Pollen analysis of three seventeenth-century lead coffins

Gerald K. Kelso *, Henry M. Miller

NPS Eastern Archeological Field Laboratory, 115 John St., 4th Floor, Lowell, MA 01852-1195, United States
Historic St. Mary's City, P.O. Box 39, St. Mary's City, MD 20686, United States

A R T I C L E   I N F O
Article history:
Received 15 October 2015
Received in revised form 18 December 2015
Accepted 24 January 2016
Available online xxxx

Keywords:
17th Century
Colonial Maryland
Burials
Seasonality
Calvert
Flora tributes

A B S T R A C T
Three lead covered wooden coffins containing the remains of a man, a woman, and a child were found during excavations inside the foundation of the 17th-Century Jesuit Chapel at Historic St. Mary's City, Maryland. Pollen analysis of physical samples and alcohol swabs from the coffins was complicated by pollen from agricultural produce stored with the coffin structural materials, the natural background pollen rain, and pollen from soil disturbance plants. The absence of pollen on the man's physical remains and on the interior of his wooden coffin indicates that his death occurred during the winter. Ragweed-type pollen dominated the woman's body and woman's wooden coffin samples, suggesting that she was died during the Fall. Perfectly preserved pine pollen grains in soil placed in the child's wooden coffin to raise the upper portion of the body suggest that the child died and was buried during the Spring. Rosemary sprigs and aster-type pollen found on the woman's chest and pea family pollen found on the woman's lumbar area are interpreted as indicating floral funerary tributes and the practice of traditional English burial rituals.

Published by Elsevier Ltd.

1. Introduction

Archeologists discovered three lead covered coffins of graduated sizes (Fig. 1) during excavations of a 17th-century Jesuit Chapel at St. Mary's City, Maryland in 1990. St. Mary's City is located near the junction of the Potomac River and Chesapeake Bay, and became the first capital of Maryland when the colony was established in 1634 (Fig. 2). The city was abandoned in 1695 and long subsequent agrarian use has permitted the archeological record of the early community to be well preserved. Investigations have been ongoing since 1969, and one of the most significant sites is a cross-shaped brick church built in the 1660s and demolished in the early 1700s. It was, the first major Catholic Church built in English America and the first brick structure in the colony. Excavations revealed the three coffins buried in a pit in the north transept of the building (Fig. 3), along with approximately 70 other burials within the church, and several hundred outside in the graveyard (Riordan, 2000, 2009). These are the only 17th-century lead sheathed coffins found thus far by archeologists in North America. Geophysics suggests there are no other lead coffins among the hundreds of burials at the chapel site (Johnson and Johnson 2002), and such unusual mortuary treatment strongly implies that the three individuals were of high social status. A major scientific investigation of the coffins was begun in 1992 with their lifting from the burial site and opening. Its goals were to retrieve as much information as possible about life and death in early Maryland, obtain 17th-century environmental evidence, and attempt to identify the deceased. Subsequent analysis, some of which is ongoing, indicates that they were members of the colony's elite founding family—the Calverts (Miller et al., 2004).

The largest coffin was well made with an internal wood coffin of Atlantic White Cedar (Chamaecyparis thyoides) and Pine (Pinus spp.) (Alden 2007), fully covered by two large sheets of lead. It contained the unusually preserved body of an apparently corpulent man who was about five and one half feet tall, right handed, and in his mid- to late fifties when he died. The muscle attachments on his bones were not robust, suggesting a relatively sedentary lifestyle (Owsley and Sledzik 1993). The range of evidence strongly suggests that he was Philip Calvert (ca. A.D. 1625 or 1626-A.D. Winter 1682/1683), youngest son of the first Lord Baltimore and brother of the second, and a person who had a key administrative role in guiding the colony, serving as governor, chancellor and the chief judge of Maryland.

The intermediate coffin consisted of a pine (perhaps Lobolly Pinus taeda) coffin covered by two large but miss-cut pieces of lead, suggesting the maker was either incompetent or inexperienced (Alden 2007, Moyer, 1998). It contained the well-preserved skeleton of a woman who appears to have been in her mid-to late sixties when she died. Her right leg had been broken, had been improperly set, and had become infected, leaving a large lesion in the bone. She also suffered from osteoporosis and advanced arthritis. She had undergone severe dental attrition, with only 8 teeth remaining, a condition that may indicate she had large amounts of sugar in her diet (Owsley and Sledzik 1993). She was buried in a dignified manner with remnants of a shroud,
silk ribbons at her wrists, knees and ankles, and sprigs of rosemary (*Rosmarinus officinalis*) strewn through the cof (Mc Weeny 1993). She is believed to have been Philip Calvert's first wife, Anne Wolseley Calvert, who died at St. Mary's City in 1678 or 1679.

The smallest cof contained the remains of an approximately six month old girl, who might have been a child of Philip Calvert and his second wife, Jane Sewall Calvert. The child suffered from serious nutritional problems including severe anemia, scurvy and rickets. The practice of swaddling may have been a factor (Owsley and Sledzik 1993). The child appears to have been initially interred in a wood cof, disinterred, a lead covering patched together from four scraps of lead added to exterior and reburied. The inner wooden cof was made of black walnut (*Juglans nigra*) and pine (*Pinus* spp.) planks (Alden 2007). The child’s head and upper back had been raised slightly at initial burial by placing a sloping layer of soil under the body at the head of the cof. Later a second type of soil that seems to have been in the form of mud was placed on top of the upper and center sections of the body, possibly to contain odor during the application of the lead covering and re-interment. Because bodies of babies disintegrate rapidly, the fully articulated nature of the bones of this small corpse indicates that the second burial took place not long after the original internment (Owsley and Sledzik 1993). Further information about these individuals and their forensic analysis can be found at [http://anthropology.si.edu/writteninbone/lead_coffins.html](http://anthropology.si.edu/writteninbone/lead_coffins.html).

The man’s and the woman’s coffins were resting on the same sandy soil stratum, with the bottom of the man’s cof only one third centimeter deeper than that of the woman’s cof. This suggests that these coffins were placed in the pit at about the same time. Confirming this is the soil profile (Fig. 4) which shows they were covered by the same soil strata. Their physical burial in the chapel was simultaneous, despite the three or four years difference between their death dates. Sampling under the two adult coffins revealed no accumulation of pollen, demonstrating that the woman’s cof had not been placed nor stored in an open crypt during the time preceding her husband’s death. Furthermore, inspection of her cof during conservation also found no scratches, dents or other markings in the soft lead that would have likely been present if she had been exhumed for reburial with her husband (Moyer 1998). Where she was for the three to four years between her death and that of Philip Calvert is a mystery. The profile shows that two shafts was later cut through the pit fill over and near the woman’s...
coffin after it had been buried. These were dug for the burial of the baby, and probably its reburial. Clearly, the child was buried after the man and woman were interred in the pit. The only relatively well preserved pollen found in the grave pit itself were four grains of oak (*Quercus* spp.) pollen recovered from the sample taken from the top of the woman’s coffin; the other pollen consisted of the degraded pollen grains characteristic of the deeper portion of soil profiles (Kelso 1993: Figs. 1 and 2). It is feasible that these fresh grains of oak pollen found on top of the woman’s coffin are related to the later excavations for the burial of the child’s coffin.

As significant number of insects were recovered from both adult coffins, representing 16 species of arthropods and one snail species, totaling over 41,000 fragments (Suman, 2006: 2). Except for one blowfly, all of these are taxa normally found in the upper humus and leaf litter ground layers (Suman, 2006: 4). None are deep burrowing insects that would have entered the coffins after burial, and sampling of the soils surrounding the coffins found no insects. The remains of only a single blowfly (*Calliphoridae* spp.) were found in the woman’s coffin and none identified in the man’s coffin (Suman, 2006: 5, Table 1). The presence of these insects suggests that the coffins were stored above ground for some period, providing the opportunity for entry by the creatures. While the woman’s coffin was probably manufactured at the time of her death, the man’s coffin shows more care in fabrication and the application of custom-made elements such as wrought iron handles. It contained the greatest number of insects and may have been constructed ahead of time and stored in a place attractive to insects and snails. The presence of a number of similar leaf litter insects in the woman’s coffin may be evidence that her coffin was not physically buried during the multi-year period between her death and final interment. In contrast, no insects were recovered from the child’s coffin, suggesting rapid construction, burial and reburial (Suman, 2006: 4).

### 2. Materials and methods

The objectives of the coffin pollen analysis were primarily to recover evidence of season of burial and burial practices involving plants. To these ends physical samples were taken immediately after opening of the coffins in November of 1992. Samples came from clothing and body surfaces and cavities, and the pollen spectra of these samples were compared with spectra collected with swabs of sterile cotton moistened with reagent alcohol from the interiors of the lead coffins and the man’s and the woman’s enclosed wooden coffins. Most of the fragments of the child’s wooden coffin were considered contaminated by the other coffin contents and collapse, and only one was sample taken from the wood in it. Researchers took multiple samples from the soil in that coffin and the surfaces of its lead coffin.

Pollen extraction followed a variation of the mechanical/chemical procedure developed for arid-lands alluvium by Mehringer (1967) (136–137). Mehringer’s first two hydrochloric acid (HCL) washes and his nitric acid (HNO3) step were eliminated as unnecessary with non-calcareous samples. The final sodium hydroxide (NaOH) wash was reduced to 0.5% (a few of drops of 5–7% NaOH in a 50 ml test tube). The pollen was identified at 450 power with a compound transmitted light microscope. All of the pollen recovered from the swab samples was tabulated, and all of the pollen recovered, up to 400 pollen grains, was tabulated for the physical samples.

### 3. Method and theory

The primary components contributing to the pollen spectra of a cultural deposit are 1) a “natural background” component derived from the native vegetation, 2) a “land-use” component contributed by plants colonizing soils disturbed by human activities, and 3) an “ethnobotanical” component consisting of the pollen of plants that were cultivated or
were selected for exploitation by members of a given society from among the plants yielding the other two components. The interpretation of the pollen from the coffins depends on the balance of these three components in the spectra.

Comparative data from the modern pollen rain (Fig. 5) were provided by daily samples of airborne pollen collected during 1992 on the roof of a four story building (ca. 40 feet elevation) by the Virginia Allergy and Pulmonary Associates PC (VAPA) of Richmond, Virginia (Schulty, 1994). Satellite photographs (MAPQUEST, 2014) indicate that the collection site is an urban office complex area with low ornamental plantings. The pollen of all but one type (locust) identified by VAPA are anemophilous (wind transported). Pollen deposited to this locus should be the equivalent of Tauber’s (1965) (23) “above the canopy” pollen component in forested areas, and should provide a regional, or at least extra-local, pollen spectrum. This is the most detailed annual pollen sampling data that is available near St. Mary’s City.

The modern seasonal pollen deposition data (Fig. 5A) will not precisely replicate the annual pollen deposition patterns of the late 17th Century because weather conditions were different during the ca. A.D. 1400–1850 cold period termed “The Little Ice Age”. Temperatures were at their lowest in England during the but conditions in North America were apparently more moderate (Matthews and Briffa, 2005: 22; Mann, 2002: 8, Fig. 2), and pollen spectra deposited during broad periods, such as “Spring,” “Summer,” “Fall,” or “Winter,” should be identifiable.

3.1. Notes on pollen types

Grass pollen grains of Eurasian cereal-type—wheat (Triticum spp.), oats (Avena spp.), barley (Hordeum vulgare), and rye (Secale cereal)—are distinguished by size (40 μm to 60 μm) in European deposits (Fægri and Iversen, 1964: 196). This distinction cannot be confidently applied to North American matrices because the pollen grains of a significant number of common native North American non-cereal grasses, beardgrass family (Andropogon spp.), wild rye (Elymus spp.), and eastern gamagrass family (Tripsacum dactyloides) for instance, fall into this same size range. Wheat (Triticum spp.), the Eurasian cereal which English settlers preferred, was laborious to grow, harvest, and process and has a low seed to grain ratio compared to maize. It was a staple food crop in 17th Century England but was largely replaced by maize (Zea mays) in contemporary Maryland (Carr et al., 1991: 34). Maize pollen can be distinguished as grass family pollen grains having a diameter greater than 60 μm (Fægri and Iversen, 1964: 197; Tsukada and Rowley, 1964: 410). Maize pollen, although wind-transported, is not widely dispersed. Most of this type detectable in the wind stream at 1 m from a discreet source comes to earth within the next 4 m, and the type disappears from the wind stream within 60 m (Raynor et al., 1972: Fig. 2). Much more maize pollen was also found in samples from the rows of a prehistoric maize field than was tabulated in the furrows (Berlin et al., 1978: 594), suggesting much of it may actually fall straight down. Maize pollen is produced in a tassel above the ear, and the kernels are well shielded from blowing maize pollen by the husk. Maize pollen does, however, accumulate on the husk (Bohrer, 1972: 25), and quantities are found throughout Southwestern U.S. prehistoric sites (Hill and Hevly, 1968: Fig. 4). Husking by hand is a time consuming task, and during the colonial period corn was usually stored, initially at least, in the husk (Wright, 1967). Maize was the basic food crop, used to pay rent, three barrels of it were part of an indentured servant’s “freedom dues” upon completion of their time, it was hand ground by mortar and pestle (and perhaps shucked) in houses, exported to other colonies from 17th Century Maryland, and maize was fed (including husks) to livestock (Carr et al., 1991: 34, 46, 70, 71). Small quantities of maize pollen should also be found in arbitrary places in Colonial-Era Maryland sites.

Ragweed (Ambrosia-spp.) proliferates in dry, disturbed soil (Bazzaz, 1974). Ragweed-type pollen percentages increased in Mid-Western pollen records as prehistoric Native American agricultural land clearance expanded (Delacourt and Delacourt, 2004: 107) and is the premier horizon marker for Euro-American agriculture in temperate zone pollen profiles (Davis, 1965: 395). The very modest 17th Century increase in ragweed-type pollen percentages where oak declined in stream-fed St. John’s pond at St. Mary’s City (Kraft and Brush 1981, Fig. 8) is attributable to the comparatively minor soil disturbance of tobacco-oriented hoe agriculture on small scattered areas.

4. Results and discussion

4.1. Pollen spectra of the largest (man’s) coffin

Four pollen sources contributed to the pollen spectra recovered from the man’s coffin. The pollen spectra of the swabs from the surfaces (bottom and sides) of the man’s lead coffin (Fig. 6 “A”–“P”) are dominated by tree pollen, with some variation in the ragweed and grass family pollen.

---

Fig. 5. Richmond Seasonal Pollen Rain for 1992, based on raw data provided by VAPA.
contributions. It is consistent in the proportions of the oak and total tree pollen percentages with the annual pollen sums at Richmond (Fig. 5), suggesting that these counts register the annual pollen accumulation rather than that deposited during any particular season.

The pine (Pinus), total tree pollen, grass family, and ragweed-type (Ambrosia type) percentages from the swab taken at the head end of the lead lid of the man’s coffin (Figs. 6 and 7) differ significantly from those taken at the foot, and the ragweed count from the head of the lid is much higher than those of any others from the man’s lead coffin. This suggests that the lead lid was fabricated, stored, or in some way treated differently than the lower portion of the man’s lead coffin.

High, relatively uniform grass family pollen percentages distinguish the pollen spectra from the upper and lower surfaces (Fig. 7 “G,” and “H″) of the lid on the man’s wooden coffin. The swab from the upper surface of the lid yielded 1% sedge (Cyperaceae) pollen and single grains of this type were recovered from the four of the six swabs from the man’s lead coffin. A sedge pollen grain is actually four fused pollen grains. It is wind dispersed but has been measured to rarely travel more than a few meters from the parent plant (Meyer, 1973: 988; Handel, 1976). Wet meadow for mowing was an important element of English husbandry and practiced in the American colonies (Minor, 1899; Donahue, 2004). The presence of some sedge pollen suggest that the wooden lid and at least some portions of the lead coffin came into contact with, or was stored near hay, at least some of it from wet meadow or marsh. Livestock were generally allowed to roam freely throughout the year in the early Chesapeake, but fodder was sometimes provided for horses and milk cows (Carr et al., 1991: 46), especially in wealthier households like the Calverts, and at public inns called ordinaries. Legislation mentioning inkeepers providing maize, hay, straw or pasture for patron’s horses appeared in June of 1674 (Archives of Maryland, 1889, 2: 407).

Two and one half percent maize pollen was recovered from the top of the wooden lid of the man’s coffin, three percent was found in the swab from the bottom of the wooden lid and one and one half percent was tabulated in the swab sample from the right sidewall of the man’s lead coffin (Fig. 7 “G″ and “H”) support the inference that the lead coffin and the wooden lid, or the materials from which they were fabricated, were stored with agricultural produce.

Only a few pollen grains were noted in the swab samples from sidewalls and bottom of the wooden coffin, and from samples of unidentifed materials from the left tibia and abdomen area of the body (Figs. 6 and 7). It appears that the coffin was fabricated and covered in some unidentified way or stored somewhere lacking either of the ambient pollen spectra found on the wooden lid and the lead coffin. It may be that the coffin was fabricated and stored with the wood lid and/or lead lid in the closed arrangement in a barn. It also appears that there was no active pollen rain while the wooden coffin containing the body was open to the atmosphere. The latest pollen of the annual record at Richmond, Virginia occurred early in November, and the earliest of year was recorded in late January (Fig. 5). This suggests that the man was buried after mid-November and before the end of January. Over 20 years after this season of death was estimated from the pollen evidence, research by Miller in 2015 located a letter written by Philip’s
nephew Charles Calvert on 24 January 1682/83. It stated that his uncle had died ten days before, on 14 January, thus providing direct documentary confirmation of the seasonal estimate of death provided by palynology (Charles Calvert, 1682/83).

4.2. Pollen spectra analysis of the woman’s coffin

Seven different pollen sources are evident among the pollen spectra recovered from the coffin containing the remains of the woman. Tree pollen percentages generally dominate the swabs of the interior of the lead and wooden coffins (Fig. 8 “A”–“E”). These essentially replicate the regional or extra-local pollen rain registered in Fig. 5 and reflect the natural background pollen component.

The membranes that cover the oak pollen grain furrows from which the sperm transfer tube emerges are delicate and do not survive long in soils. These membranes were intact on 64% to 84% of the 8% to 11% oak pollen grains in the two of the three body samples and both rosemary washes (Fig. 8). None of these sample locations involve contact with the identified agents of pollen degradation: aerobic fungi (Goldstein, 1960: 543), oxygen in the groundwater (Tschudy, 1969: 95), and repeated hydration and dehydration (Holloway, 1989: 131). They suggest pollen deposited on clothing sometime prior to the interment and pollen deposited on vegetation before it was harvested. The membranes were also intact on 60% of the 44% oak pollen grains in the lead lid interior swab, and the absence of such membranes on pollen recovered from the rest of the lead coffin suggest that the materials from which these portions of the coffin were fabricated, had been procured from different locations, stored in different locations or in positioned to differentially to collect pollen.

The relatively high grass family percentages (Fig. 9) of samples “A,” “C,” “E,” and “F,” and the 41.5% sedge family on the bottom of the woman’s wooden coffin lid (“D”) reflect wet meadow hay; These support the inference from the man’s coffin pollen spectra that the materials from which the coffins were made, or even the coffins themselves, at least part of the time, were stored in a barn or other agriculture related space.

The three percent maize pollen from the top of woman’s wooden coffin lid (Fig. 9 “C”) and the single grain of this pollen type noted on the bottom of the lid (Fig. 9 “D”) support the barn storage inference drawn from the grass family and sedge pollen contributions. Single grains of maize pollen were, however, recovered from the pelvic and lumbar samples (Fig. 9 “G” and “F”); These two pollen grains might be dietary, but pollen is more likely to be recovered from the interior of the sacrum in skeletons than it is from the area of the gastro-intestinal tract (Reinhard et al., 1992). Maize was the staple food crop of 17th Century Maryland, and this pollen may have been culturally redeposited widely at St. Mary’s City, as it was in southwestern American prehistoric sites (Hill and Hevly, 1968: Fig. 4).

Ragweed-type (Ambrosia-spp.-type) dominated all three body samples and the rosemary from the chest and the lumbar areas of the body (Fig. 9 “F”–“J”). Numerous sprigs of rosemary had been placed in the coffin over the body, part of a traditional English practice (Litton, 1992: 144, 159). The first three samples were from essentially horizontal areas that would have collected pollen while the coffin was open with the body in place, while funeral greenery would have been harvested
immediately prior to the burial. Ragweed-type appeared in the pollen rain at Richmond from mid-August until early November (Fig. 5). These data suggest that the coffin was open with the body in it during the Fall season of the year. The goosefoot-type (Chenopodiaceae/Amaranthus) pollen counts, reflecting wind-pollinated plants that flower during the late Summer and Fall (Fernald, 1950: 992), are also highest in these same samples and support the interpretation of a Fall interment for the woman.

The wash of the rosemary from the chest area also yielded 19% aster-type (insect transported pollen of members of the Asteraceae). The pollen of insect pollinated plants is secured in the flower by the sticky oils and resins by which it is transferred to the insect vector (Fægri and Van Der Pijl, 1979: 52), and did not blow onto the body. This aster-type pollen suggests that flowers were placed on the chest with the rosemary. Aster-type pollen would have originated with plants that flower in late July through October (Fernald, 1950: 1417–1471).

Four and one third percent pea family (Fabaceae) pollen resembling that of vetch (Vicia spp.) was recovered from the rosemary vegetation from the lumbar area (Fig. 9). Vetch and related taxa are insect pollinated, with some taxa self-pollinating (Fægri and Van Der Pijl, 1979: 145). Attractive flowers are common among the members of the pea family, and this pollen source may also register the presence of a funerary bouquet. The presence of Rosemary sprigs and flowers, as well as the binding of the wrist with silk ribbon shows the respectful mortuary treatment the woman received, as well as evidencing the cultural transfer of traditional British funerary practices to Colonial America (Litton, 1992).

4.3. Pollen spectra of the child’s coffin

The small coffin containing the body of a child held a mixture of physical material including two types of soil and 20 pollen samples in five sets were collected here. The contents of the coffin had been exposed to the atmosphere twice due to the rebural and altered during the second exposure. There were large differences between the pollen spectra of the samples in each set but only four could be interpreted.

The lead lid was the largest lead piece covering the child’s coffin and displayed prior cut marks. The alcohol swab sample from the interior of this piece was dominated by 76% oak pollen (Fig. 10 “A”), as opposed to 17%, 32%, 20%, and 0% on the other lead swabs, and 70% of the oak pollen grains recovered with the lid swab retained their furrow membrane. This suggests that the lead lid for the baby’s coffin came from the same piece of lead, from the same source, or from the same storage space as the covering for the woman’s coffin. Alternatively, perhaps more likely given the ca. four years between these burials, both lids may have been simply exposed to the Spring pollen rain at some point in time.

The swab sample from the lead surface under the wood at the right side of the foot and the swab sample of the lead bottom at three quarters of the distance from the head to the foot contained significantly less oak pollen but more grass family, aster-type, and ragweed-type than the lead lid swab 10 “A,” as well as small amounts of maize pollen. Sedge family pollen (Fig. 11) was present here: 17% in swab “B,” and 2% in swab “C”. These reflect the same agricultural storage milieu that included pollen of a cultivated crop and the products of wet mowing that were present in the swabs from the man’s and woman’s coffins.
The oak pollen percentages are much higher in the mud placed on the mid-section of infant’s body (Fig. 11 “M” and “N”) than any other sample except that from the interior of the lead lid (Fig. 10 “A”). The pollen in and on all of the coffins was generally excellent. Here, however, 45% of the oak pollen recovered from the soil above the ribs (Fig. 10 “M”) was severely corroded while 60% of that recovered near the sternum (Fig. 10 “N”) was badly decayed. This indicates that the oak pollen had been in the ground long enough for the natural agents of pollen destruction (Goldstein, 1960, 543; Tschudy, 1969: 95; Holloway, 1989: 113) to be effective before the mud was introduced into the second burial.

The unique feature of the six samples from the soil placed on the bottom of the infant’s wooden coffin to raise the head and shoulder portion of the upper body is the perfect preservation of all of the pine pollen in the soil around an iron nail in the wooden coffin (Fig. 10 “P”), in the soil at the head of the coffin (Fig. 10 “R”), and in the soil under the lower cervical and upper thoracic vertebrae (Fig. 11 “U”); This pine pollen took the stain like a freshly collected reference sample and suggests that the soil in these three samples was scooped or scraped from a ground surface and included pollen that had been newly released into the air between mid-March and mid-May (Fig. 5). This fresh pine pollen suggests that the infant died and was initially buried during the spring. Oak and pine pollinate about the same time (Fig. 5), and a Spring burial for the child would account for the well preserved oak pollen on the top of the adjacent woman’s coffin.

The maize pollen associated with the child’s burial can be assigned to a number of pollen sources. The maize pollen in the two swabs from the bottom of the child’s lead coffin (Fig. 11 “C” and “D”) seem to be part of the barn storage loci pollen spectrum registered by the sedge and grass pollen on the rest of the coffin case (Fig. 11 “A” and “B”). One percent each of maize were found in the abdominal and stomach samples (Fig. 11 “K” and “L”) and invite interpreted as nutritional in origin. Dietary pollen in burials is, however more likely to be found inside the curve of the sacrum than elsewhere (Reinhard et al., 1992). This pollen and the one and one and three quarters percent maize pollen found in the soil under the body (Fig. 11 “S” and “T”), more likely derived from the “Land Use component” at late 17th-century St. Mary’s City.

5. Conclusions

The objectives of the St. Mary’s City lead coffins pollen analysis were to determine the season of burial of the bodies and to recover evidence of plants employed in the interments. All three pollen components characteristic of archeological deposit spectra were present in the coffins. The “natural background” pollen component was instrumental in determining the seasons of burial for the man and the child; an element of the “land use” pollen component registered the season of burial of the woman, and pollen from the “ethnobotanical component” revealed the presence of floral funerary tributes in the woman’s coffin and indicated that much of the materials from which the coffins were constructed, if not the coffins themselves, were stored in a place with wet land meadow hay and possibly corn husk fodder. Some of the pollen spectra, those of the man’s and the baby’s lead coffin lids, for instance, recorded variations in human activity that could be recognized but not yet adequately explained. This analysis demonstrates the effectiveness of archeological pollen to identify the season of death and burial, with independent documentary confirmation later discovered for the male. At the same time, the pollen and floral materials yields important insights regarding the transfer of European funerary practices to the American colonies.
body itself, suggesting that the man was buried during the winter. This is consistent with a 17th Century report that Philip Calvert died on 14 January 1682/1683.

The 56 to 83% ragweed pollen recovered from the samples taken from the woman’s body and the materials placed on the body at interment statistically masked the background pollen contribution from the trees and the ethnobotanical component from the hay that were prominent in and on the coffin, indicating that the woman was buried in the Fall of the year. Aster-type and pea family pollen washed from sprigs of rosemary found on the woman’s chest and lumbar areas suggests that flowers were part of the funerary rites.

Dirt placed in the child’s coffin to raise upper portion of the body was intimately associated with the first burial, and the pine pollen in three of the six samples from this deposit was perfectly preserved, suggesting that the initial interment took place during the Spring.

Acknowledgments

Many individuals have contributed to this research effort. The authors particularly wish to thank Myra Harrison, former manager of the NPS Cultural Resources Center, Lowell, Massachusetts; Dwight Pitcaithley, former NPS Northeast Region historian, for encouraging archeological palynology, and Linda Towle, former manager of the NPS Cultural Resources Center Archeology Branch for local administrative support of the project. The Historic St. Mary’s City Commission funded the coffin pollen study, the Department of Archaeology, Boston University provided laboratory facilities, while pollen laboratory equipment was provided by the National Science Foundation under Grant No. BNS-7924470 to Boston University. Harry Alden, Kari Bruwelheide, Silas Hurry, Curtis Moyer, Douglas Owsley, Paul Sledzik, Timothy Riordan and Ted Suman provided important insights that greatly aided these interpretations. Donald Winter assisted with graphics.

Fig. 11. Child’s coffin herb pollen percentages.

References


Johnson, Donald and William Johnson 2002 Report Geophysical Investigation The Chapel
Field, Historic St. Mary's City, Maryland. D'appolonia Environmental Services Inc. Mon-
roeville, Pennsylvania. Report on file, Department of Research, Historic St. Mary's
City, St. Mary's City, Maryland.

Kelso, 1993. Pollen Percolation Rates in Euroamerican-Era Cultural Deposits in the North-

Kraft, John C. and Grace S. Brush 1981. A geological–paleoenvironmental analysis of the
sediments I St. John's Pond and the Nearshore Zone Near Howards' Wharf at St.
Mary's City, Maryland. Report on file, Department of Research, Historic St. Mary's
City, St. Mary's City, Maryland.


Mann, Michael E., 2002. In: MacCracken, Michael C., Perry, John S. (Eds.), Little Ice Age,

Mehler, Peter J. Jr. 1967. Pollen analysis of the Tule Springs Area, Nevada. In:

Matthews, John A., Briffa, Keith R., 2005. The Little Ice Age: re-evaluation of an evolving

Miner, Curtis 1998. A conservation report containing a description of the St. Mary's City
lead coffins and an account of their conservation treatment. Report on file, Depart-
ment of Research, Historic St. Mary's City, St. Mary's City, Maryland.

Owsley, Douglas W. and Paul S. Slepicka 1993. Osteological examination of five 17th cen-
tury lead coffin burials from historic St. Mary's City. A Report for Project Lead Coffins.

Raynor, G.S., Ogden, E.C., Hayes, J.V., 1972. Dispersion and deposition of corn pollen from

Raynor, G.S., Ogden, E.C., Hayes, J.V., 1972. Dispersion and deposition of corn pollen from

Riordan, Timothy B., 2000 "Dig a grave both wide and deep": an archaeological investiga-
tion of mortuary practices in the 17th-century cemetery at St. Mary's City, Maryland.

Schultz, Mary C. 1994 Hand-written pollen count sheets, cover letter, dated 8-23-94, from
Mary C. Schutly of VAPA (7605 Forest Avenue, Suite 103. Richmond Virginia 23229).

Soman, Theodore 2006 The lead coffins of St. Mary's City: arthropod and snail evidence.
Manuscript on File, Department of Research, Historic St. Mary's City, St. Mary's City,
Maryland.

Tauber, Henrik, 1965. Differential pollen dispersion and the interpretation of pollen dia-
grams. Geological Survey of Denmark, Series II 89, 7–41.

Tschudy, R.S., 1969. Relationship of palynomorphs to sedimentation. In: Tschudy, R.H.,
Scott, R.S. (Eds.), Aspects of Palynology. John Wiley and Sons, New York, pp. 79–96.


published.