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ADDITIONAL EVIDENCE FOR EARLY CUCURBIT USE IN THE NORTHERN EASTERN WOODLANDS EAST OF THE ALLEGHENY FRONT

John P. Hart and Nancy Asch Sidell

Two accelerator mass spectrometry (AMS) dates, 5404 ± 552 B.P. (AA-19129) and 2625 ± 45 B.P. (AA-19128), confirm the presence of mid-Holocene and early late Holocene cucurbit (Cucurbita pepo), respectively, at the Memorial Park site (36CN164) in north-central Pennsylvania. This is the second documented occurrence of mid-Holocene cucurbit and the first documented occurrence of domesticated early late Holocene cucurbit in the northern Eastern Woodlands east of the Allegheny Front. These occurrences help to establish the use of cucurbits in the Northeast on a timescale equivalent to that in the riverine interior, with the exception of the very earliest riverine interior dates. The Northeast has contributed little toward our understanding of prehistoric agricultural evolution in the Eastern Woodlands. The Memorial Park cucurbits and the mid-Holocene cucurbit recently reported at the Sharrow site in Maine indicate that greater efforts are needed to document pre-maize agricultural behavior in this area to increase our knowledge of the full range of pre-maize agricultural behavior in the Eastern Woodlands.

Dos fechas obtenidas mediante aceleración de espectrometría de masa, 5404 ± 552 B.P. (AA-19129) y 2625 ± 45 B.P. (AA-19128), confirman la presencia de cucúrbita (Cucurbita sp.) al comienzo y mediados del Holoceno, respectivamente, en la localidad de Memorial Park en el norte y centro de Pensilvania. Este es el segundo hallazgo documentado de cucúrbita en el Holoceno Medio y es el primer hallazgo documentado de cucúrbita domesticada al comienzo del final del Holoceno al norte de Eastern Woodlands, al este de Allegheny Front. Estos hallazgos contribuyen a establecer el uso de cucúrbita en el noreste en una escala temporal equivalente a la del interior fluvial, con la excepción de las primeras fechas del interior fluvial. El noreste ha contribuido muy poco al entendimiento de la evolución de la agricultura prehistórica en Eastern Woodlands. Los hallazgos de cucúrbita en Memorial Park y aquéllos del Holoceno Medio recientemente citados para la localidad del Sharrow en Maine, sugieren que se necesitan aún mayores esfuerzos para documentar la práctica agrícola pre-maíz en esta área y así aumentar nuestro conocimiento acerca de la distribución total de la práctica agrícola pre-maíz en Eastern Woodlands.

At European contact, Native American agriculturists in the Eastern Woodlands relied primarily on three crops: maize (*Zea mays*), beans (*Phaseolus vulgaris*), and cucurbits (*Cucurbita* spp.) (pumpkins, squashes, and gourds) (Hurt 1987). Archaeological investigations during this century have identified the same crops in late prehistoric (1150 B.P.–European contact) contexts.[1] There has been some question as to when these crops were first introduced to the Eastern Woodlands (e.g., Conard et al. 1984; Hall 1980; Struever and Vickery 1973), but the timing of their adoption was clarified during the last decade (Fritz 1990; Smith 1992). There is now undisputed macrobotanical evidence for maize by 2000 B.P. (e.g., Riley et al. 1994). The first evidence for beans is ca. 1000 B.P. (Riley et al. 1990; Yarnell 1994). Evidence for nondomesticated cucurbit occurs as early as 7000 B.P. (Asch 1994; Asch and Asch 1985; Smith 1992). Domesticated cucurbit is found at numerous sites after 3000 B.P. (Decker-Walters 1993; Smith 1992) and likely is present as early as 4500 B.P. (Fritz 1990; King 1985; Smith 1995; Yarnell 1993).

It is established that maize and beans were domesticated in Mexico and later diffused to the Eastern Woodlands; the path of that diffusion is not certain (e.g., Fritz 1990; Keegan 1987; Lathrap 1987; Riley et al. 1990). The domestication of cucurbits in Mexico (*Cucurbita pepo* var. *pepo*)

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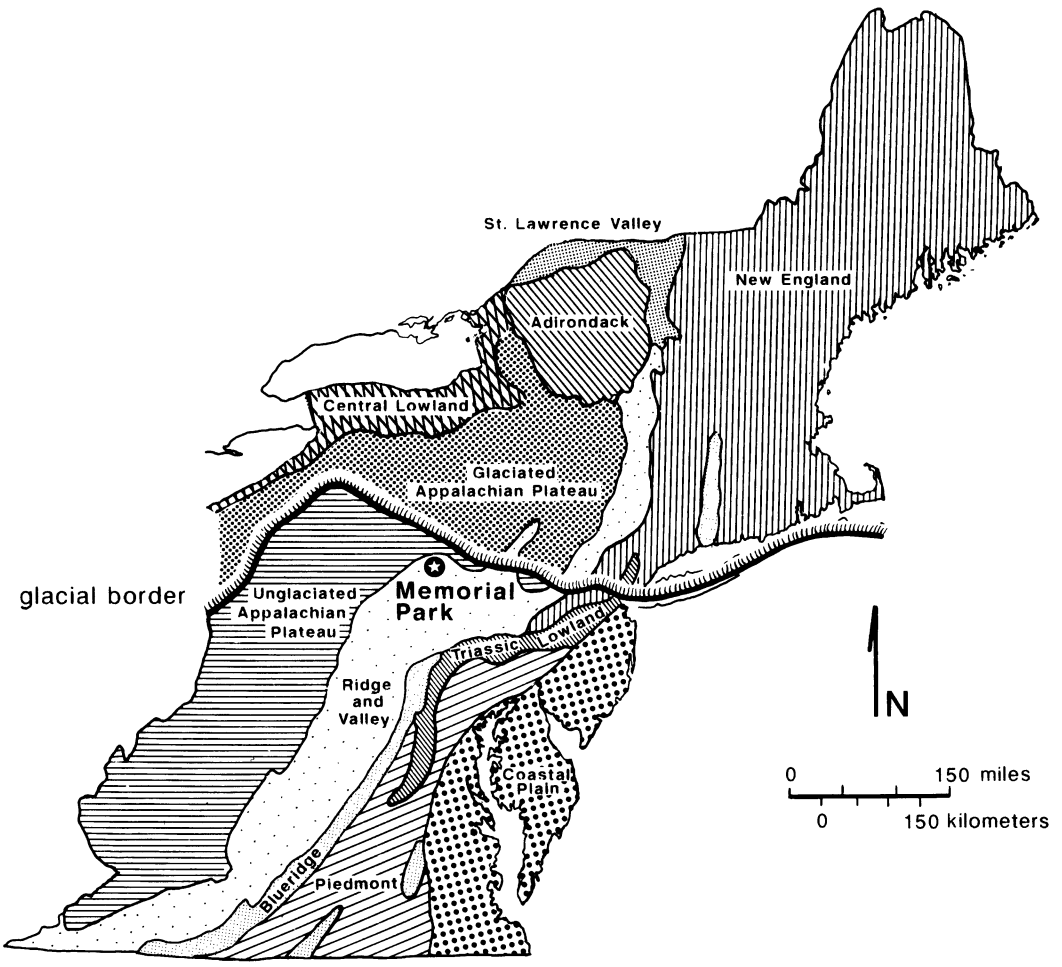

Figure 1. Location of the Memorial Park Site relative to the physiographic provinces of the northeastern United States (modified from Ciolkosz et al. 1989:288).

has also been confirmed, but recent allozyme analysis suggests that cucurbits were also domesticated independently in the Eastern Woodlands (*Cucurbita pepo* var. *ovifera*) (Decker-Walters 1993). Mexican-domesticated cucurbits are thought to have diffused to the Eastern Woodlands after 1000 B.P. (Yarnell 1994). The status of the mid-Holocene (8000–4000 B.P.; Smith 1992:40) cucurbits in the Eastern Woodlands is not resolved. Some researchers argue for exploitation of natural and/or ruderal populations over a large portion of the mid-latitude riverine interior (e.g., Smith et al. 1992). Others argue for cultivation of *C. pepo* over a large area outside of its natural range in the Gulf of Mexico plain (e.g., Asch 1994; Fritz 1990).

In addition to cucurbits, a suite of other plants indigenous to the Eastern Woodlands was cultivated before and after the adoption of maize (Fritz 1990; Yarnell 1993). The seeds of sumpweed (*Iva annua* var. *macrocarpa*), chenopod (*Chenopodium berlandieri*), and knotweed (*Polygonum erectum*) show morphological evidence of domestication by 4000 B.P., 3400 B.P., and 950 B.P., respectively (Yarnell 1993:14). The seeds of sunflower (*Helianthus annuus* var. *macrocarpa*), native to western North America, show evidence of domestication in the Eastern Woodlands by 4200 B.P. (Crites 1993). Other plants indigenous to the East, such as little barley (*Hordeum pusillum*) and maygrass (*Phalaris caroliniana*), were apparently cultivated, but their seeds lack morphological evidence of domestication (Asch and Asch 1985; Yarnell 1993).

The timing of the use of these domesticates and cultigens varies, but the area of domestication and primary use is considered to be the mid-latitude riverine interior (Fritz 1990; Smith 1992; Watson 1989; Yarnell 1993). However, as we have reviewed elsewhere (Hart and Asch Sidell 1996), early late prehistoric (1150–600 B.P.) agricultural systems of the West Branch of the Susquehanna River basin in north-central Pennsylvania, at the Allegheny Front, included indigenous seed crops (chenopod, little barley, and sunflower) at the time of the first widespread appearance of maize around 1100 B.P. Little barley has also been recovered from early late prehistoric contexts in the North Branch of the Susquehanna River basin in Pennsylvania (King 1992) and the upper Susquehanna River basin in New York (Wurst and Versaggi 1993).

Until recently, no evidence supported the use of indigenous crops before the adoption of maize in the northern Eastern Woodlands east of the Allegheny Front (hereafter, Northeast). At the beginning of this decade, in fact, Fritz (1990:423) felt compelled to state that: "Substantiation of pre-maize agricultural systems in any part of the Northeast would be significant." Significant for the investigation of agricultural evolution in the Eastern Woodlands is the recent recovery of mid-Holocene cucurbit from the Sharrow site in Maine directly dated to 5695 ± 100 B.P. (uncalibrated) (Peterson and Asch Sidell 1996). Until now, this has been an isolated occurrence in the Northeast. In this article we confirm the equally significant, previously mentioned (Hart and Asch Sidell 1996; Peterson and Asch Sidell 1996), mid-Holocene and early late Holocene (4000–2000 B.P.) cucurbit from the West Branch of the Susquehanna River basin. We do this by reporting accelerator mass spectrometry (AMS) dates of 5404 ± 552 B.P. and 2625 ± 45 B.P. on *C. pepo* rind fragments from the Memorial Park site (36CN164). Before these dates, the earliest evidence for cucurbit in the Susquehanna basin was ca. 1000 B.P. (Hart and Asch Sidell 1996).

The Memorial Park cucurbits are important because they help extend evidence for early cucurbit use in the Eastern Woodlands well north and east of the previously established range (Smith et al. 1992). They also establish prehistoric use of this indigenous crop in the Northeast over a period of time equivalent to that in the riverine interior and suggest a possible corridor of diffusion for agricultural crops from the riverine interior into the Northeast. The early late Holocene cucurbit pushes back the first evidence for use of domesticated plants in the Northeast by approximately 1,600 years. This suggests that early late prehistoric agricultural systems in at least some portions of the Northeast do not represent the sudden adoption of agricultural behavior among groups who previously relied only on hunting, gathering, and fishing. Rather, maize and other domesticates were incorporated into existing agricultural systems. Combined with the mid-Holocene cucurbit in Maine, the early Memorial Park cucurbits establish a context to intensify efforts to document pre-maize agricultural systems in the Northeast.

Memorial Park Site

Memorial Park is just east of the city of Lock Haven, Pennsylvania, on a flood-plain terrace above the West Branch of the Susquehanna River. Memorial Park is at the Allegheny Front; the unglaciated Appalachian Plateau is to the north and the Ridge and Valley Province is to the south (Figure 1). The West Branch originates at the watershed between the Upper Ohio and Susquehanna river basins in Pennsylvania. It enters the valley between the Allegheny Front and the Ridge and Valley from the unglaciated Appalachian Plateau at Lock Haven. The confluence of the West Branch with its major tributary, Bald Eagle Creek, is approximately 1.3 km south of Memorial Park. Bald Eagle Creek flows through the valley between the Ridge and Valley and the Allegheny Front south of Lock Haven.

Archaeological Investigations

The approximately 3.5-ha Memorial Park was subject to extensive excavations during 1991 and 1992 to mitigate adverse impacts from flood wall/levee construction (GAI Consultants, 1995). Investigations in a 50-x-200-m (1-ha) study area revealed a ridge and swale topography, with a ridge extending northwest to southeast and swales to the southwest and northeast (Cremeens 1995); the ridge occupied approximately 60 percent of the study area. Block excavations on the ridge to a depth of 3 m resulted in the identification of at least 15 stratified early mid-Holocene (cal 7850–7550 B.P.) to early late prehistoric (cal 1060–600 B.P.) components.

Table 1. Memorial Park Site Mid-Holocene Radiocarbon Dates by Component.

Lab No.	Dated Material	Provenience	Radiocarbon Age (B.P.)	Calibrated 2σ Range (B.P.)[a]
		Component VII		
PITT-1165	bulk soil sample	Buried Soil 3	4050 ± 230	5254–3875
PITT-1089	charred wood	Feature 203	3950 ± 65	4537–4156
PITT-1081	charred wood	Feature 178	4080 ± 50	4818–4417
PITT-1177	bulk soil sample	Buried Soil 3	4455 ± 70	5306–4862
PITT-1081	charred wood	Feature 189	4410 ± 40	5243–4863
		Component VI		
PITT-1166	bulk soil sample	Buried Soil 4	5200 ± 350	6734–5057
PITT-1085	charred wood	Feature 226	4900 ± 130	5919–5320
PITT-1169	bulk soil sample	Buried Soil 4	5045 ± 420	6727–4732
PITT-1171	bulk soil sample pooled[b]	Buried Soil 4	5025 ± 60	5914–5642
			5009 ± 53	5903–5642
AA-19129[c]	cucurbit rind	Feature 341	5404 ± 552	7386–4856
		Component V		
PITT-1172	bulk soil sample	Buried Soil 5	5790 ± 240	7179–6041
PITT-1174	bulk soil sample pooled[b]	Buried Soil 5	5830 ± 130	6914–6316
			5810 ± 170	7014–6286
		Component IV		
PITT-1168	bulk soil sample	Buried Soil 5	6355 ± 155	7524–6885
PITT-1084	charred wood pooled[b]	Feature 225	6115 ± 265	7520–6349
			6294 ± 134	7395–6873

[a]Stuiver and Reimer (1993).
[b]Dates pooled are not significantly different at the .05 level of significance (Stuiver and Reimer 1993).
[c]AMS date, not included in pooled date.

Some 171 pre–late prehistoric features were identified, mostly in the block excavations; several were also identified on the stripped surface used to expose late prehistoric features. Two-to-four-liter flotation samples were taken from most features and processed in a flotation machine (Watson 1976). Light fractions were captured in tightly woven fabric bags and heavy fractions on 1.18-mm mesh. Botanical remains were identified from 119 flotation samples representing 330.5 liters of soil from 103 pre–late prehistoric features using procedures developed at the Center for American Archaeology (Asch and Asch Sidell 1992; Asch Sidell 1995). Two flotation samples, one from mid-Holocene Feature 341 and one from early late Holocene Feature 110, yielded charred cucurbit rind fragments. Unlike some other West Branch basin sites, cucurbit was not found in the early late prehistoric features at Memorial Park (Hart and Asch Sidell 1996).

Mid-Holocene Cucurbit

Seven mid-Holocene components were identified in stratified contexts. Radiocarbon dates for Component VI, with which Feature 341 is associated, and for components in over- and underlying soils, are presented in Table 1. Feature 341 was a 41-x-28-x-8-cm concentration of burned wood in Buried Soil 4. This soil was dated with one wood charcoal and three bulk soil sample radiocarbon assays that have a pooled ^{14}C age of 5009 ± 53 B.P. (cal 2σ 5903–5642 B.P.). Buried Soil 4 contained Component VI, the latest of three mid-Holocene components with diagnostic artifacts traditionally assigned to the Laurentian tradition in the Northeast (e.g., Funk 1988). Approximately 393.5 m^2 of Buried Soil 4 were sampled; 19 features in this soil were assigned to Component VI.

At the location of Feature 341, Buried Soil 4 was above Buried Soil 5, which contained components IV and V (Figure 2), also with diagnostic artifacts of the Laurentian tradition. Two bulk soil sample radiocarbon assays resulted in a pooled ^{14}C age of 5810 ± 170 B.P. (cal 2σ 7014–6282 B.P.) for Component V. Component IV was dated with one wood charcoal assay and one bulk soil sample assay that have a pooled ^{14}C age of 6294 ± 134 B.P. (cal 2σ 7395–6873 B.P.). Buried Soil 4 was

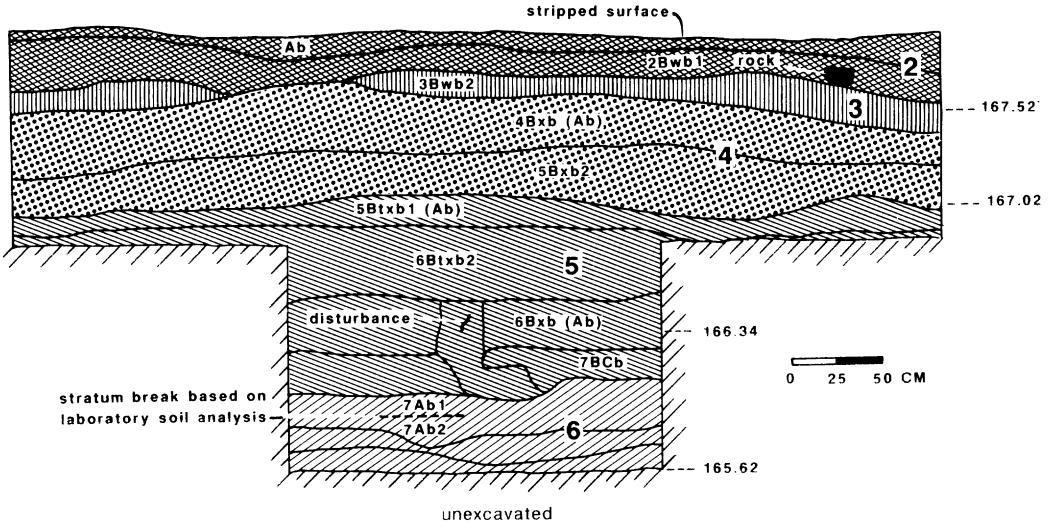

Figure 2. Profile of the South Wall of Excavation Block 13 in which Feature 341 occurred. Elevations are in m asl.

below Buried Soil 3, which contained Component VII having diagnostic artifacts traditionally assigned to the Piedmont tradition in the Northeast (Custer 1989). Five radiocarbon dates were obtained for this component: three from wood charcoal and two from bulk soil samples. The ^{14}C ages range from 4455 ± 70 B.P. (cal 2σ 5306–4862 B.P.) to 3950 ± 65 B.P. (cal 2σ 4537–4156 B.P.). Buried Soils 3 and 5 were explored with approximately the same amount of horizontal exposure as Buried Soil 4. Sixteen features were assigned to Component IV, 7 to Component V, and 18 to Component VII. Eleven features on a portion of the ridge where Components IV and V were not stratigraphically separate could not be assigned to one or the other of these components. No cucurbit rind was identified in Component IV, V, or VII flotation samples.

Cucurbit

Two small, thin (.7 mm) *C. pepo* rind fragments weighing a total of 5 mg were recovered in a 4-liter flotation sample from Feature 341 as were 435 bark fragments (carbonized and uncarbonized), 10 walnut or butternut (*Juglans* spp.) wood fragments, and 7 hickory (*Carya* spp.) nutshell fragments. The rind fragments were indistinguishable from those previously described and illustrated for the mid-Holocene components of the Koster site in Illinois and the Sharrow site in Maine: thin-shelled with epidermal cystolith deposits; epidermal pits; isodiametric cells on the interior rind surface; and, sometimes visible in cross section, a zone of regularly arranged, elongated cells between the inner and outer isodiametric cells (Asch 1994:31–32; Asch and Asch 1985:156–157; Petersen and Asch Sidell 1996:688). Asch Sidell's identification of this material as *C. pepo* rind was confirmed by another archaeobotanist, Frances B. King.

The rind fragments were submitted to the National Science Foundation University of Arizona AMS facility for dating. The sample (AA-19129) consisted primarily of humates and produced only .02 mg carbon. A ^{14}C age of 5404 ± 552 B.P. (cal 2σ 7386–4856 B.P., not corrected for isotopic fractionation) was obtained from the sample. The 2-sigma range overlaps those of the over- and underlying components. However, the date and the stratigraphic position of Feature 341 provide a strong case for its assignment to Component VI and a temporal placement of the rind fragments in the first half of the sixth millennium B.P. Flotation samples from other mid-Holocene features did not yield remains of other potential cultigens.

Regional Context

All but one of the previously reported mid-Holocene archaeological sites with cucurbit are located west of the Allegheny Front, the exception being the Sharrow site in central Maine. Memorial Park is therefore the second site with mid-Holocene cucurbit located in a river basin that

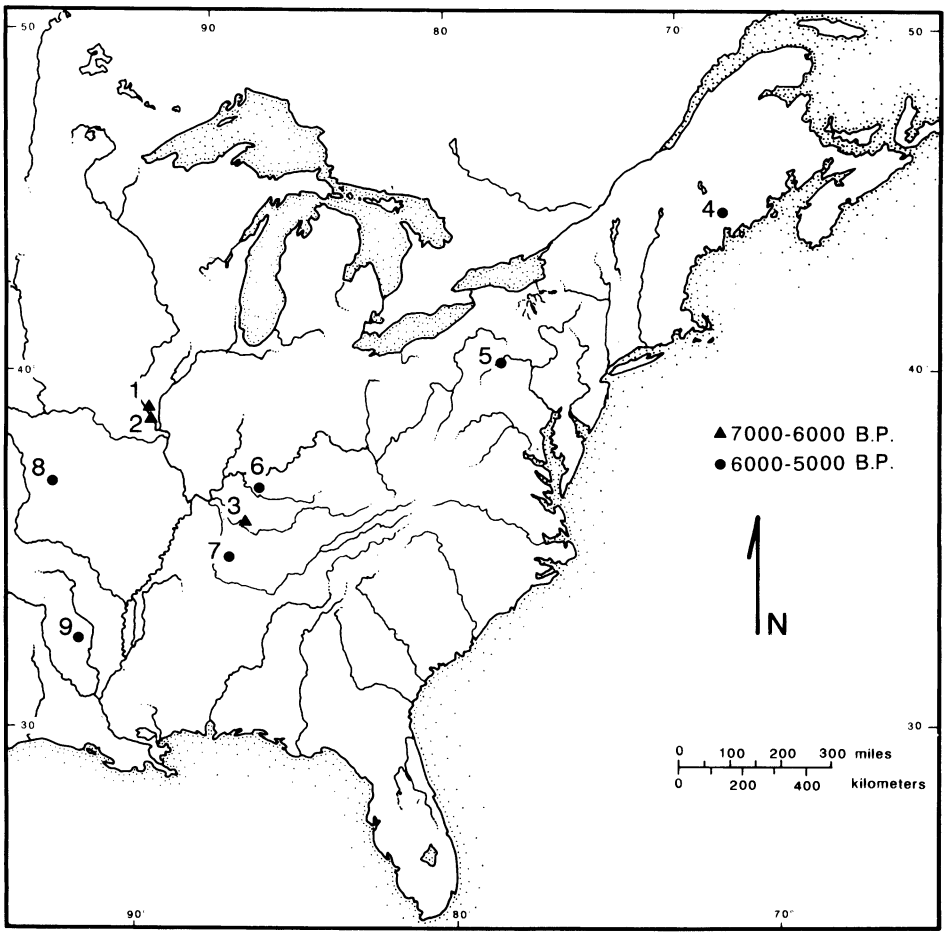

Figure 3. Locations of mid-Holocene archaeological sites with cucurbit, 7000–6000 B.P. and 6000–5000 B.P. (1, Napoleon Hollow; 2, Koster; 3, Anderson; 4, Sharrow; 5, Memorial Park; 6, Carlston Annis; 7, Hayes; 8, Phillips Spring; 9, Copes).

drains to the Atlantic coast. It is the oldest reported occurrence of cucurbit in the Appalachian Highlands physiographic division (Thornbury 1965).[2] The Memorial Park cucurbit is contemporaneous with all but the earliest of the mid-Holocene cucurbits found immediately west of the Appalachian Highlands at the Anderson site (6990 ± 120 B.P. uncalibrated, Smith 1992:286). The 5404 ± 552 B.P. uncalibrated radiocarbon age for the Memorial Park cucurbit overlaps the sixth millennium dates from Hayes (Crites 1987) and Carlston Annis (Watson 1985), just west of the Appalachian Highlands. Memorial Park helps to establish the presence of sixth-millennium cucurbits over a large portion of the Northeast (Figure 3); the Sharrow cucurbit is no longer an isolated occurrence.

Implications

A number of explanations have been offered to account for the presence of cucurbits at mid-Holocene sites in the mid-latitude riverine interior. These have been reviewed in depth by Smith (1992) and Asch (1994) and need not be revisited here in detail (also see Peterson and Asch Sidell 1996). However, based on the various arguments and lines of evidence presented in the literature, it is possible to eliminate some of the explanations from consideration for the Memorial Park cucurbit.

One explanation is that buffalo gourd (*Cucurbita foetidissima*) expanded its range or was traded into the riverine interior from the Plains during the mid-Holocene (King 1985; Smith 1992). Asch (1994:31–32) indicates that it

is possible to differentiate *C. pepo* and *C. foetidissima* cell structure in cross section. According to Asch, mid-Holocene cucurbit in Illinois conforms to the cell structure of *C. pepo*. Likewise, the cucurbit rind from Memorial Park had the cell structure of *C. pepo*.

A second explanation is that mid-Holocene gourd at archaeological sites reflects the expansion of the southern *C. pepo* into the mid-latitude riverine interior during the Hypsithermal climatic episode (e.g., Heiser 1989). The Memorial Park cucurbit occurs at the end of the period of maximum Holocene warmth and dryness as currently understood (e.g., Joyce 1988). Asch (1994:41) believes there is no evidence for long-distance Hypsithermal flora range expansion, only changes in relative abundance of various flora already present in the mid-latitude riverine interior. According to Asch, because *C. pepo* is not native to the mid-latitude riverine interior, its mid-Holocene presence at archaeological sites there cannot be explained by Hypsithermal range expansion. Asch (1994:42) also argues that onset of the Hypsithermal, as currently understood, postdates the earliest occurrences of *C. pepo* at mid-latitude riverine interior archaeological sites. Regardless, Memorial Park is well beyond any hypothesized range expansion of *C. pepo* during the Hypsithermal.

A third explanation is that cucurbit at mid-Holocene archaeological sites represents exploitation of ruderal populations growing with little or no encouragement in human-disturbed habitats (e.g., Smith 1992; Smith et al. 1992; Yarnell 1993). Asch (1994:43) argues that it is unlikely cucurbits spread over 30 degrees latitude from the Gulf of Mexico to Maine during the mid-Holocene by this mechanism; mid-Holocene cucurbits could only have persisted across such a vast area with some degree of human encouragement (see Fritz 1990:394).

It is unlikely that one explanation can account for *C. pepo* at mid-Holocene archaeological sites across the Eastern Woodlands. Cucurbit populations probably relied on humans for cultivation and dispersal to varying degrees across the broad expanse of territory in which mid-Holocene *C. pepo* has now been documented. In some areas, ruderal populations probably persisted with little human intervention as suggested by Smith (1992) and Yarnell (1993). In other places, Maine being an obvious example (Peterson and Asch Sidell 1996), cultivation and intentional human dispersal were probably necessary for perpetuation of cucurbit, as argued by Asch (1994). Whether cucurbits persisted as ruderals or through cultivation depended on local environmental conditions and local human behavior. It is quite possible that *C. pepo* was cultivated in some locations where it could have propagated as a ruderal.

Memorial Park is well north and east of the range of ruderal cucurbits proposed by Smith (1992), and there is no evidence for present-day perpetuation of escaped *C. pepo* populations in north-central Pennsylvania (Rhoads and Klein 1993:127) or adjacent New York (Mitchell and Tucker 1997). The ultimate origin of the mid-Holocene cucurbit at Memorial Park was probably intentional human transport. The Memorial Park mid-Holocene cucurbit precedes the development of extensive exchange networks in the Northeast after 4500 B.P. (Custer 1984, 1988; Stewart 1989). Even after 4500 B.P., materials from west of the Allegheny Front occur only sporadically in the Northeast (Stewart 1989). According to Stewart (1989:47), finds of nonlocal materials at locations greater than 160 km from natural sources in the Northeast before 4500 B.P. can be attributed to large group territories crosscutting physiographic zones and occasional exchange between individuals.

Nonlocal raw materials associated with Component VI at Memorial Park include rhyolite, argillite, and jasper, which originate in or near the Susquehanna Basin in Pennsylvania and Maryland (Didier 1975; Hatch and Maxham 1995; Stewart 1987). No lithic material from Component VI obviously originated west of the Allegheny Front. Explaining the presence of mid-Holocene cucurbit by reference to Stewart's (1989) mechanisms is therefore difficult.

Memorial Park's location provided access to the Ohio River drainage basin. The headwaters of the West Branch are in the unglaciated Appalachian Plateau, relatively accessible to the headwaters of tributaries to the Allegheny River, part of the upper Ohio River drainage basin. The West Branch may have provided a corridor for movement of goods across the Allegheny Front, and mid-Holocene territories may have extended across the Allegheny Front. However, Memorial

Park is located at a great distance from contemporaneous sites with cucurbit in the Ohio River basin. Direct links with these sites are unlikely because territories in the Eastern Woodlands at this time are thought to have been smaller (Sassaman 1995). It is probable that some contemporary sites in the intervening area will be found to have cucurbit remains.

To the east, the Susquehanna River basin extends well into southeastern New York, providing access to the Hudson River basin and ultimately New England, as well as the Delaware River basin, the Finger Lakes region of New York, and Lake Ontario through the Genessee River basin. The Susquehanna River also provides access to eastern Pennsylvania, Maryland, and the Chesapeake Bay. The nonlocal raw materials of Component IV at Memorial Park reflect the movement of materials through the Susquehanna River basin (Hatch and Maxham 1995). Mid-Holocene, Susquehanna River–based exchange networks may have provided means for dispersing cucurbits throughout the Northeast. Gourds, items manufactured from gourds, and seeds may have been exchanged into and throughout the Northeast during the mid-Holocene, establishing cucurbit as a widely used, if not cultivated, plant.

Based on the distance separating the two known occurrences of mid-Holocene cucurbit in the Northeast, it is unlikely that they represent direct trade; even hypothetical ranges of late Pleistocene populations in the Northeast are not so large (Anderson 1995; Custer and Stewart 1990). While it is conceivable that the mid-Holocene rind fragments at Memorial Park and Sharrow represent isolated incidents of trade with the riverine interior, given the distances involved, it is more likely that cucurbit was used over a broad area of the Northeast (Peterson and Asch Sidell 1996).

To date, mid-Holocene *C. pepo* has been recovered from very few sites, and the amount of material recovered at many of these sites is exceedingly small (Smith 1992:Table 12.1). There is a paucity of evidence for *C. pepo* at historic period sites where it is known from ethnohistoric records that squash/pumpkin was an important part of the diet. At the Zimmerman site in Illinois, only two rind fragments were recovered from 67 samples despite explorers noting the abundant and excellent pumpkins grown there (Asch and Asch 1975:117–118). At the Norridgewock Mission site in Maine, Father Rasles's letters indicate that the Norridgewock Indians grew mainly corn, beans, and pumpkins in their gardens, yet only one tiny fragment of pumpkin/squash rind and one fragment of cucurbit seed were found in 11 pit features, 10 of which contained cultivated plant remains as well as numerous wild fruits, nuts, and seeds (Asch Sidell 1996). In mid-Holocene contexts where *C. pepo* may have been used primarily for technological purposes, such as fishnet floats, rather than as food, it is even less likely that the rind and seeds may be preserved.

The recovery of even very small amounts of cucurbit rind in mid-Holocene contexts at Northeast sites must be considered significant. The find at Memorial Park does more than simply add another occurrence within an established distribution. The now-confirmed Memorial Park mid-Holocene cucurbit expands the known range of mid-Holocene use in the Northeast from the far north in Maine to the southern portions of the Northeast in north-central Pennsylvania. In order to further establish the temporal and spatial extent of mid-Holocene cucurbit use in the Northeast, it is important that flotation samples be examined carefully for cucurbit remains. Whether cucurbit persisted in the West Branch basin, and if it did so as a minimally encouraged ruderal or through cultivation, can only be answered through additional research.

Early Late Holocene Cucurbit

The second cucurbit find at Memorial Park was from Feature 110, a 1.72-x-1.66-x-.5-m hearthlike pit identified on the stripped surface used to expose late prehistoric features. Because of poor contrast between features and the surrounding soils (Graybill 1995), stripping and subsequent shovel scraping resulted in a surface generally, but in some cases more than, 10 to 40 cm below the plow zone/B-horizon contact, exposing some pre–late prehistoric features.

Four early late Holocene components were identified at Memorial Park. Buried Soils 1 and 2 contained artifacts generally considered diagnostic of both the Orient and Meadowood phases in the Northeast, representing Components X and XI, respectively. Those associated with Component X included steatite-tempered pottery

and hafted bifaces similar to the Orient fishtail type of New York (Justice 1987; Ritchie 1961). Those associated with Component XI included Meadowood bifaces and crushed-rock tempered pottery.

One radiocarbon assay on wood charcoal from Buried Soil 1 yielded a ^{14}C age of 2830 ± 50 B.P. (PITT-1088, cal 2σ 3071–2790 B.P.) providing a temporal assignment for Component XI. A second radiocarbon assay (BETA-46539) yielding a ^{14}C age of 3050 ± 80 B.P. (cal 2σ 3446–2982 B.P.) was obtained on wood charcoal from a feature on the stripped surface that may be related to Component X. Twelve features, a large midden, and the first occurrence of large numbers of post molds at the site were associated with Components X and XI.

Buried Soils 1 and 2 were underlain by Buried Soil 3, which contained early late Holocene Components VIII and IX. Diagnostic artifacts associated with Component VIII included Canfield Lobate bifaces (Bressler 1989) and those associated with Component IX included Susquehanna Broadspear bifaces (Custer and Mellin 1986). One radiocarbon assay was obtained for Component VIII (PITT-1082) with a ^{14}C age of 3590 ± 60 B.P. (cal 2σ 4080 B.P.–3698 B.P.). Forty-seven features were assigned to these two components; no cucurbit rind fragments were recovered from the flotation samples of these components. Buried soils 1, 2, and 3 were penetrated by features associated with early late prehistoric occupations; no cucurbit rind fragments were recovered from these features.

Cucurbit

Feature 110 was initially assigned to Component XI because it contained two Meadowood biface fragments, which date between 3250 B.P. and 2450 B.P. in the Northeast (Justice 1987). Meadowood bifaces were also recovered from Buried Soils 1 and 2 in the block excavations but not from other features on the stripped surface. Ten specimens of *C. pepo* rind fragment larger than 2 mm and untabulated smaller specimens were recovered from a 4-liter Feature 110 flotation sample. Asch Sidell's identification of this material as *C. pepo* rind fragments was confirmed by Frances B. King. Also recovered from the flotation sample were 306 wood fragments including hickory (*Carya* spp.) and oak (*Quercus* spp.), 65 bark fragments, and 72 nutshell fragments including black walnut (*Juglans nigra*), butternut (*Juglans cinerea*), hickory (*Carya* spp.), and acorn (*Quercus* spp.).

Two small rind fragments are thin (.5 mm and .7 mm) and morphologically similar to the pepo gourds in the mid-Holocene deposits. The remaining specimens are much thicker, measuring 1.4, 1.6, 1.8, 1.9, 1.9, 2.0, 2.6, and 3.6 mm (mean = 2.13 mm, S.D. = .69 mm). Of the thick *C. pepo* specimens, only one is relatively uniform in thickness (1.2–1.4 mm) with a level surface, cystoliths, and a zone of regularly arranged elongate cells in cross section. The remaining specimens are quite irregular in thickness, and some are irregular in surface plane, suggestive of a domesticated warty squash, with mostly isodiametric cells visible in cross section, and sometimes lacking the epidermal layer. One rind fragment weighing 9 mg was submitted to the NSF Arizona AMS Facility for AMS dating. This sample yielded a ^{14}C age of 2,625 ± 45 B.P. (AA-19128, ^{13}C-24.8‰, cal 2σ 2785 – 2717 B.P.), confirming an early late Holocene origin.

Implications

Based on a study of rinds from modern wild gourd stands, King (1985) suggests that archaeological cucurbit rind fragments thinner than 2.0 mm cannot be considered to have originated from domesticated plants, since the rinds from modern wild gourds are thinner. Smith (1992:41) uses King's suggestion as the so-called "King's Rule," where 2.0-mm rind thickness is considered the threshold for domesticated cucurbit. The early late Holocene cucurbit from Memorial Park includes fragments with thicknesses greater than 2.0 mm, at least two of which appear to be from a warty squash. It is probable that the early late Holocene Memorial Park cucurbit rind fragments from Memorial Park are from domesticated plants (Frances B. King, personal communication 1996).

The presence of early late Holocene domesticated cucurbit at Memorial Park is significant because it is the earliest evidence for use of any domesticated plant in the Northeast. Until now, all accepted evidence for early domesticated plant use in the Eastern Woodlands has come from the mid-latitude riverine interior (Fritz 1990; Smith 1992;

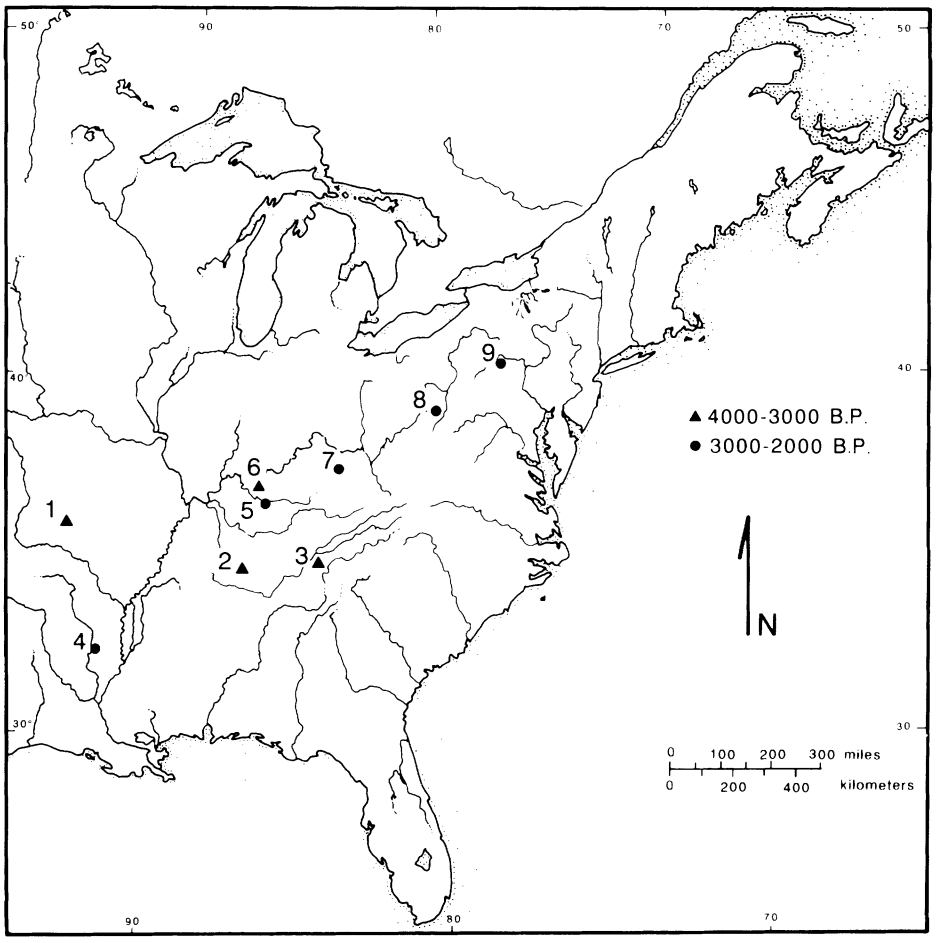

Figure 4. Locations of early late Holocene archaeological sites with cucurbit, 4000–3000 B.P. and 3000–2000 B.P. (1, Marble; 2, Jenigan II; 3, Iddins; 4, Cope; 5, Salts Cave; 6, Bowles; 7, Cloudsplitter Rockshelter, Cold Oak Shelter; 8, Meadowcroft Rockshelter; 9, Memorial Park).

Watson 1989; Yarnell 1993, 1994). The domesticated Memorial Park cucurbit is virtually contemporaneous with early late Holocene domesticated squash at Salts Cave, Cloudsplitter Rockshelter, and Cold Oak Shelter in Kentucky (Cowan 1997; Gremillion 1993; Smith 1992).

Territories were smaller during the early late Holocene period across the Eastern Woodlands than in previous periods. However, unlike the mid-Holocene, there is substantial evidence for interregional movement of goods during the early late Holocene (Stewart 1989:56–57). Stewart believes that these goods, much of which manifest as burial furniture, represent focused, or formalized, trade between groups. No obvious materials from outside the Mid-Atlantic region were recovered from early late Holocene contexts at Memorial Park. However, as with the mid-Holocene cucurbit, the ultimate origin of the early late Holocene *C. pepo* at Memorial Park was probably intentional human transport.

The great distance of Memorial Park from other early late Holocene sites with indisputably domesticated *C. pepo* (Figure 4) suggests that there are probably sites in the intervening area with domesticated *C. pepo*. Adovasio and Johnson (1981:72–73) report the recovery of early late Holocene cucurbit seed from Meadowcroft Rockshelter on the unglaciated Appalachian Plateau of southwestern Pennsylvania in the Ohio River basin. One uncarbonized piece of cucurbit seed was recovered from the middle of Stratum IV, which is bracketed by wood-charcoal ^{14}C ages of 2820 ± 75 B.P. (cal 2σ 3148–2763 B.P.) and 2815

± 80 B.P. (cal 2σ 3152–2758 B.P.). Also reported is one uncarbonized cucurbit seed from the higher Stratum V that has wood-charcoal ^{14}C ages between 2134 ± 65 B.P. (cal 2σ 2321–1946 B.P.) and 2075 ± 125 B.P. (cal 2σ 2343–1723 B.P).

Adovasio and Johnson (1981:74) believe that in conjunction with the reported early late Holocene cucurbit at Sparks Rockshelter in Kentucky (Fitzgibbon et al. 1977), "the Meadowcroft cucurbits conclusively demonstrate that domesticated squash had percolated into the Middle and Upper Ohio Valley by the beginning of the first millennium B.C." There is some controversy surrounding the archaeobotany of this site (e.g., King 1996). Despite Adovasio and Johnson's confidence in the importance of the purported early late Holocene cucurbit seeds, the site generally has been ignored in the recent discussions on early cucurbits in the Eastern Woodlands (e.g., Fritz 1990: Table II; Smith 1992: Table 12.1)—presumably because, without direct dating, it is impossible to determine if the seeds are intrusions from later deposits from which larger numbers of cucurbit seeds were recovered. The early late Holocene cucurbit from Memorial Park, however, suggests that the potentially early Meadowcroft cucurbit should be reconsidered as additional evidence of early cucurbit use in the north. Image analysis (Decker-Walters 1993) and direct dating of the seeds should be undertaken to resolve the status of this material. If confirmed, the Meadowcroft cucurbit would provide additional evidence for the range of early late Holocene cucurbit distribution in the Appalachians and perhaps provide a link between Memorial Park and the Kentucky occurrences.

It is unlikely that Memorial Park represents the only occurrence of early late Holocene cucurbit in the Northeast. Given the wide distribution of cucurbits at this time in the mid-latitude riverine interior and its now-confirmed presence in the north, in a drainage that flows east of the Allegheny Front, use of this domesticate over a larger area of the Northeast is probable. The Susquehanna River basin was a corridor of exchange during the early late Holocene as in earlier times (Hatch and Maxham 1995), providing a path for the diffusion of this domesticate throughout the Northeast. Flotation samples from early late Holocene contexts in the Northeast should be carefully searched for cucurbit remains to determine the spatial and temporal extent of its use.

No other positive evidence for early late Holocene domesticate or cultigen use was recovered from Memorial Park. One little barley seed was recovered from a possible early late Holocene feature on the stripped surface. However, given the ubiquity of little barley seeds in early late prehistoric features (Hart and Asch Sidell 1996), it is possible that the seed is intrusive. While it is probable that other domesticates and cultigens were not used at Memorial Park during the early late Holocene, this should not be taken as conclusive proof that such plants were not used in the West Branch basin until the early late prehistoric period. Relatively little archaeobotanical work has been done in the West Branch basin compared to other areas of the Eastern Woodlands, and early late Holocene settlement and subsistence in general are poorly understood. Intensive investigation of early late Holocene sites and large-scale flotation programs are needed to better document early late Holocene subsistence in the West Branch basin before the evolution of agricultural systems can be modeled.

Conclusions

The recovery of mid-Holocene and early late Holocene cucurbit rind fragments from Memorial Park, combined with the early late prehistoric evidence from other West Branch sites, establishes use of gourd and squash in the West Branch basin on a temporal scale equivalent to the mid-latitude riverine interior, with the exception of the very earliest riverine interior dates. The domesticated early late Holocene cucurbit from Memorial Park indicates that agricultural behavior was present in the West Branch basin some 1,600 years before the earliest evidence for maize. The mid-Holocene cucurbit may represent agricultural behavior at a much greater time depth, if the material represents cultivated gourd. Maize and other domesticate and cultigen use by early late prehistoric West Branch populations did not represent sudden adoption of agricultural behavior; they were adopted into existing systems of plant husbandry in the West Branch and perhaps other areas of the Northeast.

The distribution of early cucurbit remains and those of other domesticates and cultigens has contributed to explanations of the evolution of agricultural systems in the Eastern Woodlands (e.g., Smith

1992, 1995), focusing primarily on the mid-latitude, riverine interior. Maps used in recent publications to show the distribution of sites with evidence for early agricultural behavior (e.g., Fritz 1990:Figure 1, 1993:Figure 4-1; Smith 1992:Figure 12.1; Yarnell 1993:Figure 2-1) show distinct clusters of sites in the riverine interior where large-scale flotation programs were established early during the "Paleoethnobotanical Revolution" (Chapman and Watson 1993). Despite a relatively early reference to the possibility for chenopod cultivation in New York at the Kipp Island site (Ritchie 1965, 1973) dated to 1640–1320 B.P., there has not been until relatively recently (e.g., Bendremer and Dewar 1994; Bernstein 1993; McBride and Dewar 1987) intensive, sustained programs of archaeobotanical investigations in the Northeast. As a result, the region has contributed little to our understanding of agricultural evolution in the Eastern Woodlands and has had little influence on the development of agricultural evolution models.

The early cucurbit finds at Memorial Park and Sharrow, as well as the evidence for early late prehistoric use of indigenous domesticates and cultigens in the West Branch basin, are obvious indications of the potential for the Northeast to contribute to our understanding of agricultural evolution in the Eastern Woodlands. While current evidence suggests that populations in the Northeast were consumers of products that evolved in the riverine interior, the role of these populations as active participants in plant domestication cannot be discounted. Coevolutionary theory indicates that various modes of domestication can potentially occur whenever human populations consistently interact with plant populations (Rindos 1984). Potentially new domesticates continue to be identified in other portions of the Eastern Woodlands (e.g., Fritz 1988, cited in Johannessen 1993:62). It is probable that human/plant interactions in the Northeast resulted in the domestication of as-yet unidentified plants independent of the riverine interior. Additionally, varieties of maize evolved in the Northeast after its widespread adoption (Doebley et al. 1986; Wagner 1994). Given this, the length of time cucurbits are now known to have been used in the Northeast, and the great diversity of cucurbits observed there at European contact (Russell 1980), it is probable that distinct varieties of cucurbits evolved in the Northeast as well. Clearly, there is much to be learned about prehistoric agricultural evolution in the Northeast. Intensive flotation and macrobotanical analysis programs are necessary to determine the nature of prehistoric agricultural evolution in this relatively poorly understood region.

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References Cited

Adovasio, J. M., and W. C. Johnson
1981 The Appearance of Cultigens in the Upper Ohio Valley: A View from Meadowcroft Rockshelter. *Pennsylvania Archaeologist* 51(1–2):63–80.

Anderson, D. G.
1995 Paleoindian Interaction Networks in the Eastern Woodlands. In *Native American Interactions: Multiscalar Analyses and Interpretations in the Eastern Woodlands*, edited by M. S. Nassaney and K. E. Sassaman, pp. 3–26. University of Tennessee Press, Knoxville

Asch, D. L.
1994 Aboriginal Specialty-Plant Cultivation in Eastern North America: Illinois Prehistory and a Post-Contact Perspective. In *Agricultural Origins and Development in the Midcontinent*, edited by W. Green, pp. 25–86. Report 19, Office of the State Archaeologist, University of Iowa, Iowa City.

Asch, D. L., and N. B. Asch
1985 Prehistoric Plant Cultivation in West-Central Illinois. In *Prehistoric Food Production in North America*, edited by R. I. Ford, pp. 149–204. Anthropological Papers No. 75. Museum of Anthropology, University of Michigan, Ann Arbor, Michigan.

Asch, D. L., and N. Asch Sidell
1992 Archeobotany. In *Early Woodland Occupations at the Ambrose Flick Site in the Sny Bottom of West-Central Illinois*, edited by C. R. Stafford, pp. 177–293. Research Series No. 10. Center for American Archaeology, Kampsville, Illinois.

Asch, N. B., and D. L. Asch
1975 Plant Remains from the Zimmerman Site—Grid A: A Quantitative Perspective. Appendix V. In *The Zimmerman Site: Further Excavations at the Grand Village of Kaskaskia*, by M. K. Brown, pp. 116–120. Reports of Investigations No. 32. Illinois State Museum, Springfield.

Asch Sidell, N.
1995 Archaeobotany. In *Archaeological Investigations at the Memorial Park Site (36Cn164) Clinton County, Pennsylvania*, by GAI Consultants, pp. 425–440. GAI

Consultants, Monroeville, Pennsylvania. Submitted to U.S. Army Corps of Engineers. Copies available from U.S. Army Corps of Engineers, Baltimore District.

1996 Prehistoric Plant Use in Maine: Paleoindian to Contact Period. Paper presented at the New York Natural History Conference IV, New York State Museum, Albany.

Bendremer, J. C. M., and R. W. Dewar

1994 The Advent of Prehistoric Maize in New England. In *Corn and Culture in the Prehistoric New World*, edited by S. Johannessen and C. A. Hastorf, pp. 369–394. Westview Press, Boulder, Colorado.

Bernstein, D. J.

1993 *Prehistoric Subsistence on the Southern New England Coast: The Record from Narragansett Bay*. Academic Press, San Diego, California.

Bressler, J. P.

1989 *Prehistoric Man on Canfield Island (36LY37), Lycoming County, Pennsylvania*. North Central Chapter No. 8, Society for Pennsylvania Archaeology and the Lycoming County Historical Society, Williamsport, Pennsylvania.

Chapman, J., and P. J. Watson

1993 The Archaic Period and the Flotation Revolution. In *Foraging and Farming in the Eastern Woodlands*, edited by C. M. Scarry, pp. 39–56. University of Florida Press, Gainesville.

Ciolkosz, E. J., W. J. Waltman, T. S. Simpson, and R. R. Dobos

1989 Distribution and Genesis of Soils of the Northeastern United States. *Geomorphology* 2:285–302.

Conard, N., D. L. Asch, N. B. Asch, D. Elmore, H. Grove, M. Ruben, J. A. Brown, M. D. Wiant, K. B. Farnsworth, and T. G. Cook

1984 Accelerator Radiocarbon Dating of Evidence for Prehistoric Horticulture in Illinois. *Nature* 308:443–446.

Cowan, C. W.

1997 Evolutionary Changes Associated with the Domestication of *Cucurbita pepo:* Evidence from Eastern Kentucky. In *People, Plants, and Landscapes*, edited by K. J. Gremillion, pp. 63–85. University of Alabama Press, Tuscaloosa.

Cremeens, D. L.

1995 Geomorphology and Site Formation. In *Archaeological Investigations at the Memorial Park Site (36Cn164), Clinton County, Pennsylvania*, by GAI Consultants, pp. 93–134. GAI Consultants, Monroeville, Pennsylvania. Submitted to U.S. Army Corps of Engineers. Copies available from U.S. Army Corps of Engineers, Baltimore District.

Crites, G. D.

1987 Middle and Late Holocene Ethnobotany of the Hayes Site (40ML139): Evidence from Unit 990N918E. *Midcontinental Journal of Archaeology* 12:3–32.

1993 Domesticated Sunflower in Fifth Millennium B.P. Temporal Context: New Evidence from Middle Tennessee. *American Antiquity* 58:146–148.

Custer, J. F.

1984 The Paleoecology of the Late Archaic: Exchange and Adaption. *Pennsylvania Archaeologist* 54(3–4):32–47.

1988 Late Archaic Cultural Dynamics in the Central Middle Atlantic Region. *Journal of Middle Atlantic Archaeology* 4:39–59.

1989 *Prehistoric Cultures of the Delmarva Peninsula: An Archaeological Study*. University of Delaware Press, Newark.

Custer, J. F., and G. S. Mellin

1986 Analysis of "Broadspears" from Delaware: Form, Function, and Distribution. *Bulletin of the Archaeological Society of Delaware* 22:1–29.

Custer, J. F., and R. M. Stewart

1990 Environment, Analogy, and Early Paleoindian Economies in Northeastern North America. *Research in Economic Anthropology*, Supplement 5:303–322.

Decker-Walters, D. S.

1993 New Methods for Studying the Origins of New World Domesticates: The Squash Example. In *Foraging and Farming in the Eastern Woodlands*, edited by C. M. Scarry, pp. 91–97. University of Florida Press, Gainesville.

Didier, F. P.

1975 The Argillite Problem Revisited: An Archaeological and Geological Approach to a Classical Archaeological Problem. *Archaeology of Eastern North America* 3:90–101.

Doebley, J. F., M. M. Goodman, and C. W. Stuber

1986 Exceptional Genetic Divergence of Northern Flint Corn. *American Journal of Botany* 73(1):234–246.

Fitzgibbon, P. T., J. M. Adovasio, and J. Donahue

1977 Excavations at Sparks Rockshelter (15JO19), Johnson County, Kentucky. *Pennsylvania Archaeologist* 47(5):1–58.

Fritz, G. J.

1988 Adding the Plant Remains to Assessments of Late Woodland/Early Mississippi Period Plant Husbandry. Paper presented at the 53rd Annual Meeting of the Society for American Archaeology, Phoenix, Arizona.

1990 Multiple Pathways to Farming in Precontact Eastern North America. *Journal of World Prehistory* 4:387–435.

Funk, R. E.

1988 The Laurentian Concept: A Review. *Archaeology of Eastern North America* 16:1–42.

GAI Consultants

1995 *Final Report, Archaeological Investigations at the Memorial Park Site (36CN164), Clinton County, Pennsylvania*. Submitted to U.S. Army Corps of Engineers. Copies available from U.S. Army Corps of Engineers, Baltimore District.

Graybill, J. R.

1995 Field Methods. In *Archaeological Investigations at the Memorial Park Site (36CN164) Clinton County, Pennsylvania*, by GAI Consultants, pp. 73–92. GAI Consultants, Monroeville, Pennsylvania. Submitted to U.S. Army Corps of Engineers. Copies available from U.S. Army Corps of Engineers, Baltimore District.

Gremillion, K. J.

1993 Plant Husbandry at the Archaic/Woodland Transition: Evidence from the Cold Oak Shelter, Kentucky. *Midcontinental Journal of Archaeology* 18:161–189.

Hall, R. L.

1980 An Interpretation of the Two-Climax Model of Illinois Prehistory. In *Early Native Americans: Prehistoric Demography, Economy, and Technology*, edited D. L. Browman, pp. 401–462. Mouton, The Hague.

Hart, J. P., and N. Asch Sidell

1996 Prehistoric Agricultural Systems in the West Branch of the Susquehanna River Basin, A.D. 800 to A.D. 1350. *Northeast Anthropology* 52:1–32.

Hatch, J. W., and M. D. Maxham

1995 Jasper-Bearing Assemblages in Pennsylvania: Implications for the Antiquity and Scale of Regional Exchange. *Archaeology of Eastern North America* 23:230–245.

Heiser, C. B., Jr.

1989 Domestication of Curcurbitaceae: *Cucurbita* and

Lagenaria. In *Foraging and Farming: The Evolution of Plant Exploitation*, edited by D. R. Harris and G. C. Hillman, pp. 471–480. Unwin Hyman, London.

Hurt, R. D.
1987 *Indian Agriculture in America: Prehistory to the Present*. University Press of Kansas, Lawrence.

Johannessen, S.
1993 Farmers of the Late Woodland. In *Foraging and Farming in the Eastern Woodlands*, edited by C. M. Scarry, pp. 57–77. University of Florida Press, Gainesville.

Joyce, A. A.
1988 Early/Middle Holocene Environments in the Middle Atlantic Region: A Revised Reconstruction. In *Holocene Human Ecology in Northeastern North America*, edited by G. P. Nicholas, pp. 185–214. Plenum Press, New York.

Justice, N. D.
1987 *Stone Age Spear and Arrow Points of the Midcontinental and Eastern United States*. Indiana University Press, Bloomington.

Keegan, W. F.
1987 Diffusion of Maize from South America: The Antillean Connection Reconstructed. In *Emergent Horticultural Economies of the Eastern Woodlands*, edited by W. F. Keegan, pp. 329–344. Occasional Paper No. 7. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

King, F. B.
1985 Early Cultivated Cucurbits in Eastern North America. In *Prehistoric Food Production in North America*, edited by R. I. Ford, pp. 73–98. Anthropological Papers No. 75, Museum of Anthropology, University of Michigan, Ann Arbor, Michigan.
1992 Floral Remains. In *The Prehistory of the Catawissa Bridge Replacement Site (36CO9), Columbia County, Pennsylvania*, by T. C. East, J. A. Adovasio, W. C. Johnson, and D. R. Pedler. Prepared for the Cultural Resource Management Program, Department of Anthropology, University of Pittsburgh, Pittsburgh.
1996 Changing Evidence for Prehistoric Plant Use in Pennsylvania. Paper presented at the New York Natural History Conference IV, New York State Museum, Albany.

Lathrap, D. W.
1987 The Introduction of Maize in Prehistoric Eastern North America: The View from Amazonia and the Santa Elena Peninsula. In *Emergent Horticultural Economies of the Eastern Woodlands*, edited by W. F. Keegan, pp. 345–371. Occasional Paper No. 7. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

McBride, K. A., and R. E. Dewar
1987 Agriculture and Cultural Evolution: Causes and Effects in the Lower Connecticut River Valley. In *Emergent Horticultural Economies of the Eastern Woodlands*, edited by W. F. Keegan, pp. 305–328. Occasional Paper No. 7. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Mitchell, R. S., and G. C. Tucker
1997 *Revised Checklist of New York State Plants. Contributions to a Flora of New York State, Checklist IV*. Bulletin No. 490, New York State Museum. University of the State of New York, Albany.

Peterson, J. B., and N. Asch Sidell
1996 Mid-Holocene Evidence of *Cucurbita* sp. from Central Maine. *American Antiquity* 61:685–698.

Rhoads, A. F., and W. McKlein, Jr.
1993 *The Vascular Flora of Pennsylvania: Annotated Checklist and Atlas*. American Philosophical Society, Philadelphia.

Riley, T. J., R. Edging, and J. Rossen
1990 Cultigens in Prehistoric Eastern North America: Changing Paradigms. *Current Anthropology* 31:525–538.

Riley, T. J., G. R. Waltz, C. J. Bareis, A. C. Fortier, and K. E. Parker
1994 Accelerator Mass Spectrometry (AMS) Dates Confirm Early *Zea mays* in the Mississippi River Valley. *American Antiquity* 59:490–498.

Rindos, D.
1984 *The Origins of Agriculture: An Evolutionary Perspective*. Academic Press, New York.

Ritchie, W. A.
1961 *A Typology and Nomenclature for New York Projectile Points*. Bulletin No. 384. New York State Museum and Science Center Albany.
1965 *The Archaeology of New York State*. Natural History Press, Garden City, New York.
1973 The Kipp Island Site (Aub. 12-1, 13-1). In *Aboriginal Settlement Patterns in the Northeast*, by W. A. Ritchie and R. E. Funk, pp. 154–164. Memoir No. 20, New York State Museum and Science Survey. University of the State of New York, Albany.

Russell, H. S.
1980 *Indian New England before the Mayflower*. University Press of New England, Hanover, New Hampshire.

Sassaman, K. B.
1995 The Cultural Diversity of Interactions among Mid-Holocene Societies of the American Southeast. In *Native American Interactions: Multiscalar Analyses and Interpretations in the Eastern Woodlands*, edited by M. S. Nassaney and K. E. Sassaman, pp. 174–204. University of Tennessee Press, Knoxville.

Smith, B. D.
1992 *Rivers of Change: Essays on Early Agriculture in Eastern North America*. Smithsonian Institution Press, Washington, D.C.
1995 Seed Plant Domestication in Eastern North America. In *Last Hunters First Farmers*, edited by T. D. Price and A. B. Gebauer, pp. 193–213. School of American Research Press, Santa Fe, New Mexico.

Smith, B. D., C. W. Cowan, and M. P. Hoffman
1992 Is It an Indigene or a Foreigner? In *Rivers of Change: Essays on Early Agriculture in Eastern North America* by B. D. Smith, pp. 67–102. Smithsonian Institution Press, Washington, D.C.

Stewart, R. M.
1987 Rhyolite Quarry and Quarry-Related Sites in Maryland and Pennsylvania. *Archaeology of Eastern North America 15:47—78.*
1989 Trade and Exchange in Middle Atlantic Region Prehistory. *Archaeology of Eastern North America* 17:47–78.

Struever, S., and K. Vickery
1973 The Beginnings of Cultivation in the Midwest-Riverine Area of the United States. *American Anthropologist* 75:197–220.

Stuiver, M., and P. J. Reimer
1993 Extended ^{14}C Data Base and Revised CALIB 3.0 ^{14}C Age Calibration Program. *Radiocarbon* 35:215–230.

Thornbury, W. D.
1965 *Regional Geomorphology of the United States*. John Wiley and Sons, New York.

Wagner, G. E.
1994 Corn in Eastern Woodlands Late Prehistory. In *Corn*

and Culture in the Prehistoric New World, edited by S. Johannessen and C. A. Hastorf, pp. 335–346. Westview Press, Boulder, Colorado.

Watson, P. J.
1976 In Pursuit of Prehistoric Subsistence: A Comparative Review of Some Contemporary Flotation Techniques. *Midcontinental Journal of Archaeology* 1:77–100.
1985 The Impact of Early Horticulture in the Upland Drainages of the Midwest and Midsouth. In *Prehistoric Food Production in North America*, edited by R. I. Ford, pp. 99–148. Anthropological Papers No. 75, Museum of Anthropology, University of Michigan, Ann Arbor, Michigan.
1989 Early Plant Cultivation in the Eastern Woodlands of North America. In *Foraging and Farming: The Evolution of Plant Exploitation*, edited by D. R. Harris and G. C. Hillman, pp. 555–571. Unwin Hyman, London.

Wurst, L., and N. M. Versaggi
1993 *Under the Asphalt: The Archaeology of the Binghamton Mall Project*. 2 vols. Report prepared by the Public Archaeology Facility, Binghamton University, Binghamton, New York for the City of Binghamton Urban Renewal Agency, Binghamton, New York.

Yarnell, R. I.
1993 The Importance of Native Crops during the Late Archaic and Woodland Periods. In *Foraging and Farming in the Eastern Woodlands*, edited by C. M. Scarry, pp. 13–26. University of Florida Press, Gainesville.
1994 Investigations Relevant to the Native Development of Plant Husbandry in Eastern North America: A Brief and Reasonably True Account. In *Agricultural Origins and Development in the Midcontinent*, edited by W. Green, pp. 7–24. Report No. 19. Office of the State Archaeologist, University of Iowa, Iowa City.

Notes

1. We have chosen to use nontraditional time units to avoid any confusion that might result from using culture-historical time periods that have the same names but different dates in the Midwest and Northeast. Following our earlier use (Hart and Sidell 1996), early late prehistoric is 1150–600 B.P., while late prehistoric is 1150 B.P.–European contact. Following Smith (1992:40), mid-Holocene is 8000–4000 B.P., and by extension late Holocene is 4000 B.P.–present. We have arbitrarily defined early late Holocene as 4000–2000 B.P

2. Cowan (1997:68) reports an AMS date on cucurbit from Cloudspitter Rockshelter in eastern Kentucky of 5130 ± 60 B. P. This site is located on the Cumberland Plateau, which is part of Thornbury's (1965) Appalachian Highlands physiographic division.

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