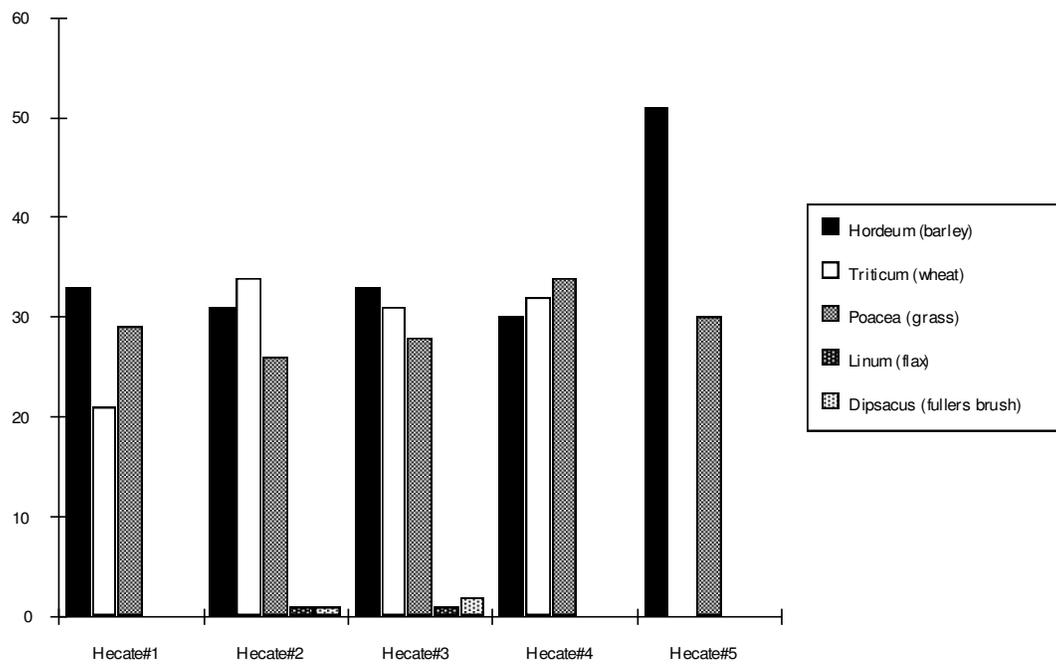


Figure 2: Lagina-Hecate Temple Grain and grass species

Figure 3: Lagina-Hecate Temple Pollen Table

Plant Species	Lagina #1 floor cap	Lagina #2 floor cap	Lagina #3 inter floor	Lagina #4 inter floor	Lagina #5 ash layer
Arboreal species:					
<i>Cedrus (cedar)</i>	6	5	2	5	1
<i>Quercus (oak)</i>	16	23	5	9	8
<i>Pistacia (pistacio)</i>	6	1	6		5
<i>Tamarix (tamarisk)</i>	2	2	1	1	2
Grain and grass species:					
<i>Hordeum (barley)</i>	33	31	33	30	51
<i>Linum (flax)</i>		1	1		
<i>Poacea (grass)</i>	29	26	28	34	30
<i>Triticum (wheat)</i>	21	34	31	32	30
<i>Dipsacus (fullers brush)</i>		1	2		
Additional edible species:					
<i>Olea (olive)</i>	16	13	13	7	4
<i>Ligulifloreae (endive)</i>	7	4	9	11	2
<i>Plantago (plantain)</i>	11	5	6	14	11
<i>Umbelliferae (anise)</i>	6	5	9	12	14
<i>Vitae (grape)</i>	10	23	9	8	8
Disturbance and herbal species:					
<i>Artemisia (herb)</i>	9	6	13	10	5
<i>Chenopodiacea (weed)</i>	11	4	8	7	13
<i>Ephedra (herb)</i>	7	2	5	9	8
<i>Tubuliflorea (weed)</i>	7	2			1
Wetland species:					
<i>Nymphaea (water lilly)</i>		4			
<i>Typhallatifolia (cat tail)</i>	2		1	2	
Percentile Sum	100	100	100	100	100
Pollen Sum	200	200	200	200	200

Figure 4:
Pollen Extraction Procedure

Step One

The first step in the process is termed deflocculation. It is the goal of this step to loosen and break the bonds that hold the pollen to the soil.

- 1) After preparing and labeling the appropriate number of 15 ml test tubes, 3 ccm of sample is scraped from the envelopes into each of the tubes.
- 2) 10 ml of a 20% Trisodium Phosphate (TSP) solution is then added to each tube in order to break down the physical bonds that cement the pollen to the soil matrix.
- 3) The contents of the tubes are then stirred to form a homogeneous solution.
- 4) The samples are now let to set for 3-5 days and are stirred occasionally.

Step Two

The next step is the reduction of the organic fraction.

- 1) The samples are first centrifuged at 3000 rpm for 5 minutes and decanted. They are then rinsed with distilled water to remove any remaining TSP and again centrifuged and decanted.
- 2) The volume in the tubes is now brought back up to 10 ml with a 20% solution of NaOH. The resultant mixture is stirred vigorously and placed in a boiling bath of distilled water for 10 minutes.
- 3) Hot water is harvested from the bath for the subsequent rinsing process.
- 4) Shortly after the tubes are removed from the bath they are centrifuged and decanted. Samples are then rinsed with the hot distilled water, stirred, centrifuged and decanted again until the liquid portion clears.
- 5) After repeated rinses the samples are allowed to sit until the following week; a second boil might be needed.

Step Three

The third step is an optional repetition of *Step Two*, this is done until the decanted liquid is clear.

Step Four

The next step in separating out the pollen so that it can be analyzed is termed swirl separation.

- 1) The mixture in the tubes is again stirred to create a homogeneous mixture.
- 2) The mixture is then decanted through a #80 screen (180 μ) into fresh labeled 15 ml test tubes.
- 3) This process is repeated at least one more time to separate as much of the matrix from the large mineral fraction of the sample as possible.
- 4) The volumes of the tubes are now brought up to a level of 15 ml with distilled water.
- 5) The tubes are then centrifuged for five minutes at 3000 rpm.
- 6) The liquid from the tubes is then poured off as the matrix containing the pollen is forced to the bottom of the tube during centrifuging. Samples with multiple tubes are combined into a single tube.
- 7) Each pollen matrix should now have its own individual tube (e.g. three tubes for three samples).

Step Five

The fifth step in isolating the pollen is termed heavy liquid separation. This step uses a dense liquid to float the lighter pollen grains, while the heavier soil is separated out as it sinks to the bottom.

- 1) Samples are centrifuged at 3000 rpm for five minutes and then decanted to remove the unneeded water.
- 2) Ethanol is now added to the matrix in place of the water and the sample is stirred.
- 3) The mixture is then centrifuged and decanted with the ethanol solution.
- 4) After allowing for drying the test tube is filled with a solution of ZnCl₂ with a specific gravity of 2.0, using three times as much volume of ZnCl₂ as remaining matrix.
- 5) The solution is stirred vigorously until it is homogenous, then centrifuged.
- 6) While decanting, the top 2/3 of the liquid is poured off into a clean labeled 15 ml tube and the new solution is then diluted with water using three times the volume of water as the solution. It is now centrifuged and decanted. This then allows the recovered pollen to drop back down out of suspension.
- 7) The new polleniferous matrix is then transferred with ethanol into freshly labeled dram vials for storage.

Step Six

Step six is the final in the progression. The pollen can now be mounted (glycerol) and stained (fuchsin) on microscope slides so that individual grains can be identified and 200 grain per sample counts made.