(Carb. 14)

Charcoal Test
Bone ???
15 grams of charcoal needed
for test
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100 to M.U.
at least 6 to 8 month
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Ken Reed (will
write up Nebo
Hill)

Mo Stat Highway
archaeologist

Kerry McGrath
Mo St High Com.
Jefferson City, Mo.

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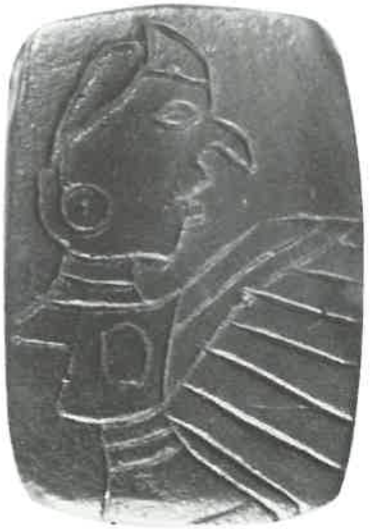
DISCOVERY FALL 1980 (ST. LOUIS MUS. OF SCIENCE

Cahokia: A Mississippian Metropolis

William R. Iseminger
Site Interpretive Specialist III
Cahokia Mounds State Historic Site


"Bird Man" tablet found in Monk's Mound.

About one thousand years ago, a tall forty-year-old man died and was buried at Cahokia, the site of an ancient city now just eight miles east of downtown St. Louis. He must have been an individual of great importance, for it was no ordinary burial. Archaeologists excavating the gravesite in the late 1960's discovered the body resting on thousands of disc beads made of marine shells from the Gulf of Mexico. Near his body were others — sacrificial victims, perhaps servants or relatives — as well as goods suggesting the importance of both the man buried there and the ancient city of Cahokia.

There was a pile of uncut mica from North Carolina, a rolled sheet of copper from the Lake Superior region, fifteen chunkey game stones, several strands of marine shell beads, and two caches of arrowheads — nearly eight hundred perfect points in various forms and cherts (flint), indicating origins as diverse as Wisconsin, Oklahoma, Arkansas, Illinois and possibly Tennessee. Goods found in the ancient grave show that Cahokia was once the hub of a bustling prehistoric metropolis with far-flung trading connections; today, it is a state-owned historic site managed by the Illinois Department of Conservation.

Ancient Cahokia began in the seventh century A.D. as a series of Late Woodland settlements along Cahokia Creek. The earliest Cahokians hunted, fished, and gathered wild plants and fruits. However, farming seems to have been established by this time, with corn, squash, and other items being cultivated.

In the ninth century A.D. Cahokia changed as the Mississippian cultural tradition began to emerge.

Late Woodland peoples coexisted with the Mississippians for some time, possibly as a "lower class," but eventually they were assimilated. In the hinterlands, however, Late Woodland villages lasted longer.

* * *

Cahokia became the largest community in what is now the United States, reaching its peak between A.D. 1000 and 1200. At its height, the city sprawled over six square miles and had a population ranging from ten to forty thousand.

Cahokia's ideal location led to its development as an "urban" center. There were abundant local resources. Bottomland soils were very fertile for the Mississippian crops that formed a vital part of the diet, and ancient Cahokians often planted surpluses, which they prepared for use during harsh winter months when food was scarce. Corn, beans, squash, pumpkin, gourds, sunflowers and other crops were grown, and many wild plant foods were collected. Cahokians also hunted deer and other animals that were plentiful throughout the area in the wooded uplands.

Another important factor in Cahokia's growth was its location near the confluence of the Mississippi, Missouri, and Illinois river systems; and the Ohio River system was not far to the south. Those river systems were highways for long-distance travel and trade (Cahokia reached its peak long before the Europeans brought horses to the Americas). Finally, Cahokia was near the center of the country, where several physiographic regions come together. Each of those regions has different flora, fauna, and minerals; and by following the river systems, the ancient Cahokians were able to exploit those resources.

Thus Cahokia developed into a political, cultural, economic, and religious capitol. Its influence probably extended over much of the middle Mississippi River valley and eastern North America. Several satellite towns grew nearby. The largest was a community that stood at the present location of downtown St. Louis. All were within ten or fifteen miles of Cahokia.

Those satellites probably served as trading centers along the rivers and gathered resources from their areas for Cahokia.

As Cahokia grew, labor became more specialized and distinct classes emerged. Various craftsmen produced pottery, shell beads, copper ornaments, clothing and stone tools. Merchant-traders

Museum of Science and Natural History

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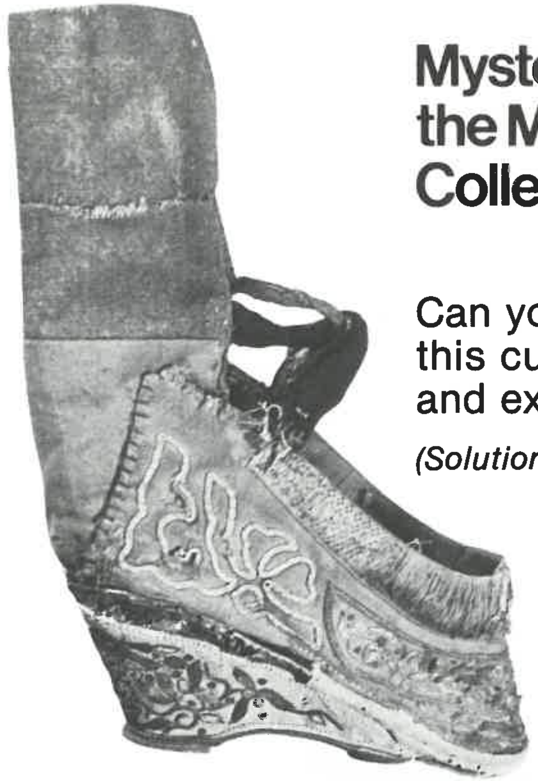


Mysteries from the Museum's Collections

Can you identify
this curious object,
and explain its purpose?

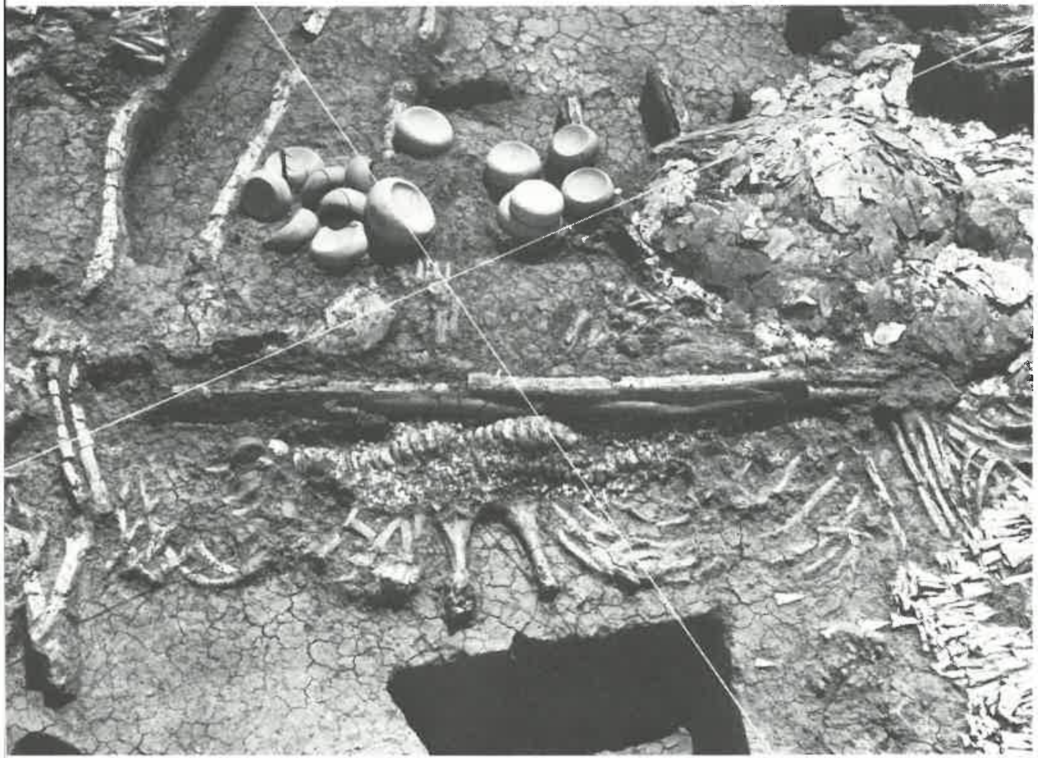
(Solution on last page)

distributed Cahokian wares and obtained raw materials and finished products. Members of the upper classes supervised agriculture, construction, mound building and other public works. Priests performed rituals and advised the rulers, and a military class directed various offensive and defensive operations.

The community appears to have been organized according to a plan. It included ceremonial mounds, open plazas, market places, ranked residential districts, workshop areas and cemeteries.

Perhaps trouble came from neighboring Woodland groups. In any case, the stockade was built four times. As one wall decayed with age and rot, another replaced it. Each construction of the stockade required some fifteen thousand logs for its two-mile length, and that depleted local forests.

Bastions with raised platforms projected from the walls at seventy-foot intervals. There, defenders could stand to keep watch to launch arrows when attacked. L-shaped gates were located between bastions.



Artifacts found in the central burial, Mound 72. (courtesy Illinois State Museum)

Walls of the typical Mississippian house consisted of vertical posts set in narrow trenches; and they were covered with mud, mats, thatch or a combination. Roofs were grass thatch.

About four hundred acres of the central city was protected by a large post wall (stockade), which enclosed the more sacred part of the city. It is probable that the nobility or upper classes lived within the walled area and the commoners outside. But, in case of attack, all could take refuge within the stockade, which served as an inner line of defense.

Archaeologists have also uncovered evidence of several large circles of posts called "woodhenges," providing clear evidence that the ancient Cahokians had a sophisticated understanding of astronomy and engineering. From the center of a woodhenge, priests could see how the rising or setting sun aligned with the posts. Thereby they calculated changes of season (equinoxes and solstices), planting and harvest times and special ceremonial periods. Recent research indicates that some of the posts may relate to moon phases and certain bright star positions.

Archaeologists have identified about eighty-five man-made earthen mounds of various sizes and shapes, although early accounts indicate that there were over one hundred.

Monks Mound, which takes its name from a group of Trappist monks who cultivated its terraces in the early nineteenth century, is the largest earthen mound built by prehistoric people in the New World. It is 100 feet high and covers over 14 acres. Excavations at its summit located the remains of a large building that measured 104-by-48½ feet.

Like Monks Mound, many of the mounds were rectangular platforms used to elevate important buildings that served as temples, council lodges or elite residences. The few conical mounds may have served as burial places for the elite, while most people were buried in cemeteries in the surrounding flatlands. Large ridgetop or linear mounds were at the west and south edges of the city.

In 1965 Mound 72, a small ridgetop about seven feet high, aroused the interest of an archaeologist who hypothesized that Cahokia had a north-south centerline. This and other lines, he argued, converged at one end of Mound 72, and he felt that excavations might reveal the location of a marker post. Excavations did indeed uncover a posthole , exactly where he had predicted. And next to the post was the "beaded" burial and the grave offerings discussed at the beginning of this article.

Many human sacrifices were found, primarily women between the ages of fifteen and twenty-five. They were buried in mass graves, with the largest pit containing fifty-three bodies. Nearby were four men with severed heads and hands, apparently the result of some ritual. One burial pit had been partially redug and grave goods deposited, including over thirty-six thousand marine shell beads, about four hundred perfect arrowheads, many disintegrated bone and antler points and harpoons, and five broken vessels.

(continued)

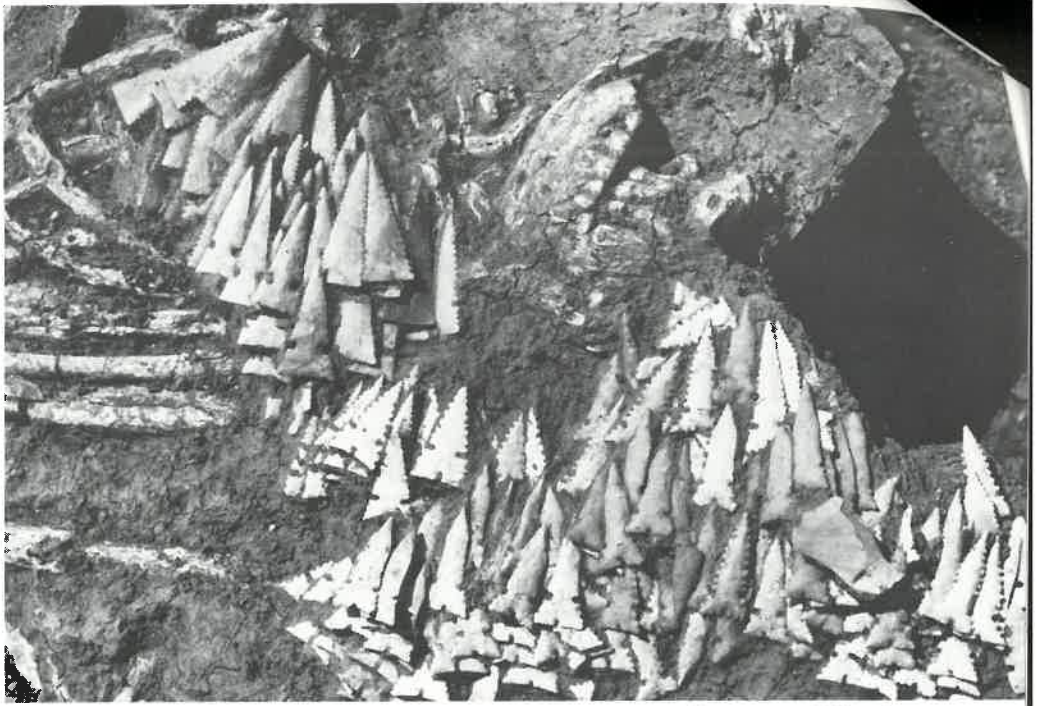
Another burial pit had forty individuals of mixed age and sex tossed in irregularly. About six inches above them were fourteen people who had been carried there on litters. Cedar litter poles still remained alongside some of the skeletons. This was also a mixed sex/age group, which may indicate death by disease or warfare — or perhaps this was another mass sacrifice.

In the two-thirds of Mound 72 that was excavated, over three hundred burials were found, mostly in mass graves.

As Cahokia's population increased, so did environmental pressures, and their urban problems were not unlike ours — overpopulation, pollution and an energy shortage. Depletion of resources was probably a major factor in the city's decline. The demand for wood alone was tremendous. Over the centuries, wood was used to build thousands of structures ((houses, temples, stockades, etc.) and to fuel countless fires for heating and cooking.

Woodcutting decimated the forest habitat of animals and plants that were important resources for the ancient Cahokians. Forced to travel in search of new sources, the Cahokians competed with other peoples for increasingly limited resources. The fact that most Mississippian communities were fortified is grim evidence of the nature of that competition.

Some evidence suggests that a climatic shift that occurred around A.D. 1300 may have contributed to Cahokia's demise by disrupting the crop production that sustained the large population.



Cache of over 350 perfect points found in Mound 72. (courtesy Illinois State Museum)

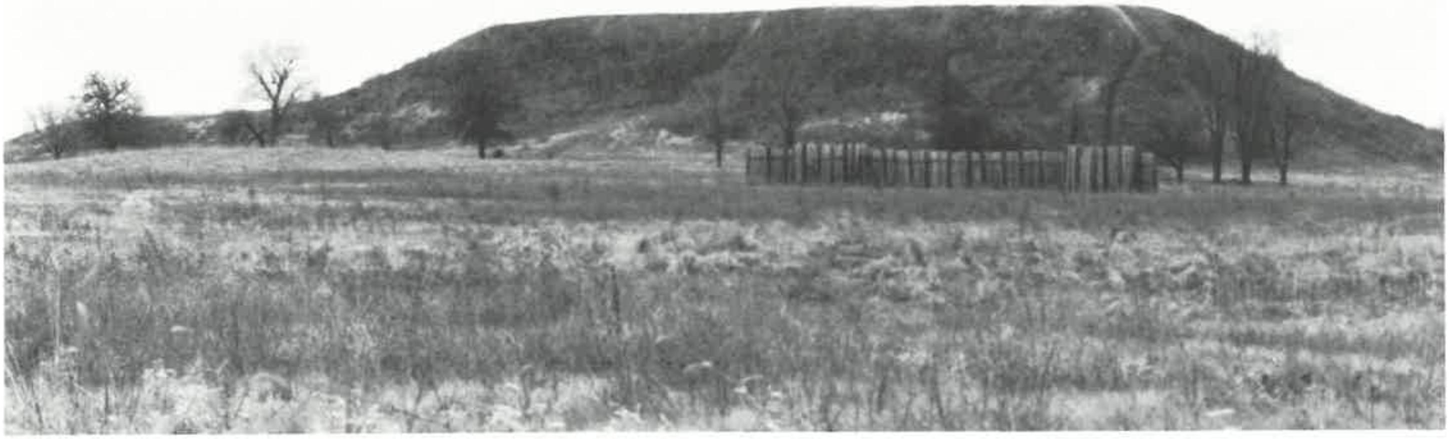
Disease is another possibility. In historic times the American Bottom has been infamous for its "malarial fogs," and Cahokia's many swampy areas and refuse dumps would have been prime breeding grounds for mosquitoes and other disease bearing insects.

Perhaps the lower classes revolted. In any case, Cahokia was abandoned by the late fifteenth century as the population splintered into smaller groups and settled elsewhere.

Cahokia was the first and the largest of the big Mississippian centers that eventually spread through the Mississippi River valley and the Southeast — but nothing ever equaled it.

This article first appeared in the April, 1980 issue of "Historic Illinois," published by the Illinois Department of Conservation, Division of Historic Sites.

East profile of Monk's Mound. In the foreground is a partial reconstruction of the stockade that once encircled about 400 acres of the village. (courtesy Cahokia Mounds Museum Society)



The Mounds of Downtown St.Louis

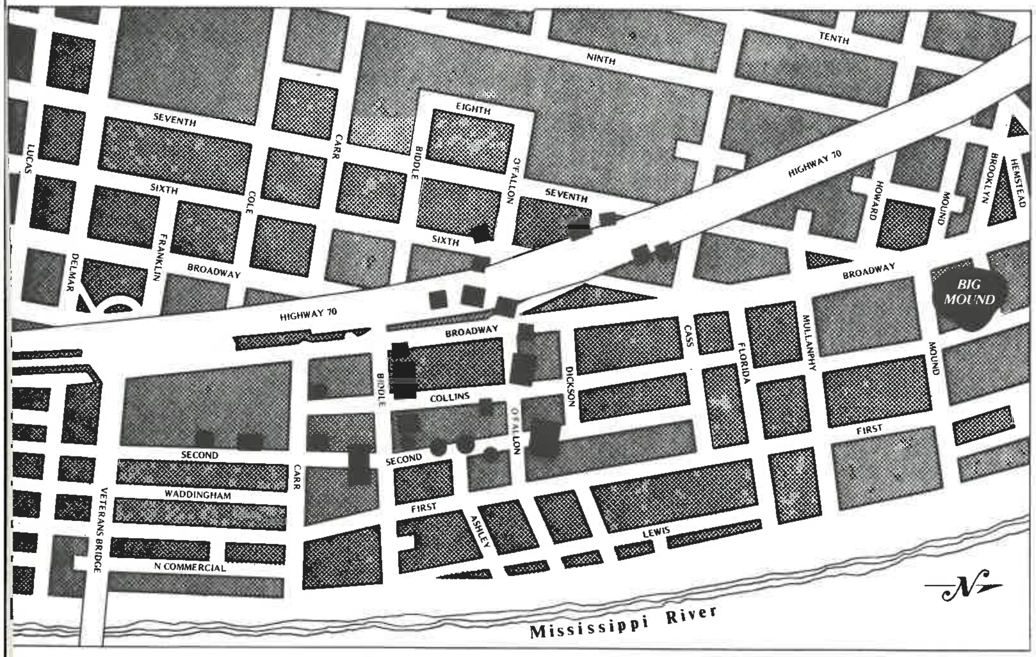
James G. Houser, Curator

The mounds at the Cahokia Mounds State Historic Site are not the remains of an isolated prehistoric community. Satellite villages flourished both to the north and south along the rich bottom lands of the Mississippi River. There was even a sizeable community of mound builders near the waterfront in what is now downtown St. Louis. Early settlers discovered more than two dozen mounds including a large terraced mound which they called "Big Mound," measuring 34 feet in height and 319 feet by 158 feet at its base. In fact it is from these mounds that St. Louis derived its nickname, "The Mound City." The name seems inappropriate today since we have over the last 150 years managed to destroy each of these mounds with one exception. Fortunately the locations are not lost because they were noted, more or less accurately, by early surveyors and map makers. One of the earliest and most complete descriptions of the mounds comes from a map maker by the name of Major Stephen H. Long who, on passing through St. Louis paused long enough to measure, describe and map 27 mounds in the downtown area. It is from these early records that we have been able to construct the map reproduced on this page.

As the map shows, the mounds of downtown St. Louis were not randomly placed, but, like Cahokia and other Mississippian communities, were grouped around a large open plaza. This arrangement is seen by some archaeologists as significant because it closely parallels building patterns found in Mexico. This type of configuration may indicate an exchange of ideas between the two regions. According to Major Long, some of the mounds were flat-topped, while others were conical or ridge-topped — but most were relatively small, some no higher than five feet. The flat-topped mounds probably served as bases for important buildings like a chief's house or a temple. The ridge-topped or conical mounds may have contained burials. Unfortunately little is known of the contents of these mounds, if indeed there were any contents. The men who leveled them were more interested in the earth as filler, than as something to be sifted for artifacts.

Big Mound, 1869

The destruction of Big Mound in 1869, however, was followed with more interest, perhaps because of its great size. From contemporary accounts, it is known that two burials were initially encountered near the top of the mound and that there were numerous artifacts found, including two copper ear ornaments representing a long-nosed god. Further excavation uncovered a large burial area near the base of the mound containing 20 to 30 skeletons and large quantities of shell beads. The present whereabouts of most of these artifacts is unknown although tantalizing bits and pieces of information and objects turn up from time to time. A lock of human hair from one of the burials and several shell beads are in the collections of Harvard University's Peabody Museum. A six-foot rope of beads is said to be in the Missouri Historical Society's collections and all that remains of the long-nosed god ornament is a single photograph also found at Harvard University. But perhaps the most intriguing bit of information regarding the material from Big Mound is found on page 60 of Volume 1 of the Missouri Historical Society's accession book, dated November 4, 1869: "Mr. James H. Loring, through Mr. Russell, presented the Society with a great number of relics taken from Big Mound, also a carefully prepared diagram of it." Stephen Williams and John M. Goggin from whose booklet "The Long-Nosed God Mask in Eastern U.S.," the above quotation was taken, state that "Neither the artifacts nor the plans have as yet been found although quite a thorough search was made by one of the writers."



Museum News

Western Trails Exhibit

"Western Trails, in Search of Geologic Treasure" a new temporary exhibit designed to assist the collector in locating minerals and fossils common to the western United States, will be on display in the Natural History Building thru January, 1981.

Included in the exhibit are specimens of both minerals and fossils common to the region between Kansas and the Pacific coast. A large wall map provides the location of more than 100 sites in the west where rockhounds are invited to dig for a nominal fee.

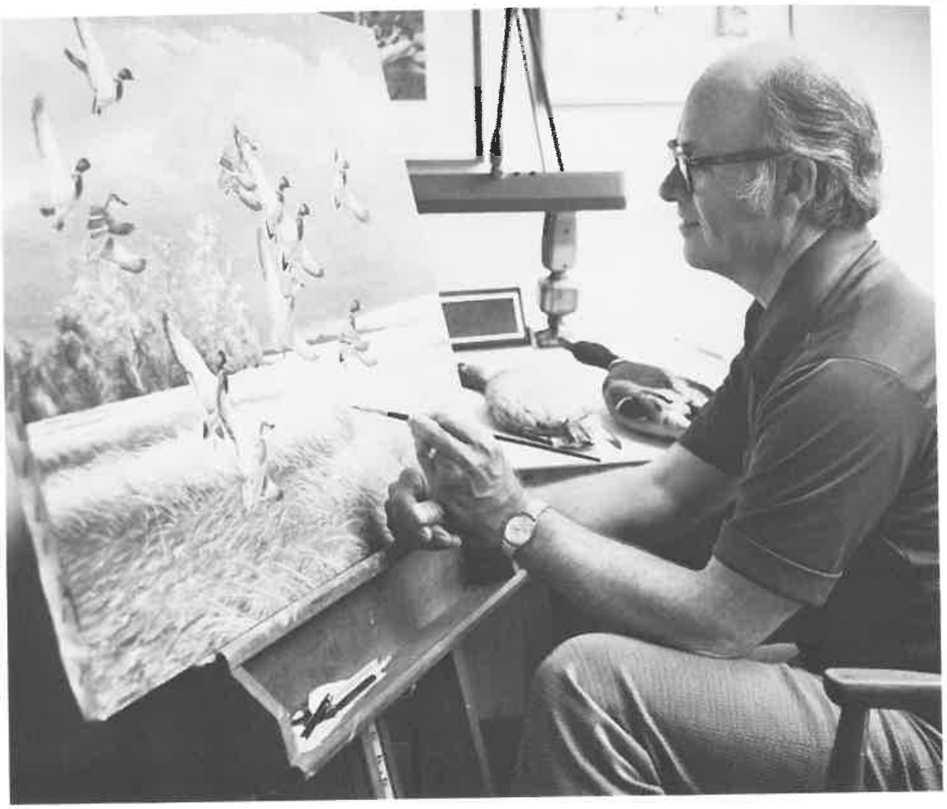
A four page bibliography of books and maps useful to the collector is available at no charge at the lobby reception desk.

Museum Joins in Central American Celebration

On July 4, 1980, the National Museum of Natural History in Guatemala City, Guatemala, celebrated its 30th anniversary as chief institutional repository for native flora and fauna, as well as leader of the conservation movement in the country.

Upon invitation from Jorge A. Ibarra, Director of the museum, the reception was attended by Peggy Coats, Assistant Curator of the St. Louis Museum of Science and Natural History, as a gesture of the Museum's support of, and interest in, the activities of other natural history museums.

Ms. Coats, who was visiting friends in Mexico, was able to extend her trip to include this special event.



Original paintings by wildlife artist Maynard Reece will be exhibited at the museum from September 27 through November 30. Here the artist puts the finishing touches on one of his many water fowl paintings.

Maynard Reece Paintings Coming to Museum

Selected works by Maynard Reece, the only artist to have won the prestigious Federal Duck Stamp Competition five times, will be exhibited at the museum from September 27 through November 30. The exhibit will be in the Marguerite D. Yates Hall of the Science Building.

The Friends will host a preview cocktail reception open to members of the organization from 6:30 p.m. to 8:30 p.m. on Friday, September 26.

A native of Iowa, Reece combines a love of nature and a talent for art which have made him one of America's most distinguished wildlife painters.

He works in stone lithography, watercolor and other media but prefers oil on canvas.

It has been said of Reece: "All the knowledge obtained from years of study, travel and field observation are brought to bear in each new work. One does not need to be a hunter, a birder, nor an outdoorsman to respond to the work of Maynard Reece. His paintings, because of their aesthetic quality, their universal appeal, stand by themselves."

His son, Mark, is also an accomplished wildlife painter, taught by his father how the ever-changing elements of nature can be used to advantage by the wildlife artist. Mark is studying medicine at Creighton University.

Signage Returned to Big Mound

Mrs. Georgia L. Buckowitz, director of the St. Louis Parks and Recreation Department, and Donn P. Brazier look over new signage designed by the museum staff which marks the site of Big Mound.

Fall/1980
Published quarterly as a service to members of the Friends of the Science Museum

Vol. 1, No. 1

Discovery/80

On the cover

On the cover are four American Indian effigy jars called *head pots.* Fashioned sometime between 1000 AD and 1400 AD, they are extremely rare, being found only in certain parts of Arkansas and Southwestern Missouri. Most, if not all, were made as grave offerings — although what they may have contained is a mystery since the contents have not been preserved. Some authorities suggest that the pots, some of which show similarities of style and execution, may be the work of a small group of master craftsmen. Whatever their source and function, their rarity and unusual nature make them highly prized as collectors' items. Just how rare they are can only be guessed at. Lawrence Mills who wrote an article on head pots in *The Missouri Archaeologist,* Volume 30, December 1968 said that he was able to locate only 63. Other estimates of their number in both private and public collections range from 59 to a high of 80. The St. Louis Science Museum is fortunate that four of these remarkable pots were included in the large collection given to the museum by the wife of Henry M. Whelpley.

The Science Museum

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The St. Louis Museum of Science and Natural History is a subdistrict of the Metropolitan Zoological Park and Museum District which was established by voters in St. Louis city and county in 1971. The museum is supported by property tax revenues derived from the district, as well as by private contributions.

The museum is open daily from 9 a.m. to 5 p.m. April — October and 9 a.m. to 5 p.m. Tuesday through Saturday and on Sunday from 1—5 p.m., November through March.

Admission to the museum and parking is free.

The Shop for Science, located in the Science Building, is staffed by members of the Friends of the Science Museum and is open during normal museum hours. The Shop sells a variety of items including books, minerals, mounted specimens, gems and science kits. Proceeds from the gift shop are earmarked for the museum's capital improvements fund.

From the Director

This is the first issue of *Discovery/80* and replaces the *Newsletter* which appeared six times a year. *Discovery/80* is published quarterly — in the fall, winter, spring and summer — and brings you information about what is happening at the museum, the Friends organization activities, a three-month calendar and feature articles on science and natural history subjects of local interest. The greater number of pages allows the editorial staff more room to produce a publication of broader interest.

We at the museum feel there is a niche for a publication which goes beyond the newsletter identification and steps past the walls of the museum, as does our exhibit program with its lobby displays and outreach lectures and demonstrations.

Persons wishing to submit articles for use in *Discovery/80* are invited to send manuscripts to the office of the Curator. Such articles should be limited to four typewritten (double spaced) pages and should be restricted to matters related to the metropolitan St. Louis area.

Donn P. Brazier

Donn P. Brazier
Director

Canoes near Paris date back 6,000 years

NP 9-15-00

Associated Press

PARIS — Thousands of years before the Bateaux Mouches began plying the Seine with sightseers, Neolithic Parisians cruised the river in dugout canoes, fishing and trading with their neighbors upstream.

Three 6,000-year-old canoes, unveiled Thursday, suggest human settlements were set up at the location of present-day Paris up to 1,500 years earlier than had been believed.

The 20-foot canoes, each hewn from a single oak log, will be the centerpiece of a new wing of the Carnavalet Museum scheduled to open later this year.

The dugouts, the earliest of which experts say dates to 4,500 B.C., were unearthed along with thousands of artifacts by French archaeologists in 1990 during a major urban renewal project on the banks of the Seine at Bercy, in southeastern Paris.

"The site is the most spectacular of its kind ever found in Paris and shows that the city is much older than we had thought," said Philippe Velay, archaeology curator at the Carnavalet.

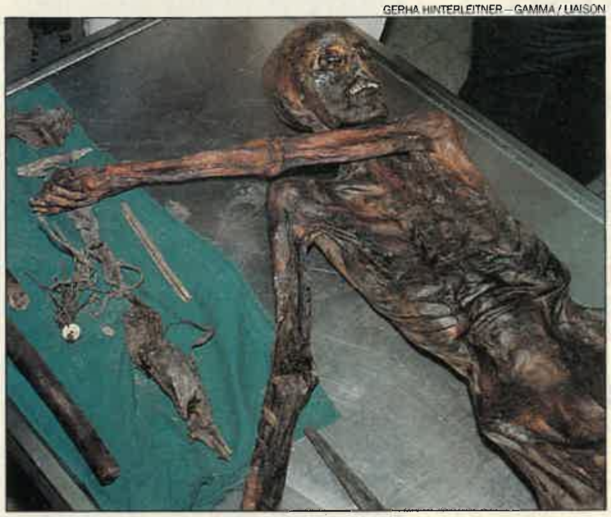
Other Neolithic remains were found under the courtyard of the Louvre Museum in central Paris when it was undergoing renovations in the early 1980s, he said. But that find, much smaller than the Bercy one, was not studied in depth at the time.

Together, the finds suggest two Neolithic communities a few miles apart that had contact each other via the Seine, at the time was over a mile

Tales from the crevasse

DNA from the Iceman and other mummies offers a new lens on the ancient past

7-4-94



GERHA HINTERLEITNER—GAMMA / LIAISON

Iceman cometh. *A 5,000-year-old genetic time capsule*

An old maxim says, "Dead men tell no tales," but scientists know better. An international team of researchers has just announced the isolation of the first fragments of DNA from the "Iceman," a 5,000-year-old, naturally mummified corpse discovered in the Tirolean Alps three years ago. The new genetic studies are helping to illuminate how this ancient wanderer perished, and in the process telling a startling tale of the life and times of ancient Europeans.

The Iceman is one of hundreds of mummified humans whose flesh, bone and belongings are beginning to shed light on the intimate details of ancient people's daily lives, the roots of diseases, such as tuberculosis and syphilis, and perhaps the origins of the human race itself. Found from the frozen Arctic and the bogs of Florida to the mountains of Peru and the tombs of ancient Egypt, these mummies are today being probed with the tools of modern "molecular paleontology," including X-rays, CT scans and chemical analysis of bone, tissue and DNA.

The Alpine Iceman, because of the circumstances of his demise and discovery, has been the focus of intense speculation and scientific scrutiny. His frozen body emerged from a glacier and was found by two hikers, who mistook the corpse for the victim of a recent murder. Scientific dating techniques soon revealed that he had been dead for five millenniums, although a series of high-tech analyses of the mummy's body and his trove of artifacts does suggest that the man was the victim of foul play.

Telltale tissue. The Iceman's tissue is very low in body fat, indicating that he may have been close to starvation when he perished, according to Konrad Spindler of the University of Innsbruck, who is the leader of the research team and author of *The Man in the Ice.* X-ray images of the Iceman's skeleton reveal that the man had recently suffered four broken ribs on the right side of his body. Scientists can even infer the pain of the herder's injury; bone in the Iceman's right arm shows signs of decreased chemical activity, suggesting that the Iceman had been favoring the injury by reducing his arm movement on that side of his body.

Artifacts found along with the Iceman seem to indicate that he had departed on his trek in haste. He was well equipped for a long journey, with

Modern checkup. *A 3,000-year-old mummy,*

ON THE ECONOMY

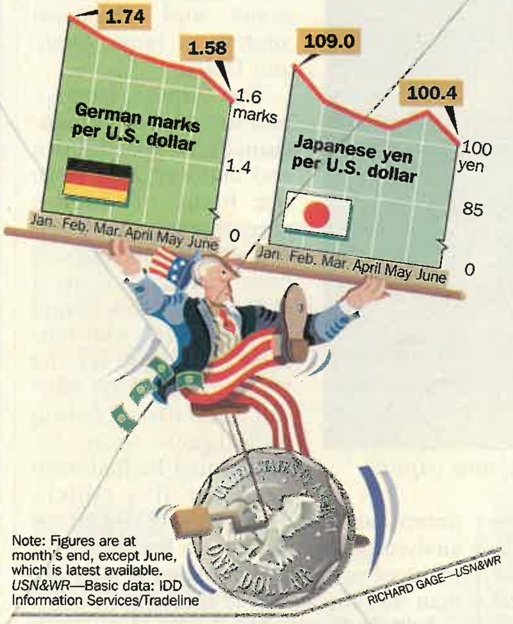
BY SUSAN DENTZER

Diagnosing the dollar's decline

"A strong dollar means a strong America," Ronald Reagan proclaimed in the 1980s when the greenback was riding high. But last week, the dollar sank against the German mark and hit a postwar low against the Japanese yen, triggering a move by the Federal Reserve and other central banks to buy dollars and shore up the currency. Some traders crowed that the slide reflected American weakness—everything from doubts about Bill Clinton's competence to fears about renewed inflation. But how to square that with evidence that the U.S. economy is in its best shape in decades, as Fed Chairman Alan Greenspan observed again last week? The "weak currency, weak country" fallacy is just one sign of the confusion that characterizes volatile currency markets. In reality, so many different forces influence exchange rates that no simple story line can possibly explain the dollar's ongoing tumble.

Unsteady currency

Since January, the dollar has slid almost 8 percent against the yen and more than 9 percent against the mark.



Note: Figures are at month's end, except June, which is latest available. *USN&WR*—Basic data: IDD Information Services/Tradeline

RICHARD GAGE—USN&WR

Despite the Gipper's pronouncement, it isn't useful to think of the dollar as being either fundamentally weak or strong, argues economist Kathryn Dominguez of Harvard's Kennedy School of Government. Such terms assume that we know what level is appropriate for the greenback or any other currency—and in truth, we don't. There are several different theories about what should determine currency prices; for example, one school of thought holds that at any given time, a currency's market value is the "right" one since it reflects the inexorable global forces of supply and demand. By that logic, the dollar last week was neither weak nor strong, but right on the money.

Price parity. A second theory holds that over the long run, exchange rates should reflect what's called "purchasing power parity." Consider a basket of goods consumed in both Japan and America and traded freely between both countries—say, a camera, a VCR, some cosmetics and a few farm products. Now assume that it costs $1,000 to buy those goods in America and 100,000 yen to buy them in Japan. In such circumstances, the exchange rate should be about 100 yen to the dollar—roughly what it is now—to reflect the purchasing power of each nation's currency. But in fact, prices of such goods are decidedly higher in Japan for a variety of reasons, including the lower overall productivity of that nation's economy. As a result, the same basket of goods would probably sell for roughly 120,000 yen, suggesting an exchange rate closer to 120 yen to the dollar. In other words, the greenback is now about 20 percent lower than the "purchasing power" equation says it ought to be.

Another popular explanation for the dollar's decline is America's gaping trade deficit and its mirror image, Japan's huge trade surplus. But even these don't fully account for the dollar's behavior last week. In theory, big Japanese trade surpluses mean that Japanese firms receive lots of dollars that Americans pay for their goods. As these firms swap greenbacks for yen, the Japanese currency rises and the dollar falls. According to the laws of economics, eventually the yen should rise so high that Japanese goods are priced out of the U.S. market. America's trade deficit and Japan's trade surplus should then fall.

Recent trends suggest that this process of reversal is underway. America's trade deficit with Japan has lately been shrinking—while Japan, emerging from recession, is beginning to import more goods. Moreover, newly confident Japanese investors are starting to hold on to and reinvest dollars rather than converting them back to yen, notes Gerard Vila, who heads WEFA Group, an economic forecasting firm. Yet all of this portends a yen that should be declining a bit relative to the dollar, rather than rising as it did last week.

Does this mean that currency markets are in some sense irrational? Sometimes it seems that way. Foreign-exchange traders often crowd onto a bandwagon to push a currency's price up or down. "They are very shortsighted and don't seem to take into account these long-term economic factors," says University of Washington economist Charles Engel. He points to a recent newspaper story quoting a currency market player who blamed dollar woes on the sexual harassment suit facing President Clinton. And other traders are clearly jittery about the prospect of higher U.S. inflation, even though there is virtually no sign that prices are really picking up.

Given the chaos in the markets, what further steps can the U.S. government take? Last week's coordinated effort to buck up the dollar effectively failed, partly because many traders had been expecting it. Now the Fed's only option may be to raise short-term interest rates to draw global investors back to the dollar. Yet the central bank might be reluctant to do so amid signs that the rapid economic growth of recent months is now tapering off. Still, if the Fed fails to act, the risk is that the dollar could break into a dangerous free fall that could further undermine investors' confidence, curb recoveries in Europe and Japan and disrupt world economic growth. Thus, both U.S. policy makers and currency market players clearly face some tension-ridden days ahead. ■

CHIP CLARK – SMITHSONIAN INSTITUTION

known as Minister Fox, enters a CT scanner.

a backpack, medicine, an elaborate repair kit and live embers wrapped in leaves. But he also carried an unfinished bow, cut from the yew trees that grew lower down the mountain, and what appears to be bowstring, suggesting that his weapon had been broken and he was trying to fashion a new one. His quiver and arrows were damaged, too, yet he continued to carry them, perhaps hopeful of repairing them when he had the chance. Two tiny grains of wheat and fragments of corn, found tangled among the Iceman's belongings, indicate that he had only recently been in an agricultural settlement, most likely in the valley below; a ripe sloeberry found at the site suggests that he left in late summer or in autumn.

Spindler speculates that the Iceman was a herder who came down into the valley for harvest time and perhaps to wait out the bitter Alpine winter. But it appears that the Iceman became involved in a violent conflict—perhaps with a raiding party from a nearby valley, a common occurrence that has been documented by new archaeological research. Injured in the fracas, he fled to the familiar hill country, where he was caught in a chance snowstorm and, exhausted from his ordeal, perished.

Five thousand years later, an equally freak bout of warm weather freed his body from its glacial tomb. The bizarre circumstances surrounding the discovery of the Iceman fueled rumors of a hoax, a theory the new DNA research goes a long way in debunking. Svante Paabo of the University of Munich and his colleagues reported in a recent issue of the journal *Science* that the Iceman's DNA confirms the body is of European descent—and entirely unlike the DNA of mummies from other parts of the globe that might have been secretly deposited in the crevasse as part of a hoax.

Sick days. Scientists studying the Iceman and other mummified humans are particularly interested in signs of diet, health and illness, because personal health records can tell a great deal about societies, both their glories and their declines. Indeed, DNA analysis has already put to rest one long-running controversy about the Americas—whether European colonists introduced the devastation of tuberculosis into the New World five centuries ago. Studying the naturally mummified remains of hundreds of people who lived in coastal Peru, University of Minnesota researcher Arthur Aufderheide found that one woman had lumps of tissue in her lungs and lymph nodes that appeared to be the result of tuberculosis. Probing the DNA in the tissue, he discovered that the molecule matched that of modern TB, confirming the presence of the disease in the New World some 400 years before Columbus arrived. Aufderheide does not deny that TB was devastating to the native populations during the period of the European exploration, but it was not a new microbe; it was an old germ spread as a result of the social disruption caused by invasion and colonization.

CHARLIE ARCHAMBAULT – USN&WR

Leaf of ages. *Plant life, 15 million to 320 million years old*

Recent studies of a population of Peruvian mummies provide a fascinating record of a society moving from a period of remarkable stability into tumultuous change. Dating back nearly 9,000 years, this pre-Columbian society buried its dead in dry sand, an excellent preservative, and consequently 3 of every 4 bodies were naturally mummified. Aufderheide discovered in their skull remains very little evidence of head fractures—a sign, he says, of a remarkably peaceful society.

These ancient Americans were fishermen. Because the land and the sea have different chemical makeups, researchers can look for clues to a person's diet in the chemical composition of bones. For example, comparing the levels of strontium and nitrogen in the human mummies with such trace elements in sea lions and llamas, Aufderheide and his colleagues surmise that only about 6 percent of the society's diet came from land plants; nearly 90 percent of the society's protein came from the ocean.

Isolation and migration. This dietary evidence suggests that the people in this society lived virtually isolated for nearly 50 centuries from other societies that are known to have existed in the neighboring highlands. Such social isolation lasted far longer than anything experienced by the dynasties of ancient Egypt or the Roman Empire. When an agricultural society did finally move down from Lake Titicaca to the coastal lands around 1000 B.C., the native diet changed drastically. Research also shows that subsequent invasions from the Andean highlands introduced a new practice – chewing coca leaves, the source of cocaine.

Because ancient human remains carry the genetic legacy of past generations, mummies can give clues to ancient migrations as well. Paabo, for instance, examined the DNA of a 7,000-year-old corpse that had been mummified in a Florida bog and found that its genotype did not match any of the three groups of American Indians thought to have colonized the New World from Asia millenniums ago. The mummy's DNA pattern was similar to some modern-day Japanese, however, suggesting that a fourth ancient invasion of the Americas may also have occurred. Another study of Floridian mummies showed that the group's genetics remained remarkably stable over dozens of generations, suggesting that they had little contact with outsiders.

Ultimately, examining the preserved remains of ancient people might illuminate the origins of the human race itself. The bones of many such humans have not fully fossilized, so it is theoretically possible that DNA is encased deep in the bones' interiors. At least one group of researchers is trying to extract DNA from the bones of a Neanderthal, the humanlike creature that lived in Europe tens of thousands of years ago. If such mummified DNA could be recovered, it could be compared with the DNA of modern humans to see what, if any, legacy the Neanderthal left to the modern world.

Scientists used to do the best they could to tease the past from the size and curvature of ancient skeletons. Thanks to the tools of modern science, the mute now are beginning to whisper their long-held secrets. ■

By William F. Allman
with Betsy Wagner

A loaf of bread, a glass of wine

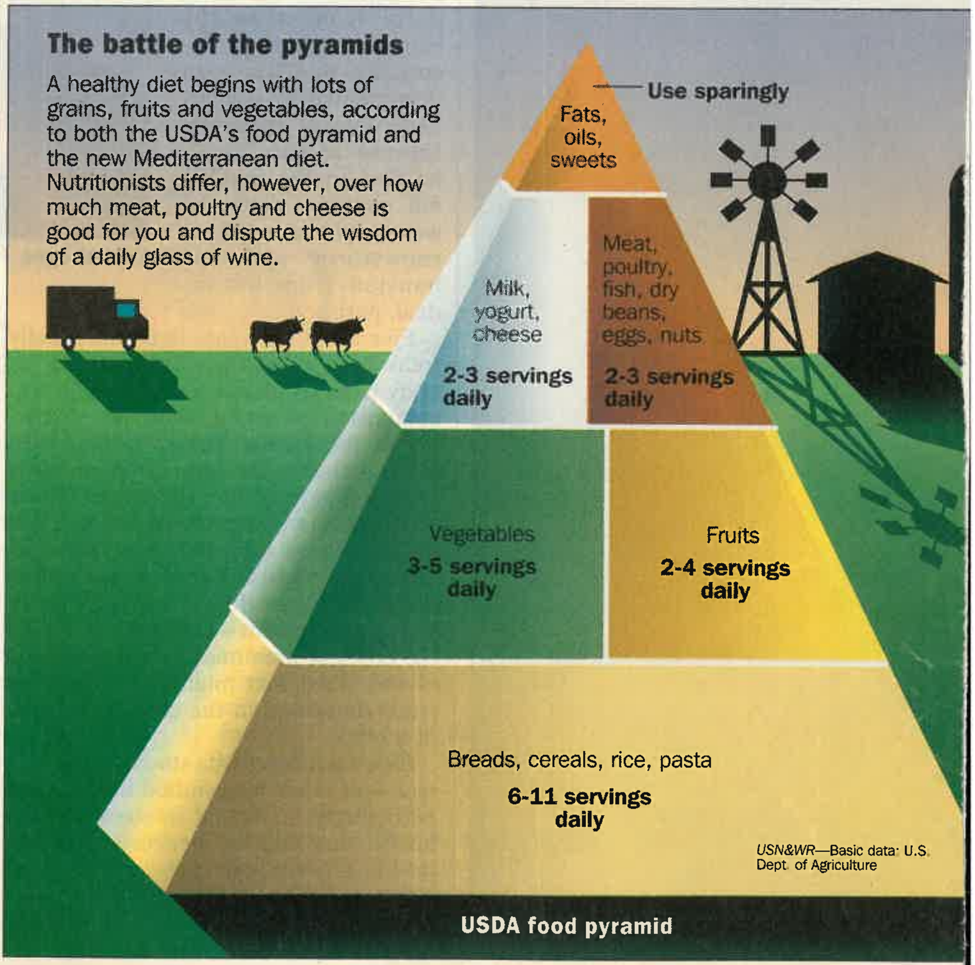
The new Mediterranean diet is causing both heartburn and the 'aahs' of contentment

Eating right used to be easier. That was when a square meal meant choosing from the four major food groups, when a slice of beef, a baked potato and a serving of carrots washed down with a glass of milk were considered a healthy dinner. Trouble is, it wasn't all that healthy, as America's rates of heart disease and cancer readily show. Enter the U.S. Department of Agriculture's food pyramid, a set of dietary guidelines released in 1992 that was supposed to prod Americans to eat more grains and fruits and vegetables and less fat.

Now there's the Mediterranean diet, a culinary and scientific rejoinder to the USDA's pyramid, which began stirring a pot of controversy even before it was officially unveiled last week in San Francisco. Two years in the making, the diet is the brainchild of an unlikely trio – the Harvard School of Public Health, the European office of the World Health Organization and Oldways Preservation & Exchange Trust, a Boston-based "food think tank." This latest diet is based on the foods of the Mediterranean region, whose denizens enjoy some of the lowest rates of heart disease and cancer in the

The battle of the pyramids

A healthy diet begins with lots of grains, fruits and vegetables, according to both the USDA's food pyramid and the new Mediterranean diet. Nutritionists differ, however, over how much meat, poultry and cheese is good for you and dispute the wisdom of a daily glass of wine.



USN&WR—Basic data: U.S. Dept. of Agriculture

10-23-79

Working on 227

David B. Crampton
Jeff City, Mo.

John W. Shopland
Columbia, Mo.

(State Highway archaeologists)

Missouri Archaeology Month September 2000

Missouri Archaeological Society
P. O. Box 958
Columbia, MO 65205

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Missouri Archaeology Month September 2000

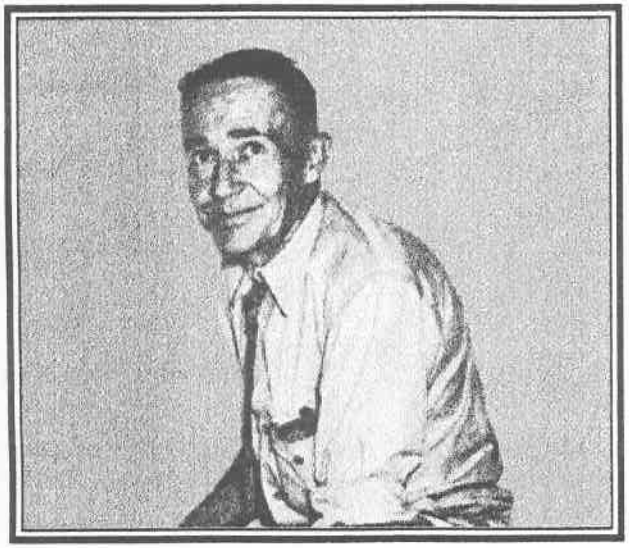
Rockshelters are among the most sensitive archaeological sites because they are one of the few places where perishable items, such as the shoes made of plant fibers are found. Other perishable items such as woven bags, strings, and cords, pieces of skins, items of wood, bone, shell, and gourd fragments have been found. Since these items are organic they can be Carbon dated and so are very important artifacts.

The cultural information which can be obtained from rockshelters is vast if recovered by people with proper training who use proper procedures and publish their results. Rockshelters should not be disturbed just to find artifacts.

Help Preserve the Past.

Please Recycle

80 YEARS OF ARCHAEOLOGY–
METT SHIPPEE REMEMBERED



A keen observer, a meticulous note taker, a good archaeologist, always curious about the past–these are just a few of the phrases that come to mind to describe J. Mett Shippee. While his name is the one most often associated with archaeology and prehistory in the Kansas City area, his archaeological career and the discoveries he made far transcend that local area and the boundaries of the state of Missouri.

–Jim Feagins, Archaeologist

Sunday, March 19, 2000
2 p.m. until 4 p.m.

Three archaeologists will be on site showing never-before-seen artifacts from the three archaeological periods most closely associated with Mett Shippee

Refreshments will be served

For more information call the
St. Joseph Museum
816-232-8471

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Mr. & Mrs. Don Reynolds
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8-15-82
Phone call from Mike
Fisher. Frank Block
of Rushville called
him – has plowed
into Indian bones.
Wants someone to come
down.

8-16-82 6:00 PM
To Frank Blocks
at Rushville. two
places in plowed
ground to N.W. of
his home on ridge
where bone + teeth
show on surface
Probably two
different burials.
Upper distal end
of a femur found

Mr. Mrs. [illegible]
Mike [illegible]

60-7
lo in Carr
previously
being
of 2½
when ha
for the
point **
collec
ng and
has dug
ound (small
es, some
pieces
no other
and [illegible]
bone material found [illegible] teeth –
One point that Mr Block
brought in this time –
a triangular point (found

teeth at West site on

out bones and screen
soil for artifacts
Burials appears to
have been plowed
Through however
Will salvage whatever
we can. Block
wants bones removed
to another location
so that he can harrow
his field.
8-17-82 - 9:00
Mileage to Blacks
Rushville - 12913
12872
Started on West
burial first.
Flexed burial

---

at east burial
Grinding stones on
surface near by. Mono.
Burned lime
stone fragments
around both burial
sites. Some large
flat stones near
by. Black found
one large spear
just to south
of burial sites
some time back.
Chert chips and
chunks around
about. We
will return
Tomorrow to bas

Previously
Bury
of Eb he
when he
for the
point #1
collar
and
has dug
owned (small
, some
pieces
Bone material found compare to other teeth
One point that Mr Block
brought in this time is
a triangular point (found

Sort bones and screen
soil for artifacts.
Burials appear to
have been plowed
through however.
Will salvage whatever
we can. Block
wants bones removed
to another location
so that he can harrow
his field.
8-17-82 - 9:00
Mileage to Blacks
Rushville
12872 - 12913
Started on West
burial first.
Flexed burial

teeth of West [illegible]

Previously
being
of the
when, he
for the
point
culture
ay and
has dug
found (small
, some
pieces
and [illegible] no other
Bone material found close to teeth
One point that Mr Block
brought in this time is

---

at east burial.
Grinding stone on
surface near by. Mono.
Burnett line
stone fragments
around both buri
sites. Some larg
flat stones near
by. Block foun
one large spear
just to south
of burial sites
some time bac
Chert chips
chunks a
about. W
will return
tomorrow to

Head to eastward
burial laying on
left side. It had
turned upward
and somewhat to
back.
top of burial
just at plow
depth (6 or 7")
Plow had cut
front of skull off
and turned it
out on surface
to be discovered
by Mr. Black
The burial, less
skull was
dug out. ~~and~~

~~Left for Mr. Block~~
~~to show his friend~~
~~and me of bones.~~ He
~~would remove bones~~
were removed from cultivated area
~~to a safer place~~
No artifacts were
found associated
except chips in cultivated area
with the burial
Bones very soft
and in an advanced
state of decay. Unable
to measure
Mr Block says
that this site has
been given a number
33 BN 12 ?
check!
~~[illegible]~~

Previously
Burial
of the
when he
for the
point #1
[illegible]
and
has also
found small
[illegible], some
pieces
Some material found [illegible] tooth
One point that Mr Block
brought in this time
a triangular point (found

~~left for Mr. Block~~
~~to show his friends~~
~~and [illegible].~~ He
~~would remove~~ Bones
were removed
~~to another place~~
away from cultivated area
The artifacts were
~~found associated~~
Pecked chips in burial area
with the burial
Bones very soft
and in an advanced
state of decay Unable
to measure.
Mr Block says
that this site has
been given a number
Check! 23BN12
~~[illegible]~~?

---

ably
lo in area
previously
being
of the
when to
for the
point #1
culture
ory and
has dug
and (small
es, some
pieces
chips to other
and ~~[illegible]~~ found with teeth
bone material
One point that Mr Block
brought in this time
a triangular point (found

Head to eastward
burial laying on
left side, 17 k
turned upw
and down
back
top

#2 Burial (East) (40')
Bones dissociated.
Mostly broken +
fragmented. Mixed
with burned lime-
stone. One shank
portion of a small
calcedony white
woodland type (?)
point near bottom
of bone + stone
deposits. (Below)

Except for the one
partial projectile in
the east burial site,
no cultural material
or artifacts were
found. This point

---

previously
being
of the
taken to
for the
point #1
culture
ny and

has dug
found (small
es, some
pieces
and chips to other
Bone material found close to each
One point that Mr Block
brought in this time is
a triangular point (found

while being ~~at~~
~~[illegible]~~, at
the burial line below
present day plow
zone could "possibly"
be an intrusion
We questioned
why after 30 some
years of cultivation
over the burial area
that now two burials
should be plowed
into. Mr Block
said that only
a few years ago
he had bull-dozed
soil from the top
of the hill top area

---

to make a pond
To the south the natural
water and wind
erosion has since
removed additional
soil. It is likely that
even more burials
will be plowed into
in the next few
years. Burial
limestone has in
recent years been
plowed out at several
other spots near
the excavated
burials. Such reddened
stone fragments are to be
found scattered over the surface
of the hill top area

[illegible] in [illegible]
Previously
being
of the
when he
for the
point #1
collection
and
1.
has also
owned small
some
pieces
bone material found [illegible] other
One point that Mr Block
brought in this time
a triangular point found

To make a pond
to the south lateral
water and wind
erosion has since
removed additional
soil.

It is likely that
even more burials
will be plowed into
in the next few
years. Burned
limestone has in
recent years been
plowed out at several
other spots near
the excavated
burial. Such rolled
stone fragments are to be
found scattered [illegible] the hill top area

---

lon in an
previously
being
of the
when he
for the
point #1
calbur
ry and
l.
has dug
and small
es, some
pieces
to other
chips teeth
~~and~~ bone material found [illegible]

One point that Mr Block
brought in this time is
a triangular point found

---

while lying ~~at~~
~~were~~ at
the stone lie below
present day [illegible]
some could
be an [illegible]
We [illegible]
why [illegible]

No charcoal was found with the burials.
It should be noted that Mr. Block dug eight copper culture blades and eight blanks from the hilltop circle just about 300 yards to the north of our excavation. The blades & blanks were beneath hematite pieces and at a depth of ___?. This was of particular interest since we have in recent years learned

of several such copper culture spear caches all of which have been found without ~~isolated from any~~ ~~[illegible]~~ of cultural material in our area. [a possible] exception could be the highway 29 dig near Poiriff Wis at which place large blades were found very near burials by construction workers operating earth moving equipment. These points and the burials were not, however, proven to be in direct contact.

Previously
being
of the
when
for the
point *1
culture
and
has also
small
some
pieces
no other
One point that Mr Block
brought in this time
a triangular point (found

of several such Copper
Culture spear caches
all of which have been
found without
~~isolated from any~~
~~trace of~~ cultural material
in our area. [A possible
exception could be the
highway 29 dig near
Fairfax Mo at which
place large blades
were found very near
burials by construction
workers operating
earth moving equipment.
These points and the
burials were not,
however, proven to be
in direct contact.

---

previously
being
of the
taken to
for the
point #1
culture
ry and
l.
has dug
found (small
ces, some
pieces
no other bone material found except teeth
and chipped chips
One point that Mr Block
brought in this time I found
a triangular point

No charcoal was
found with the
burials.
It should be noted
that Mr Block
eight copper
blade
Blade
type

A bison horn core
identified by J.M.
Shipee as from Bison
Antiquus was found
in close proximity
to the Fairfax Burials
(See ———)

23-BN-12
AREA ~~Sets~~ 1-2 + 3
We dug on #3
8-large points
8-long blades } #2
8-hemolite

Burial #2
In addition to
the afore mentioned
pelvis (thought to
be female) ~~another~~
~~a~~ part of another
pelvis (R.H. side)
was discovered
beneath it just
~~[illegible]~~
~~[illegible]~~
~~[illegible]~~
(is part there of)
Quite possibly disturbed
previously at
conclusion of
some time in the past

[illegible]
previously
being
of the
when he
for the
point #1
collar
and
[illegible]
has dug
found some
pieces, some
pieces
the other
[illegible] material found
One point that Mr Block
brought in this time
a [illegible] point found

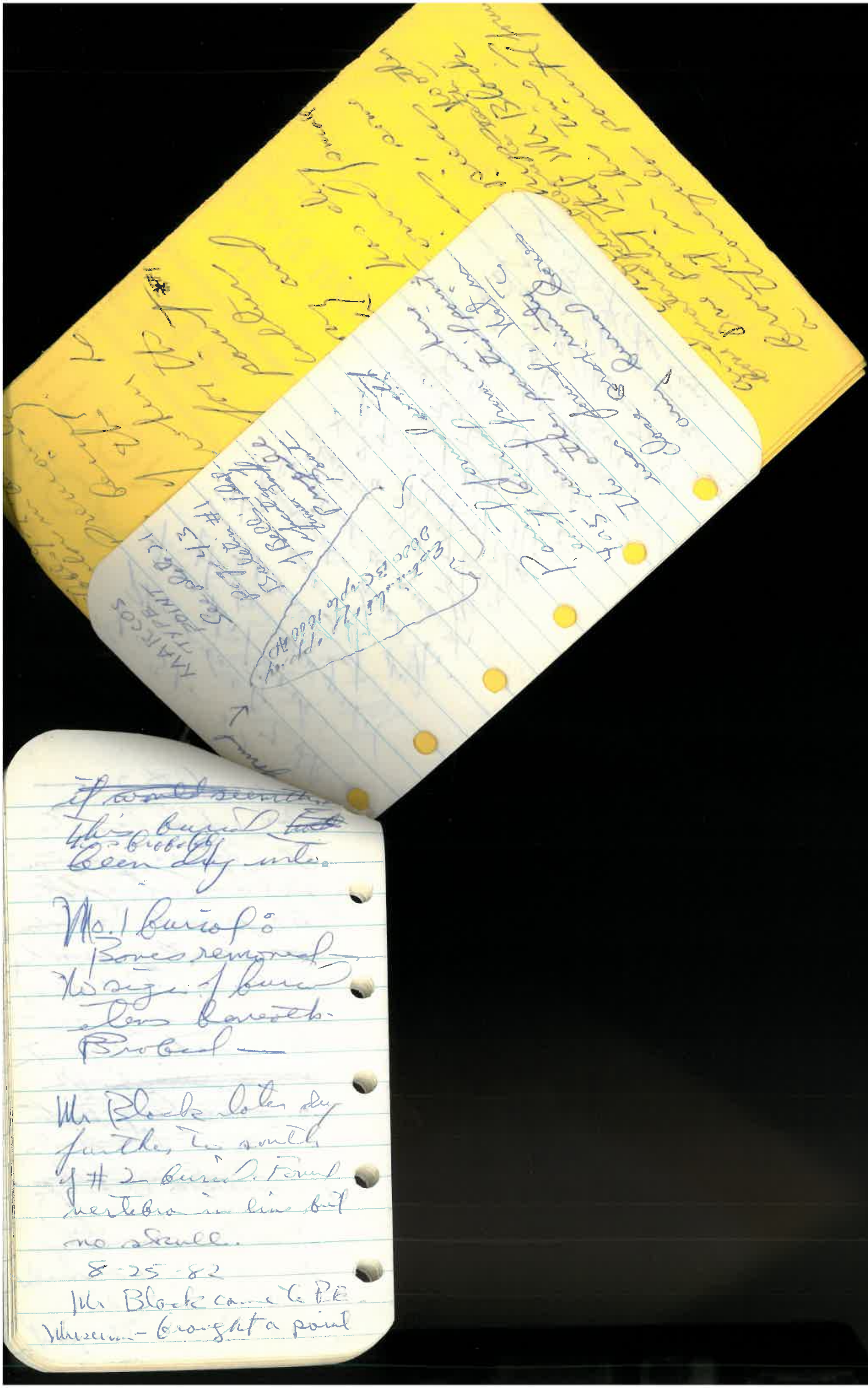
A bison horn core
identified by J.M.
Shipee as from Bison
Antiquus was found
in close proximity
to the Fairfax Buffalo
(See ——]

23-BN-12
AREA ~~Site~~ 1-2 + 3
We dug on #3
9 - large points
8 - large blades
8 - hemolite

Level #2 —
In addition to
the aforementioned
pelvis (thought to
be female) ~~another~~
~~a~~ part of another
pelvis (R.H. side)
was discovered
beneath the first
~~[illegible]~~
~~[illegible]~~
~~[illegible]~~
~~were [illegible]~~
evidently are burned
(a part thereof)
Quite possibly
previously disturbed
Conclusion: at
some time in the past

---

lie in [illegible]
previously
being
of the
taken to
for the
point
collar
and
has dug
found (small
s, some
pieces
and chipped chips — no other
bone material found like tooth
One point that Mr Block
brought in this time —
a triangular point (found



~~it would seem that~~ this burial ~~has~~ has probably been dug into.

No. 1 burial:
Bones removed
No sign of burial items beneath.
Probed —

Mr Block later dug farther to south of #2 burial. Found vertebra in line but no skull.

8-25-82
Mr Block came to P.E. Museum – brought a point

MARCOS TYPE POINT
See plate 11
p. 43
Bulletin #1
J Bell 1958
Oklahoma Anthropological Society
Point

Established approx. 6000 BC up to 1000 AD

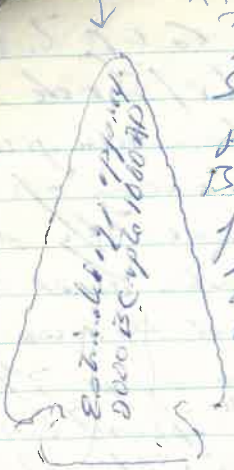
found

Point found in #1 burial
405' west from where
The other partial point
was found. Not in
proximity to any burial bones

~~It was~~ [illegible]
this probably
Been dug into
No 1 Burial
Bones re
W

found

MARCOS
TYPE
POINT
See plate 21
page 43
Buletin #1
1 Bell's illus.
[illegible]
Projectile
Point



Point found with
1st Burial
4or5' west from where
The other partial point
was found. Not in
close proximity to
any burial bones

...low in ...
Previously
being
of the
when he
for the
point #1
collect...
...y and
...!
has dug
...ound (small
...es, some
pieces
...o other
and chipped chips
Bone material found ... tooth
One point that Mr Block
brought in this time
Tiemenda point found

8-31-8
Phone Call 2 PM
from Mr Block.
He has now probed
in the area of
the recently dug
burials and has
located an area of
stones app 3½'
x 2' just 6 or 7
feet south of the
burial #1. He
wants to dig into
it. Would call us
when he has worked
it. (about 24" deep)
I told him that
probably we should
not at this time

(In This case it
would be a salvage
dig) Will contact
Wil Fisher —

9-1-82 Fisher
same opinion.
Since the stone
area is below plow
zone and for the
time being safe it
should be left
alone. (The museum
will not undertake
to excavate except
possibly salvage
if necessary to save
information that would
otherwise be destroyed)

[illegible]
[illegible]
Previously
been
of the
taken to
for the
point #1
letter
and
ng and
h. I.
has dug
and (small
es, some
pieces
tooth other
bone material found
One point that Mr Block
brought in this time
a triangular point + found

Phone call to DR from Mr Block. He has now probed with one of the recently dug burials and has located an area of stones app 3½' x 2' just 6.27 feet south of the burial #1. He wants to dig into it. Would call us when he has worked it. (about 24" deep) I told him that probably we should not at this time

(In this case it would not be a salvage dig). Will contact Mr. Fisher —

9-1-92 Fisher same opinion. Since the stone area is below plow zone and for the time being safe it should be left alone. (The museum will not undertake to excavate, to salvage, possibly if necessary to save information that would otherwise be destroyed.

...low in com...

Previously

being

of the

when he

for the

point

collect

...y and

has dug

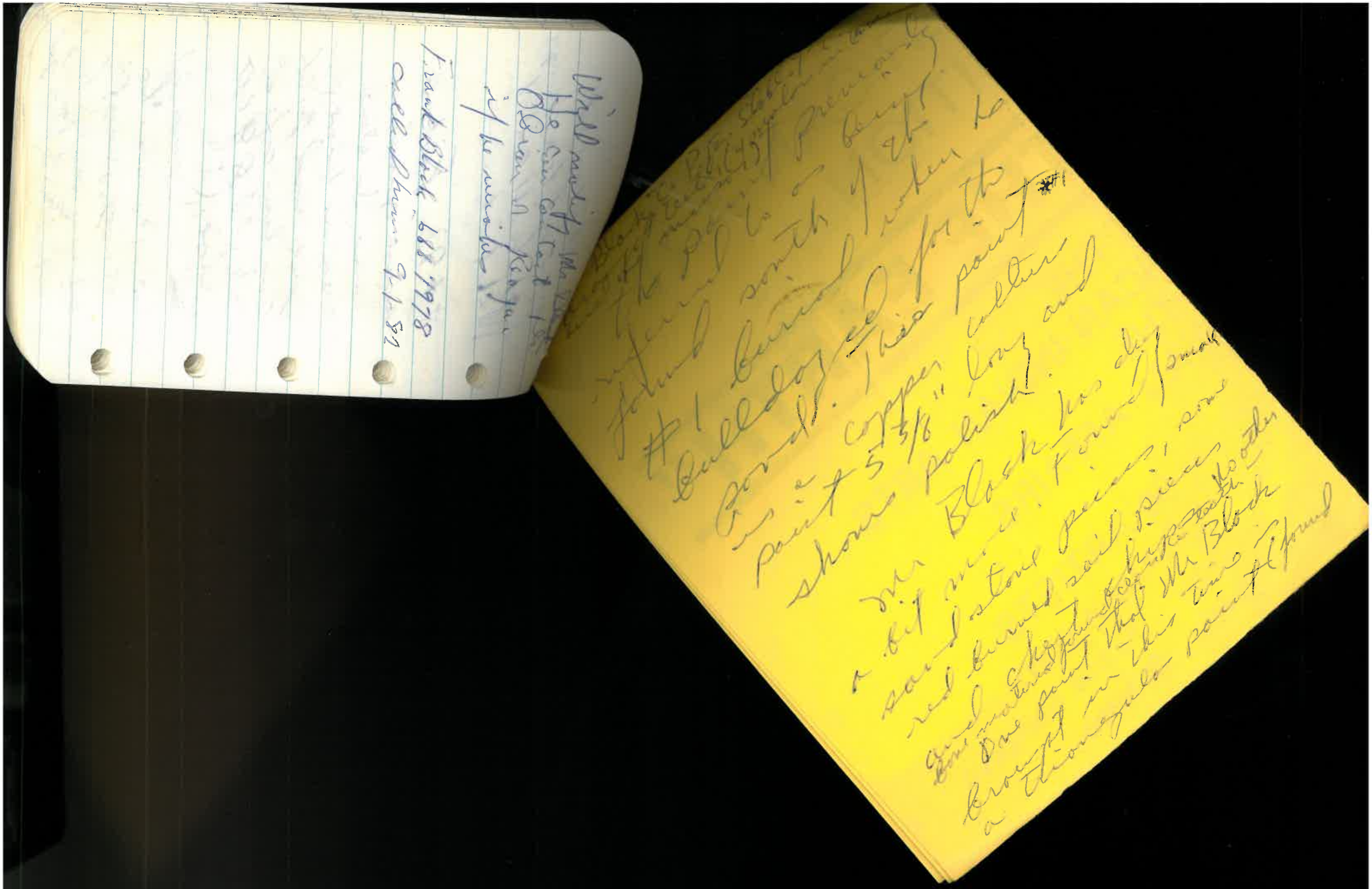
found small

...ces, some

pieces

and chips to other
bone material found ... teeth

One point that Mr Block brought in this time is a triangular point found



Will notify Mr Block
He can contact Dr.
O'Brian or Kenyon
if he wishes.

Frank Block 688 7978
called Thurs. 9-1-82

Block [illegible] SLOPE [illegible] came
[illegible] PROJECT [illegible] previously
in the PP to a burial
found south of the
#1 burial when he
bulldozed for the
pond. This point *#1
is a copper color
point 5 3/16" long and
shows polish.
Mr Block has dug
a bit more. Found small
sandstone pieces, some
red burned soil pieces
and chipped [illegible] No other
[illegible] material found [illegible]
One point that Mr Block
brought in this time
a triangular point found

Block to P.E. Stobb [illegible]
crop of teeth, (4 molar in [illegible]
[illegible] of muscle)?

The point previously referred to as being found south of the #1 burial when he bulldozed for the pond. This point is a copper culture point 5 3/8" long and shows polish.

Mr Block has dug a bit more. Found small sandstone pieces, some red burned soil pieces and chert chips. No other bone material found except teeth.

One point that Mr Block brought in this time a triangular point (found

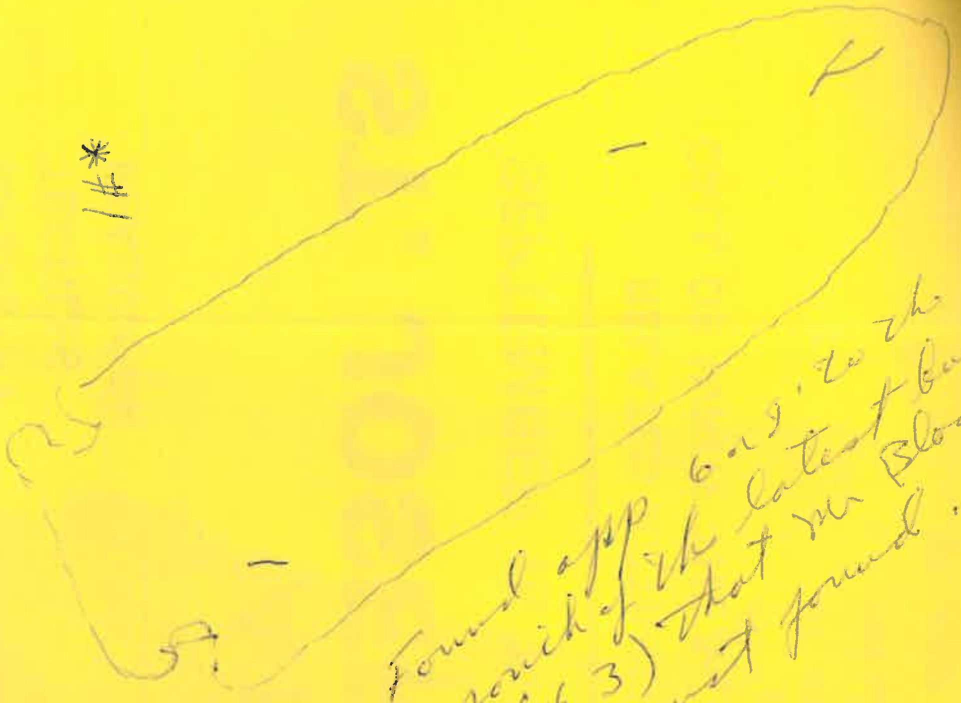
Will notify Mr Black
He can contact Dr
O'Brian & Re
if he wishes
Frank Block b
called Dh

in area #2 of 23BN12
See #2) This point
is partially fluted
either by design or
accidental chipping

Notched scrapers!?
He has found 30 or 40
on the field by the old
Truck (#2 of 23BN12)

ICAN ART
ITION
THE EART
THE
ICAN INDI
THE
DIAN

1#*



Found app 6 or 9' to the south of the latest burial (#3) that Mr Block just found.

ERICAN ART
ITION
THE EART
THE
ICAN INDIAN
THE
DIAN AFF

AT

JOSEP

EPTEMBER 15 THR

RELATED ACTIVITIES

CALL OR WRITE THE MUSE

ST. JOSEP
11th & CHA
M
ST. JOSE

* #2

HUEFELMEYER HILL
OCEOLA SPEAR CACHE

Ralph A. Stanton
2501 Leonard Rd
279-1044

Building house on
John Haffelmeyer
place (on hill at rear
of John's house)

Route #2

Copper Culture
(Skipper)

Research Series #2
1964 (Skipper

See pages 27 & 29

(Report submitted)

truck driver
Tom Corcoran (for Glob

Smelting plant
Forest City
Schoolcraft Metal plant
North out of Forest City on 111
4 miles north.
if you get to 157 highway
you have gone 1 mile too far
at 4 miles mark there is
a gravel road to NE
over

Blades side by side
all pointing south

Mon: 11-22-75
Dozer operating to
north of building
removing soil to back
of house. At a point
about 6' north of NE
corner of house a fire pit
was uncovered at
a depth of about
one foot. It
was [illegible] Fea. 7 2 [illegible]
[illegible] and contained
F[illegible]
[illegible]

Tues 11-25-75

At point 7' south of
[illegible] of house say
30' about 40' to SE
of [illegible] center a
stone (white limestone –
not found) was
encountered at about
6" to 8" deep. They
fine (brilliant)
clay from around
[illegible] it. (Excellent [illegible])

At a point 18' South of
the SE cor of house
the Dozer scoop struck
[illegible] fire place
about 6" below surface
and at the [illegible] slope
of hill [illegible]
The [illegible] pushed

[illegible] the [illegible]. The
[illegible] to [illegible]
pattern to placement of stones
of fire reddened [illegible]
stone fragments from
heat [illegible] 6 in. 407 St
[illegible] (+/-).
The area of the
hearth was app
24 x 30". Flecks
of charcoal (?) or
[illegible] from
roots of old anchor.
that was once on
site. Probing of
the fireplace area
indicates under
sand on down, and
troweling of soil
under fire stones
showed no evidence
disturbance of soil
We estimate the stone
amount of [illegible]
75 #.

? ? ?

Measurement of Paint,
Fireplace 8½" & 7"
Name of people with other points
Ketchum

Township Range, Section
Part of the east ½ of NW ¼ 26 SE
Quarter of Section 7 Township 58 north
Range 35 W
Andrew Co
Distance from south El. wall ?
of last fireplace ?
21'   56 out

Whif creek below ?
Dillon Creek

Size of house
36 x 80

Distance from point East
summit of hill 45' OVER

---

ranch
~~[illegible]~~ [illegible]
The fireplace at
NE Cor of house
was ~~[illegible]~~
replaced in
[illegible] [illegible] and
covered [illegible]
[illegible] of the
Starke.

> > ?

Measurement of paint
[illegible] 8 1/2" + 9"

Name of people with other paints
——— Ketchum

Townships Range, Section
Part of the east 1/2 of NW 1/4 [illegible] SE Quarter of Section 7 Towns 58 north

Distance from south wall of lost fireplace?
21' 56 out

What creek below?
Dillon Creek

Size of house
30 x 80

Distance from point East to summit of hill 45' over

Range 35 W Andrew Co

---

hearth
~~[illegible]~~ stone in
the fireplace at
NE Cor of house
was ~~[illegible]~~
replaced in
fireplace hole and
covered up by [illegible]
[illegible] of the
Stanley.

How much was the ridge at south grade off at center. 1' or less

Spears laying flat?

Name of machine operator?
Amos

Has hill ever been cultivated?
Corn several years – the apple orchard > first

Distance to creek on north?

How far to outcropping to the N.W.?

Knapp Cat Co.?

The point [illegible]

[illegible]

Were blades spears polished? –

~~The points were~~
~~by side~~

The points were side
by side in the top of
the scoop load with the
loose dirt caving falling
away [illegible] & expose
them. They were all
pointing southward and
those present believe
that their original
position in the ground before lifting
to the surface was
the same. [illegible]
[illegible] because of the

Were blocks spears
polished? —

How much was the
ridge [illegible] swell graded
off at center : 1' or less

Spears laying flat?

Name of machine operator?
Amos

Has hill ever been cultivated
corn severly [illegible]
archeologists?
Distance to creek on north?

How far to outcropping to
the N.W.?

Knapps C

I have made several phone calls and [illegible] to [illegible] Stanton, near home on [illegible] Hill [illegible] Wheeler, [illegible] / did not [illegible] Point.

[illegible] member [illegible] knows where [illegible]
[illegible] Mike to check further.

April 23 Unable to attend the
Spring meeting of the [illegible] & the
Check Lee at [illegible] Charles Mo.
I asked ~~[illegible]~~ Mike Fischer to
Look to Eichenberger re
possibility of making
copies of all four spears
On return he said that
Eichenberger was [illegible]
under with work and
did not know [illegible]
he could [illegible]
no.

Stanton would call
when he located the
other two remaining spears
so that I can measure
and photograph them.

I mentioned the
possibility of having all
four cast in plaster
for exhibit at SD Jos Mus.
(If we are unable to get originals)
Or if necessary to barter for
the originals. Or —
if it is the only way that
we can have for exhibit.

Check with Eichenberger
as to possibility and cost.
Time required if
he will or can do it.

Stanton would call
when he located the
other two remaining spears
so that I can measure
and photograph them.

I mentioned the
possibility of having all
four cast in plastic
for exhibit at St Jos Mus.
(If we are unable to get origin
Or if necessary to barter fo
the original. Or —
if it is the only way that
we can have for exhibit.

Check with Eichenberger
as to possibility and c
Time required if
can do it.

I have made several phone
calls and two trips to
Stanton's new home on Hoppelmy
Hill to get latest info on
whereabouts of other two
points.

Charles F. [illegible], an arch S.
member, knows where the other two
Points are according to Mike Fisher.
I asked Mike to check further —

April 23 Unable to attend the
Spring meeting of the Mo
Arch Soc at St Charles Mo;
I asked Mike Fisher to
talk to Eichenberger re
possibility of making
copies of all four spears

On return he said that
Eichenberger was "snowed
under with work and
did not know when
he could do it for
us. If and when

he could, however
it would have to
be done through the
Mr. [illegible] [illegible]
dept and there might
be little or no charge

May 15 Phone call from
Mike Fisher He has a
letter from [illegible]
saying that he may
be able to start on
our spoons in a
week or so! Only
at a time. Send only
with measurements
etc of the rest.

May 16 Reached [illegible]
on phone. Explained
situation. He has not
yet been able to get

the two spoons and
cannot give name of
person or person that
have them. (It is
doubtful that he has
made much effort
to get them back.
(He will call around
and will call back.
I phoned and back.
I mentioned possibility
of getting copies and
the necessity for prompt
action.

He returned phone call
two hours later - the
name of the person
that may have one
the spoons is
Quentin K
RFD #
Wood

other two spears and can not give name of person or persons that have them. (It is doubtful that he has made much effort to get them back.)

(He would "call around" and phone me back.

I mentioned possibility of getting copies and the necessity for prompt action.

He returned phone call two hours later — The name of the person that may have one of the spears is:

Quentin Ketchum (T. 371H)
RFD #3 (233-1922
Works for Water Dist #1

he could, however it would have to be done through the Mo. [illegible] dept. and there might be little or no charge

May 15 Phone call from Mike Fisher. He has a letter from [illegible] saying that he may be able to start on our spears in a week or so! One at a time. Send one with measurements etc. of the rest.

May 16 Reached Stanton

Stanton wants me to go with him to explain to Ketchum.

Sun, May 16 With Ralph Stanton went to see Quentin Ketchum 233-1922 (North of bank on W side of 37) Ketchum will contact his work partner that has the fourth spear and call tomorrow.

Mon 5-17 Call to Ketchum. Wife would have him call back at 7:00 P.M. No return call

Tues 5-18 Call to Ketchum — Not home. Called back 11:00 PM He can not contact 4th party. (½ breed Indian — Name: ____ Roach. Lives at Frazier, Mo., Construction helper. Was assisting backhoe operator when spears were discovered.)

Ketchum says that Roach reached in and took one. Ketchum stated that he would like to have the one and Stanton gave him one. Ketchum says he may have to go down to the Judge and talk to him. I am to phone him tomorrow night at 10:00 PM. Ketchum afraid to mail spears fearing Breakage. Stanton was also concerned —

5-19-76 (Wed) 10:30 PM Ketchum phoned. No luck in contacting Roach "Will not return call" Ketchum suggests we go to see him. Take black top north from

Stanton want me to go
with him to explain
to Ketchum.

Sun, May 16 With Ralph Stanton went to see
Quentin Ketchum 233-1722
(North of bank on W side of 371)
Ketchum will contact his
work partner that has the
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Not home. Called back 11:00 PM
He can not contact 4th
party. (1/2 Breed Indian -
Name: ____ Roach. Lives
at Frazier, Mo. Construction
Wilson. Was associated

Kitchem says that Roach
"reached in and took one"
Kitchen stated that he
would like to have one
and Stanton gave him one.
Kitchen says he may
have to go down to his
place and talk to him.
I am to phone him tomorrow
night at 10:00 P.M.
Kitchem afraid to mail
spears fearing breakage.
Stanton was also
concerned —

5-19-76 (Wed) 10:30 PM
Ketchem phoned - No
luck in contacting Roach
"Will not return call"
Ketchum suggest that
I go to see him.
Take black top road
north from just ~~east~~ west

Thursday May 20, evening. 238 3413
Rooch. No answer. Called to
Fri 7:30 PM Went to Miller ㉑
place on 169. Roach not
at home. Told Ches I would
return Sat AM. (They said he
would be at home then
64240
Sat 9:30 AM 64219
To Miller place on 169
Roach not home
㉑

east on 169 highway)
of Opals restaurant.
First house on ~~north~~ left
after turning north.
He lives with Jerry
Miller.

5-20-AM Phoned Allen
Eichenberger. Other work
started – Can go ahead with
ours when it arrives because of
it being borrowed. Prefers one
at a time but will take all 4
if brought to him. Would take
about a month. Can make
10 copies per model. 8 of
these are supposed to go to
M.V. He thought Carl Chapman
might take fewer copies
so we could provide
copies for loaners. (Full
set for Stanton and copy of
single loaned by Kitchen
and Roach (1 copy ea)

east on 169 highway
of Opals restaurant.
First house on ~~north~~ left
after turning north.
He lives with Jerry
Miller.
5.20-AM Phoned Allen
Eichenberger. Other work
started — Can go ahead with
ours when it arrives because of
it being borrowed. Prefers one
at a time but will take all 4
if brought to him. Would take
about a month. Can make
10 copies per mold. 8 of
these are supposed to go to
M.V. He thought Carl Chapman
might take fewer copies
so we could provide
copies for loaners. (Full

---

238 3413

Thurs May 20, evening - Calls to
Roach. No answer —

Fri 7:30 PM Went to Miller (21)
place on 169. Roach not
at home. Told them I would
return Sat. AM (They said he
would be at home then

64240
Sat 9:30 AM 64219 (21)
To Miller place on 169
Roach not home

2-23-76
+
2-24
Andrew Co.?

Jim Fehr
Route #2

S & W of Hoffelmeyer
Hill site

Basement excavation

Red slab limestone at
east center of basement
starting at about or
just below plow
zone and continuing
on down to ——
below present day
cross level of
Hill. Charcoal lay
pieces with fired stone

Hill once in orchard
Peach seeds in burrows

For years cultivated
and subject to
erosion in those

West 1/2 of the South 1/2 of the S.W. Cor. of Sec. 7 Andrew Co., Mo.
Township 58 N Range 35 W

years

Slab limestone (burned) to northwest of near edge of hill has evidently been dug by vandals at some earlier time. Probing of immediate area shows additional stone at a level of app 2 feet. Burials?

Pottery to south (below) in eroded area is grit tempered and with plain tan surface. Contour and arc of this one sherd indicate diameter of app

12" or more.

Numerous chert chips & flakes

No bone material found associated with the firestone and charcoal in basement — The basement excavation is to the south some 30' from the now highest point of the loess hill which would have been even higher at the time of Indian occupation. Could this have been a Nebraska house mound dug in the lee side of the hill??

Red quartzite rubbing
stone (grinding mano)
palm size (photo)
found at 24" depth
to side of fireplace
area.

E.K. Castle owned
property prior to
John. Stones ~~on~~
~~on~~ to west of basement
(photo) were from
an Indian grave
dug by Castle some
c. 40 years ago
(75 years old now
still has some paint
found in grave
Spear point 5 or 6"
long. Mr. Castle
told Jim John

That he dug several
items from the grave
Bow ??
spear point
Feathers ??
Head dress !??

More flint chips, pottery
sherds and some smaller
pieces of funnel-lined
stone on face of steep
slope to south of fire-
place area

Three grinding stones
(irregular

For lack of I.P. artifacts the tribal connection of this site cannot be determined at this time. The arch. Soc. has been asked to dig a test square on the slope below the site. This may be done later on if so could produce pottery etc.

ACK TO SITE LEHIC

Mar 24 - 76

Call from Ray Charles
to museum 2:30 PM
Re Lehi site —
Uncovered skull
to N.W. of corner
Basement at 13'6"

Grinding stone —
(Bottom piece) found
immediately [illegible]
some 18' from fire
place area #1
of recent dig.

ALL TO LEHR
SITE

Mar 24 - 76

Call from Ray Charles
to museum 2:30 PM
Re Lehr site —
Uncovered skull
to N-W of corner of
basement ~~#~~ 13'6"

Grinding stone
(bottom piece) found
immediately north
some 18' from fire
place and # ___
of recent dig.

For lack of I.P.
artifacts the tribal
connection of this
site cannot be
determined at
this time. The a
has been an
dig a te
on the
the
be

Mar 25 Thurs

2nd skull to west of 1st

Bottom portion of burial missing Badly deteriorated

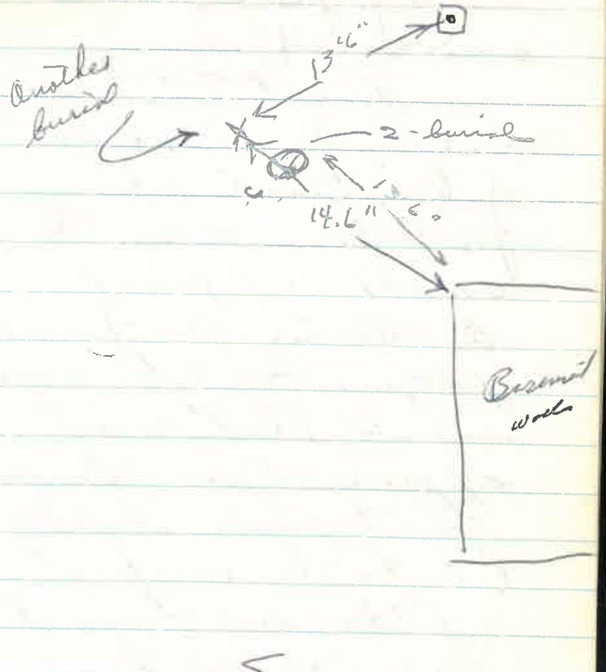
1 adult + 1 juvenile
adult teeth well worn
juvenile (?) little wear

Measurement of the adult humerus app 12"

No measurable bones on the juvenile.

Juvenile? 3 (small ribs - new - & teeth showing little wear —
Thru skull

X1



5

Pottery fragment with
some black design
was found 18' feet
north of west end
of basement. Also
found there was the
small red point.
A strata line of rock
fragments (fire reddened)
is at that point
exposed in the bank
about 1' in depth
(7' to the northeast
of the west pad
for car port.

Both skeletons were
removed after
photography and
re-buried at a point
to the west of the main
burial area.

Neither skeleton was
complete. The adult
was missing all bones
from the rib cage
down.

The juvenile was
only a skull and upper
body bones. The burials
had been disturbed
either by [illegible]
random digging
or possibly agricultural
disturbance. (orchard
and garden use)

Both skeletons were removed after photography and re-buried at a point to the west of the main burial area

Neither skeleton was complete. The adult was missing all bones from the rib cage down.

The juvenile also had only skull and upper body bones. The burial had been disturbed either by ~~persons~~ random digging or possibly agricultural disturbances. (orchard and garden use)

Pottery fragment with some burnt design 18' feet was found north of west end of basement. Also found there was th small red paint. A strata line of rock fragments (fire redden is at that point, exposed in the bas about 1' in depth (7' to the northeast of the west pad for car port.

Sex of the two individuals
not determined – Sacrum
bone, missing [illegible] –
skull base badly deterior-
ated on both.

Burial depth appx 36" ?

Tues 3-30-26

Tehr site

Call from Jim Tehr on 3-29 – 2 more skulls

Burial # 3

Measurable bones

Femur 16"
Humerous 11½"
Clavicle 5¼" ?
Tibia 14" ?

Root through rib cage

Excavation time 9am - 2pm

22" depth from present surface

Head to south
Flexed burial

1 pc cord marked grit temp pottery 5" above bones

Burial #4

18" depth from
present surface

Part of head struck
handle (i.e. most 12"

~~Head to south~~

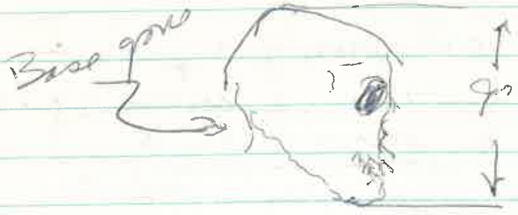
~~Flexed~~

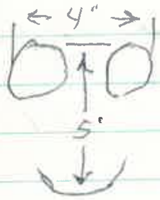
Disturbed — Possibly
by cultivation & orchard
planting

Juvenile (small ribs

No Shell

Vertebrae & part of femur





Remaining portion of ossuary
flat

Burial #4

18" depth from present surface

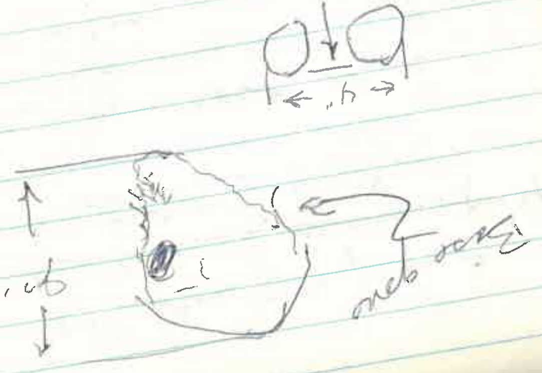
Pot ~~sherd with~~ handle to most 12"

~~Head to south – Flexed~~

Disturbed — Possibly by cultivation or orchard planting

Juvenile (small ribs

No Skull
Vertebrae & part of femur



Remaining portion of sacrum flat

Basement size
24 x 40 (E+W

Burial #5

about 1' in depth
from present grass
surface. Head
to south. Flexed

Bank Area
Grading to establish
proper slope to north
of carport —
A line of burned
limestone about one
foot below the present
grass surface continues
from a point just
to north of the original
fireplace area to,
and possibly somewhat
into, the area of

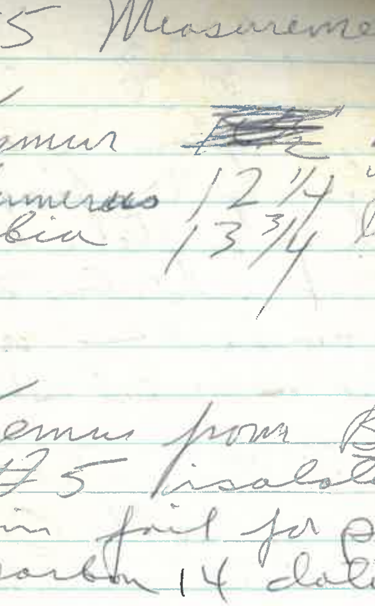
Burial #5. This burned stone in sizes from pea size up to fist size. They softened lime stone nodules rounded — and fire reddened slab pieces.

Plattsmouth lime stone from the Oread formation. This limestone can be found in a strata ~~on~~ at the base of the hill on the north, south and west some 60 feet below the site.

#5 Measurements

Femur	17"	
Humerus	12 1/4	upper arm
Tibia	13 3/4	long bone lower leg

L.H. Femur from Burial #5 isolated in foil for possible carbon 14 dating



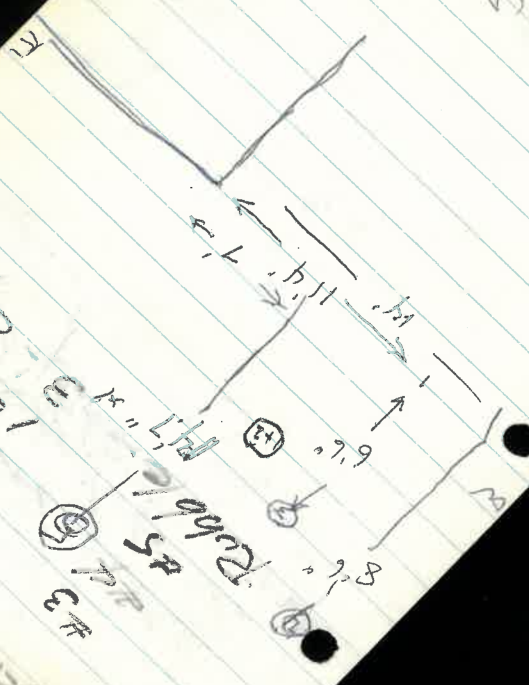
Liv. Rm. Stob.. 2'5"

#3 2nd 2'6 1/2"

#5 Rubble 2'1 1/2"

11'10 1/8"

H7" x 3'-0"

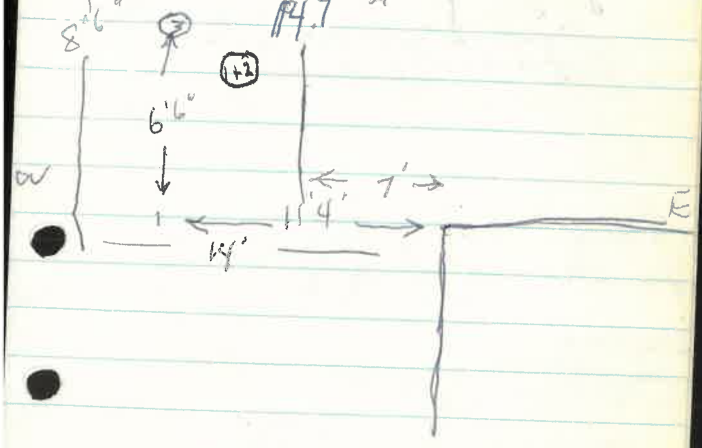


Columns 5

22 steps We

Liv. Rm. Slab. - 2'-5"

#3 2'-4½"
#4 2'-1½"
#5 1'-10⅛"
Rubble 3'-0"

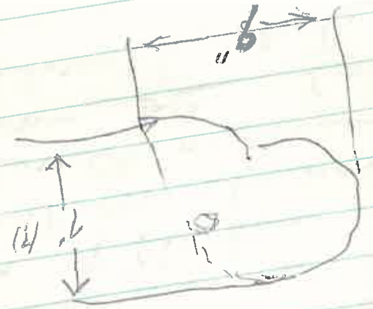


Returned 24 steps West of #5

#5 Measurements

Femur 17" upper arm
Humerous 12¼
Tibia 13¾ lower bone forearm

L.H. Femur from Buria
#5 isolated
in foil for possib
carbon 14 dating



#5 burial

Section of grey chert

point found in pelvic area - (Just above in front of 5th ~~[illegible]~~ lumbar vertebrae

---

Where was Harder pit found? near [illegible]

✓ How far north was spring? 100 yds [illegible] 30 mi. down in [illegible]

to what are #5 ornaments related to? [illegible]

✓ Draw in highest point on map.

✓ Metate made of ~~sandstone~~? (Quartzite or [illegible]?)

Photos needed yet.

Section of point from abdomen of Burial #5

Sunburst pottery ca. 2 in 18' N of fireplace

Pottery w/ handle from #4

What color quartzite were manos

What size were fireplace st

(over

#5 Burial
Section of grey chert

point found in
area – [illegible]
from [illegible]

Where was broken pot found?
near ~~Sunburst~~

✓ How far north was spring? 100 yds
30 000'
down in west end

To what are #5 on map related to?
~~[illegible]~~

✓ Draw in highest point on map.

✓ Metate made of ~~sandstone~~?
(Quartzite) (~~or quartzite~~?)

Photos needed yet.
Section of point from abdomen of Burial #5
Sunburst pottery ~~from~~ sec. 2
18' N of fireplace
Pottery w/ handle from #4

What color quartzite were manos?
What size were fireplace stones
(over)

Were other grave stones at site (other than on point) the
others than those over the [illegible]
when we came there 8 years ago

Exactly where was the sunburst pottery and archaic point found 18' W of W end of basement? ; (Or was it the east end of basement?)

? Size of sunburst shard

Partial notes
on Lehr site
in Lower Bluffs W.
of K highway).
Report made and
submitted

CANON HOLLOW
(Partial report)
2-76
Don. K.

I was sent to this site by the St. Jos Museum to make a preliminary surface search. They had been contacted by the MAS.

I sensed a distant attitude – even a reluctance to cooperate. Went ahead anyway – a partial look-see –

(acid pollution problem I later learned)

Submitted to M.A.S. by Chas

3-76 + 2-14-76

Harold Ellis
plant manager

Tomahawks

Hoe

Arrowhead

Some pottery
Orange
"Spooned"

Will bring to plant on Sat.

Hard Layer 4-6" down

Canon Hollow
4½ Mi N of Ford City

Canon Hollow rd goes
east & BB from 111

On south end of
trailer about 1300'
east of 111 highway

On property owned
by Schuylkill
Mellon Corp

SW 1/4 Sec 12
T 60 N - R 39 W
Holt Co. Mo.

1 To 2" removed
from parking lot
area

Spring near pond
to east of exposed
portion of site. this
area was peeled
with grader in prep-
aration for parking lot.
Mr Ellis said no
more than 2 to 3" inch
was removed.

① 25# red quartzite
stone found near
pond (when dry)
stones are flat
polished sides.

On south side of
hollow about 1300'
east of 111 highway

On property owned
by Schuylkill
Metals Corp

SW 1/4 Sec 12
T 60 N - R 39 W
Holt Co. Mo.

1 to 2" removed
from parking lot
area

Spring near pond
the east of exposed
portion of site, this
area was peeled
with grader in prep-
aration for parking lot
Mr Ellis said no
more than 2 & 3" inch
was removed.

⊙ 25# red quartzite
stone found near
pond (when dry)
stones are flat
polished sides.

Bob Doebbling
presiding judge
Dr Bullock
was in Oregon
died about mid 40's

Dr Calkin has part
of the collection

Frank ~~Hall~~ Milne
in Oregon was a
nephew of Dr Bullock
" he has some of collection
lives south of football
field

Bob Doebbling has
"rag top collection
"one man Comahawk'
(Kimsey)
Neyl creek valley south
has more in it than
Cannon Hollow

on the property owned
now by Shelby Steel Metal
corp.

Herby Sparks
~~South of~~
Oregon, Mo.
has collection
90 years old
no relatives

Rock house
South of Forest City
Above Route # T
South of Forest
in cut east of Forest City
5 miles south

Log 11
1-4-77

after Jan 1, 1977

Leonard Blake will
be doing identification
& analysis of archeological
plant remains through
the Dept of Anthropology at
Washington Univ on a
voluntary basis.
His address will be

Box 1114,
Dept. of Anthropology,
Washington Univ.
St Louis, Mo. 63130

True Davis dig
Thurs, Apr. 16, 1981 Don R

At 5:10 P.M. a call from
True Davis to Don R.
Not home but returned
the call on arrival at
5:15.
Indian bones had
been found when digging
a trench for a new
porch at the rear (east)
of his home at 7601
N Belt. "Buttons, beads,
and metal found."
At 5:30 P.M. Don R
to 7601 to investigate.
A foundation trench
had been opened by
the Routh Const. Co
and was ready for
concrete pouring.

Reinforcement rods were in place and grade stakes driven. I talked with both Mr & Mrs Davis. They showed me bones that had been dug out and also the metal buttons and and ornaments. Several rusted pieces of metal one of which appears to have been a knife. A white stone and a gun flint were among the items taken out during the trench excavation. also some two dozen glass beads of assorted sizes. The Davis's said That they were told That the skull was just within the corner of the trench edge!

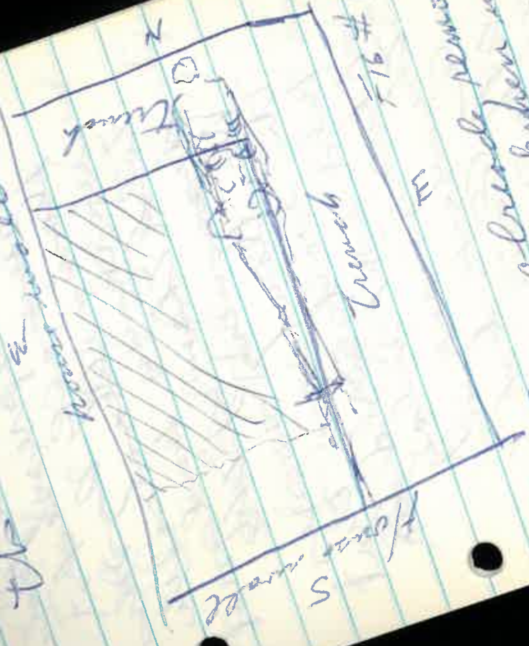


Fig #1

Bones already removed by the workmen were in a dust pan set aside from the work area. They appear to be portions of femurs and arm bones. Two

Reinforcement rods
were in place and
grade stakes driven,
I talked with both
Mr & Mrs Davis. They
showed me bones that
had been dug out and
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and and ornaments.
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during the trench
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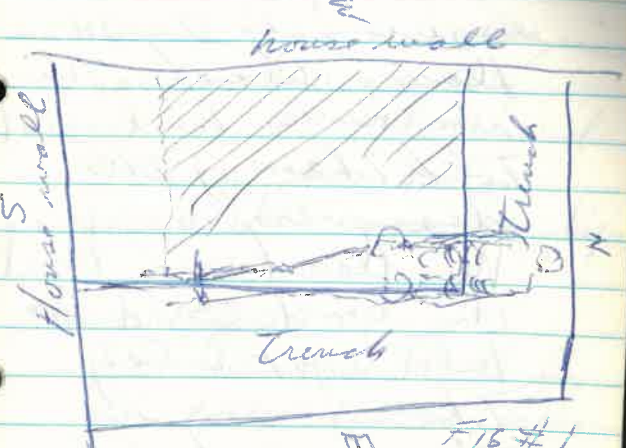

FIG #1

Bones already removed
by the workmen were
in a dust pan set
aside from the work
area. They appeared
to be portion of femurs
and arm bones. Two

lower mandible
and portion of
the skull were
also in the pan.
Some dissatisfaction
was expressed,
especially by Mrs
Davis because the
workmen had not
told them of the
discovery sooner.
Mr. Davis said that
the work could be
held up Friday
thus giving us
the week end to
dig (Easter week-end)
When we are through
they would prefer
that the bones be
buried away from
the house at some

other place on this
property.
Kaustal Const Co.
I contacted Michael
Fricker, Pres. of the
local archeological
Soc., at his work
place at K.Q.T.V. and
asked for help
from their membership.
Fri. April 12-81
To 1601 N. Bell by
7:30 AM with tools
shovels screens etc.
Present were.
Don R. (Wiss.)
Mike Fricker (Arch Soc)
Rich Richard Snow (Wiss)
Stanley Kozak (Wiss)
Frank Pringo (Arch Soc)
Paul Pringo "

lower mandible
and portion of
the skull were

---

other place on this
property.
Kautth Const Co.

I contacted Michael
Fisher, Pres. of the
local archaeological
Soc., at his work
place at K.Q.T.V. and
asked for help
from their membership.

Fri April 17-81
To 7601 N. Bell by
7:30 AM with tools
shaker screens etc.
Present were:

Dan R (Mus.)
Mike Fisher (Arch Soc.)
Keith Richardson (Mus.)
Stanley Kovack (Mus.)
Frank Punzo (Arch Soc.)
Paul Punzo "

Screening slow
just to clear away
dirt piles blocking
dig area. Dry
screening not
successful since
window screen
was needed to separate
the small size
beads and it would not
pass the damp
soil. One screen
was rigged for water
screening. An
average of 5 or any
beads per two
shovel batch
could be washed
out in this manner
Screening a slow process
with use of water but
productive.

Mike Fiske and
Paul & Frank Pungo
could only stay
until 10:45.
Stanley Novak worked
until 2:00 PM at
which time Keith
Richardson and myself
broke for lunch.
At 3:00 PM. Jerry Lyon
a Central H.S. Junior
came (Arch Soc member)
and he and Richardson
screened the rest of
the P.M. I dug
the over Burden to
of the Burial of the
within 2" of the
estimated level of
the remaining Bones
Quit work at 4:50
To go to 914 Penn to close
out the Pony Express Museum

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Paul & Frank Pungo
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Screening started
just to clear away
dirt piles. Blocking
dig area. Dry
screening not
screens for s
window scr
needed to s
was The small
beads and it
pass
soil
was nig
ac

Sat, april 18

Jerry Tyson
Route #1
Easton, Mo. 64443

Chuck King, another member of the arch. Soc. was unable to come as planned this AM.

Don. R to 7601 N. Bell by 7:30 AM. Photographed dig progress after first cleaning away loose dirt that had fallen into the hole over night.
Cloudy, threatening rain. Need for tarps. Locating plastic sheeting.
Had dug to 24"

depth on Friday (2" or 3" above the estimated top of bones. Did not expose bones due to children playing in area after we were to leave. By 9:30 AM. down another 1½ or 2". Darker dirt and burial area and bone fragments indicate that the skull was well across the E-W trench instead of in the corner as thought by the workmen. (Sketch #1) The dark soil of the burial area is at a N-NE by S-SW angle across the corner of the foundation trench. Most of depths on Friday (2" or 3" above the estimated top of bones. Did not expose bones due to children playing in area after we were to leave. By 9:30 A.M. down another 1½ or 2". Darker dirt of burial area and bone fragments indicate that the skull was well across the E-W trench

Seeing #1

instead of in the NE corner as thought by the workmen. The dark soil of the burial area is at a N-NE by S-SW angle across the corner of the foundation trench. Most of

---

Sat, april 1st
Jerry Tyson
Route #1
Easton, Mo. 64443
Chuck King, anoth
member of the o
Soc. was w
to come a
This A.M
Don
by
ee

The bones were
removed with the
soil from the trench.
Remaining Bones -
the femurs, lower leg
bones and foot of
the right leg are
in the very edge
of the west side
of the N-S foundation
trench. The lighter
clay surrounding the
dark soil of the
immediate burial
area appears to
be sterile so a
trowel may be used
since haste in
completing the dig
has been requested
by contractor Routh.
(He complained in a
loud manner about
the delay last night.
Blamed me, or us,
or whoever, for 3
weeks delay." I
told him that we were
only using one working
day at this time - Today
and that he should see
Mr. Davis with any
such complaints. He
backed down and said
no more. His son
apologized for him.)
11:00 AM found leg bone
and foot uncovered
bills of the RH were
removed and that pel-
vis removed. Bones were
soft. Cleaned over
Burial area f

loud manner about
the delay last night.
Blamed me, or us,
or whoever, for a
"weeks delay." I
told him that we were
only using one working
day of his time - Friday -
and that he should see
Mr. Davis with any
such complaints. He
backed down and said
no more. His son
apologized for him)
11:00 AM Lower leg bones
and foot uncovered
and based out very
little of the RH. pelvis
remains and that pul-
verized. Bones very
soft. Cleaned up
burial area for

The bones were
removed with the
soil from the
Remaining
the femur and
bones and
the right
in the
of the

photography.
Jerry Lyon worked
in P.A.S. screening
(Water)
The right leg bones
as described are the
only bones remain-
ing of the burial
the remainder of the
body having been
dug out in fragments
with the soil
of the trench by
the contractor's
workmen. These
remaining bones
will be taken out
and all soil around
them water screened
for burial objects.
Not enough of either
the skull or the

Pelvis remains to
determine the sex
of the individual.
Probably male con-
sidering the burial
items.
Both Mr. + Mrs. True
Davis - each at diff-
erent times - saw
the exposed burial
after excavation and
each expressed their
dissatisfaction of
the way the trench-
ing was cut through
more than one-half
of the burial
without their know-
ledge. It is appar-
ent that the foot
trench cut off
half of the b

Pelvis remains to determine the sex of the individual. Probably male considering the burial items.)

Both Mr. & Mrs. True Davis - each at different times - saw the exposed burial after excavation and each expressed their dissatisfaction of the way the trenching was cut through more than one-half of ~~[illegible]~~ the burial without their knowledge. It is apparent that the footing trench cut off one-half of the body

---

photography.
Jerry Lyon worked
in P.A.L. screenin
(Water).
The right leg bo
as described a
only bones
ing of the
the remo
Body

lengthwise and
all of the upper
portion including
most of the pelvis.
Not only did the
trench cut through
the burial but
the side of the trench
next to that portion
still undisturbed
was undercut by
some pointed object
as if to pick out
bones and/or
grave goods.
Also two probe
holes were noticed
during the excavation.
It should be noted
that Mr. & Mrs. Davis
notified the St. Joseph
Museum of the

Burial discovery
Just as soon as they
learned of it.
This in spite of
some added expense
to themselves, possibly,
because of one day's construction
loss in
time. (More than one
day according to the
contractor)
Mr & Mrs. Davis have
verbally agreed to
give the Burial
items (beads, gun
flint, metal knife,
ornaments, etc.) that
are found in the
excavation to the
St. Joseph Museum
We have agreed to
bring the bones

lengthwise and
all of the upper
portion including
most of the pelvis.
Not only did the
trench cut through
the burial but
the side of the trench
next to that portion
still undisturbed
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as if to pick out
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holes were notic
during the excav
It should be no
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the St. Jo

Burial discovery
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day according to the
contractor)

Mr. & Mrs. Davis have
verbally agreed to
give the burial
items (beads, gun
flint, metal knife,
ornaments, etc.) that
are found in the
excavation to the
St. Joseph Museum.
We have agreed to
bring the bones back

to their property
(after study of same
which could take
a year or so) and
re-bury them at a
spot of their choosing.
According to the con-
tractor's son the
Davis were warned
by them that if they
notified the museum
a delay in construct-
ion might result.
Mrs. Davis expressed
concern for the inad-
vertent disturbing
of the dignity of
the Indian's place
of burial because
of construction work

1:00 P.M. Reached
sterile soil on either
side of the remaining
leg bones. Femur
measured. app.
length as best as
can be determined
with the deteriorated
distal ends is
16". All assoc-
iated soil beneath
down to sterile
was screened.
All beads and other
artifacts will be
photographed in
the lab under more
favorable conditions
after these have been
cleaned. Had pro
Mr + Mrs Da

1:00 P.M. Reached sterile soil on either side of the remaining leg bones. Femur measured. app. length as best as can be determined with the deteriorated distal ends is 16". All associated soil beneath down to sterile water screened.

All beads and other artifacts will be photographed in the lab under more favorable conditions after they have been cleaned and prepared. Mr & Mrs Harris would

---

to their property
(after study of [illegible]
which could take
a year or so) and
re-bury them at
spot of their
according to
doctor's
tradition
by them
notify
a

Especially the sound
tools and ornaments, and
the beads. (See photos
on file, that etc)
We should contact again
Mr. Johnson concerning
the slides that we
sent to him of the
artifacts from that
Kansas site that
were brought to
the St. Joseph Museum
by the finders to
be photographed.
(We had asked for
information on the
same kind of ornaments
as those found in
the Dawn find etc.)

like, copies of certain of these
35 mm slides for
themselves. Also
an abbreviated report
should be sent to
them.

A descriptive report
and all 35 mm slides
will be kept on file
at the St. Joseph Museum
for study and reference
and to be added to
when and if further
information becomes
available.

Remarkable is the
similarity of the
grave items in this
burial and those
found in burials
on the Sunker farm
north of Sparks, Kan.

Especially the round trade ornaments and the beads. (See photo on file of that site) We should contact Mr. Johnson again for his comment on the slides that we sent to him of artifacts from that Kansas site that were brought to the St. Joseph Museum by the Sinkers to be photographed. (We had asked for information on the same kind of ornaments as those found in the Davis dig.

copies of —
likes certain of these
35 mm slides for
themselves. Also
an abbreviated repo
should be sent to
them.
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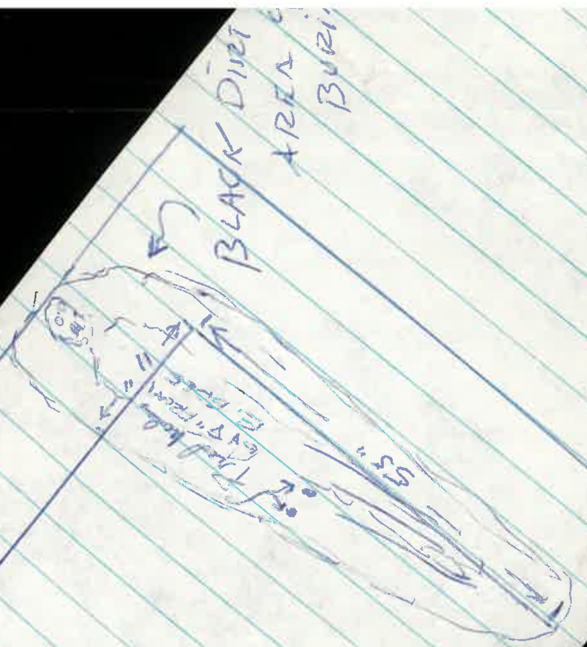
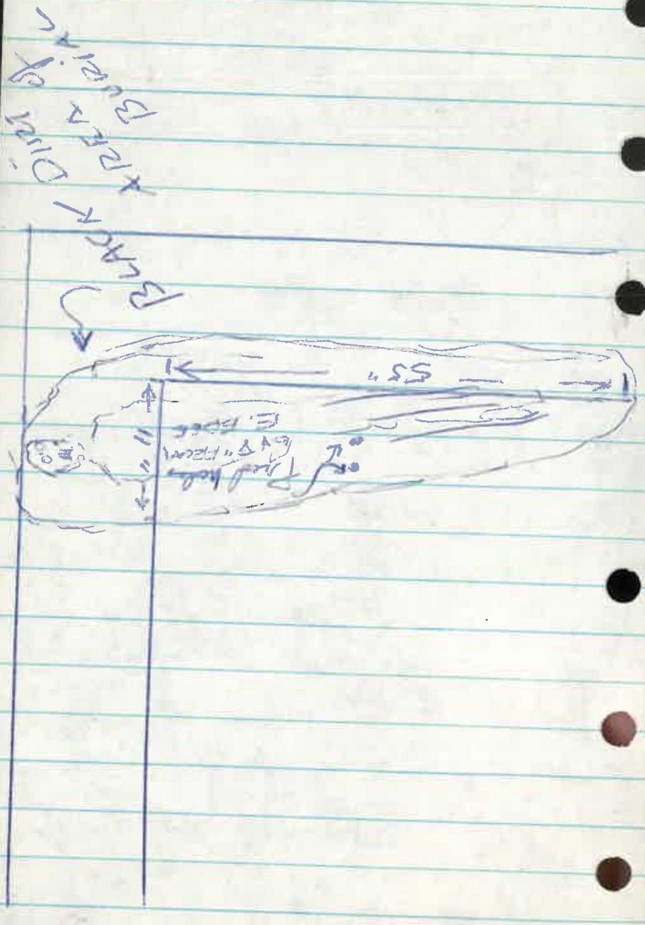


Completed dig at 3:00 PM.
The Bones, after
photography and study
are to be taken back
to 7601 N. Bell and
buried in the North
east corner of the
yard and a flat
stone placed above
them at the surface
of the ground.
Depth 2 feet.
This spot was
designated by
Irene Downs (and
is just SW of
the existing tree
there.



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stone placed
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UNIVERSITY OF MISSOURI-COLUMBIA

J. A. EICHENBERGER
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Mr. Mike Fisher
2519 Jackson Street
St. Joseph, Missouri 64500

College of Arts and Science
Department of Anthropology—American Archaeology

University of Missouri - Columbia

COLLEGE OF ARTS AND SCIENCE
Department of Anthropology
American Archaeology

~~Room 15 Switzler Hall~~
~~Columbia, Mo. 65201~~
P.O. Box 14
Saverton, Mo. 63467

Telephone
~~314-882-8273~~
314 221 8194

Mr. Mike Fisher
2519 Jackson Street
St. Joseph, Missouri

Dear Mike:

I hope I have your address correct. It is one that our Marion-Ralls Secretary had in his records.

Within a week or so I will finish my current project- that of casting the Packard, Oklahoma points. These points represent an interesting sequence- Agate Basin Points below Dalton with a date of 7456 B.C and along with the Agate Basin Points a Side-Notched point with smoothing in the basal concavity.

Before starting on anything else, now would be a good time to take on the large cache points you have access to. I would rather have them one at a time but along with the first an outline of the others. It is possible that a flask could be made that would accommodate all of them- that is if there is not too much difference in the sizes. We would of course want to have all of the known data that you have for the record.

The meeting at St. Charles was very good and well attended. I especially enjoyed the Shell Petroleum picture, But the main pleasure that comes out of these meetings is the renewing of contacts with people like yourself.

Even if there is to be a delay, please let me hear from you so that I will know the score.

Sincerely,

Allen

J. Allen Eichenberger
Research Archaeologist

Nebr Hist Soc

Do you have a problem in your community in terms of historic preservation? The Society will have representatives at the "One Stop Information Center" where state agencies will gather to provide information. This program will be held on November 1 at the Ramada Inn, Lincoln. This is the afternoon prior to Nebraska Community Improvement Awards Day. Further information on this event can be secured from the Department of Economic Development, Box 94666, State Capitol, Lincoln NE 68509.

The Colorado Magazine, Winter 1973, has an interesting comment in reference to history and its potential economic impact on a community which has a museum. "Bureau of Outdoor Recreation figures, substantiated by the Colorado Bureau of Business Research, show that an average of twenty-four tourists a day visiting a museum have an economic impact on the community equivalent to an industry with a payroll of $125,000 per year."

Archeological sites recently approved for entry on the National Register in Nebraska include

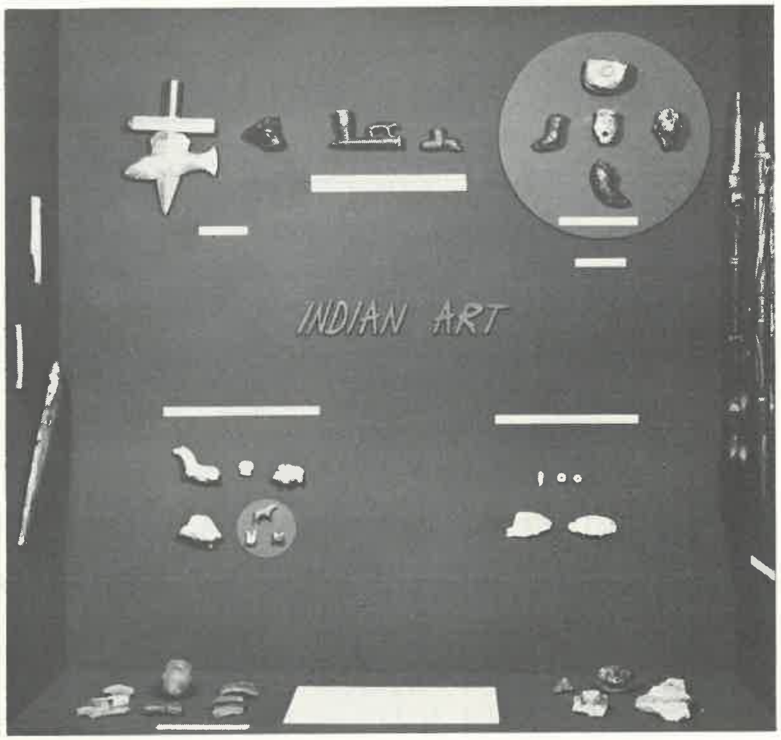
1. Wright Site, an early Pawnee village, Nance County.
2. Blue Springs Site, historic Pawnee village, Gage County.
3. Clarks Site, historic Pawnee village, Polk County.
4. Pahuk Hill, sacred area for the Pawnee, Saunders County.
5. Kurz Omaha Village, one of last native villages for the Omaha, visited by Swiss artist Rudolph Frederick Kurz in 1851, Sarpy County.
6. Omaha Big Village, historic Omaha, visited by Lewis and Clark, 1804, Dakota County.
7. Schuyler Site, early Pawnee village site, part of the site recently destroyed by a housing development, Colfax County.
8. Wes Stevens Site, tipi ring site of unknown age, Cheyenne County.
9. Hudson-Meng Bison Kill Site, currently under investigation by researchers at Chadron State College, has yielded "Early Man" projectile points, Sioux County.

Among recent visitors to Nebraska was Mary C. Means from the Chicago Midwest Office of the National Trust who was interested in seeing various historic structures in Omaha and Lincoln.

Jerry Rogers of the National Register Office, National Park Service, Washington, D.C., visited various historic sites in Lincoln and spoke at the Society meeting on September 15th.

The State Archives has received court dockets dating prior to 1900 from Franklin, Valley, Hamilton, Custer, Phelps, and Cheyenne counties. The Microfilm Division has completed filming Merrick County Board proceedings, 1864-1972, and abstracts of election, 1877-1972. Also microfilmed were records of the Uehling Congregational Church, 1906-1972.

Orientation to the resources and functions of the State Archives were provided to several groups during the month. These included students from Dr. Frederick Luebke's frontier history class at UNL; Dr. George Thompson's history class from Union College; and Dr. Virginia Corgan's class in business-teacher education at the University. On August 30 Manuscript Curator Donald Snoddy discussed the acquisition and preservation of historical materials at a meeting of the Platte County Historical Society in Columbus.



Indian art from the prehistoric period of 1100 A.D. to the early 1800's is featured in a new exhibit mater - ials used include stone, bone, shell, pottery and wood.

WITH THE SOCIETY

We were pleased to have so many of you attend the two-day meeting on September 14-15th. The workshop on Friday attracted an excellent group who represented a wide range of historic projects. One of the major problems in holding such meetings on the University of Nebraska-Lincoln campus is the limited parking space. We are already planning for a "bigger and better" session next year and hope to hold it off campus.

At the business meeting Saturday morning the membership reelected the following individuals to a three-year term on the Society Board: Edwin J. Faulkner, Lincoln; Charles W. Martin, Omaha; Warren C. Wood, Gering; and Nellie Snyder Yost of North Platte. They also elected Nes Latenser of Omaha to serve out the unexpired term of his late father, Frank Latenser, which terminates in 1975. At the later board meeting the present officers were reelected for a one-year term. They are:

President James A. Rawley
First Vice President Nellie Snyder Yost
Second Vice President M. S. Hevelone
Treasurer Arthur Carmody
Secretary Marvin F. Kivett

Recipient of the "James L. Sellers Memorial Award" for the article judged to be the most outstanding published in Nebraska History in 1972 was Professor Robert A. Trennert of Temple University, Philadelphia.

The Brownville Historical Society is the first recipient of the "Addison E. Sheldon Memorial Award" in recognition of the society's outstanding efforts to preserve and interpret Nebraska history. John Rippey, Jr., accepted the award as president of the society.

Nebr. Hist Soc Oct 1974

NU, will work under Archivist Joseph Svoboda in the program.

Plans are being made by the Nuckolls County Historical Society to move the 1884 Beach country school near Cadams to the Superior city park near the museum now under construction. Much of the original furnishings has been maintained.

A new wing on the Museum of the Fur Trade near Chadron was opened to the public in July. Director Charles Hanson reports that over $3,000 in money and material, with the Rotary Club a principal donor, has made the addition possible.

Elected officers of the Valley County Historical Society July 23 were Dale Zadina, Ord, president; Elsie Furtak, secretary-treasurer; E. P. Kapustka, Elyria, vice-president. The society is co-operating with Ord High School in interviewing long-time residents.

The Lodgepole Historical Society museum, only recently completed, will be the focal point for the town's 50th Old Settler Reunion on Labor Day. A Nebraska Historical Marker has been placed on the museum grounds.

WITH THE SOCIETY

With this issue is the preliminary program for the annual meeting to be held September 21 at the Lincoln Hilton. As you will note we have combined the workshop session with the annual meeting to provide a full schedule of activities. We will have full staff available as well as representatives of the National Park Service to be of service and consult on any particular matter. We even promise to report regularly throughout the afternoon on the football score.

Of particular significance at the luncheon will be the presentation of two special awards. The Addison E. Sheldon Award will be presented to Mr. Harold Warp "For Dedicated Achievement in the Interpretation and Preservation of Nebraska History." Mr. Warp as you know, is the founder of Pioneer Village at Minden.

The James L. Sellers Memorial Award will be presented to Professor Oliver Knight of the University of Texas. His article "War or Peace: The Anxious Wait for Crazy Horse," which appeared in the Winter, 1973, issue of Nebraska History, was judged the most outstanding for the year. If you are interested in Nebraska history you should attend this annual meeting. Remember that you do not have to be a member to attend so bring a friend. Reservations are necessary, however.

Staff Archeologists Gayle Carlson and Terry Steinacher were engaged from July 9-25 in the excavation of an earthlodge floor measuring some 42 feet square. The site in Indian Cave State Park was partly exposed by road building activities and was reported by Mr. Larry Cook, Park Superintendent. Limited artifacts from the house site suggest an assignment to the Nebraska Culture and may date back to 1200-1400 A.D.

Nebraska now has a total of 116 sites or structures on the National Register of Historic Places. The following are those most recently approved:

O'Fallons Bluff	Lincoln County
Horse Creek Pawnee Village (25 NC 2)	Nance County
Table Rock Archeological Site (25 PW 1)	Pawnee County
Mowry Bluff Archeological Site (25 FT 35)	Frontier County
Burkett Archeological Site (25 NC 1)	Nance County
Wurdeman-Lawson Archeological Site (25 PT 12)	Platte County
The Burlington Station	Douglas County
Pawnee Mission and Burnt Village Archeological Site (25 NC 14 and 15)	Nance County
Trinity Cathedral	Douglas County
Storz, Gottlieb, House	Douglas County
Wolfe Archeological Site (25 CX 2)	Colfax County
Schulte Archeological Site (25 CD 1)	Cedar County

Massacre Canyon Battlefield and 25 HK 13	Hitchcock County
Sweetwater Archeological Site (25 BF 1 and 25 SM 4)	Sherman County
Astro Theater	Douglas County
Bellwood Archeological Site (25 BU 2)	Butler County
Cornish, Joel N., House	Douglas County

Curator of Historic Sites Tim Turner attended the Cheyenne County Historical Association meeting at Lodgepole on August 5. He presented $6,000, a federal grant to the Association for the restoration of the Bachelor Officers' Quarters at Fort Sidney.

On August 25, Paul D. Riley, Research Associate, spoke at Old Settlers Day in Red Cloud on the early post offices of Webster County.

The State Archives has transferred assessment schedules and Tax lists from Kimball County, 1887-1963; and from Chase County, 1886-1961. In addition, county board proceedings, 1889-1964, and election records, 1897-1970, from Kimball County were placed on microfilm. The Manuscript Division has received papers of the late Clarence Davis who was Nebraska Attorney General, 1919-1923, and who served as Undersecretary of the Interior in the first Eisenhower Administration. The Henry J. Amen Co. records, 1904-1948, were loaned by the Amen family of Lincoln for microfilming. Mr. Amen's business has been an important part of Lincoln's German-Russian community and the firm's records provide insight into the development of Lincoln and this ethnic group. The Microfilm Division has completed filming the *Omaha Evening Bee*, 1893-1937.

On August 14, Karen Mander of Love Memorial Library visited the Society to learn about our organization and resources. Librarian Louise Small and State Archivist James Potter explained the operation of their departments and their relationship to the Society. We cordially invite other librarians to pay us a visit.

Among matters to be considered at the Society membership business meeting on Sept. 21 is a resolution passed by the Executive Board on May 3, 1974 to raise the annual membership dues from $2.00 to $3.00 effective January 1, 1975.

NEW MEMBERS

ANNUAL

Mrs. Robert A. Nelson, Albion
Ralph Bainbridge, Bristow
Bill Sunderland, Cedar Rapids
Butler Co. Historical Society, David City
Verneda Titzell, Fairbury
Floyd Tonniges, Gresham
Mrs. Beuford Wells, Kearney
Mrs. Dale G. Anderson, Lincoln
Ed Barthule, Lincoln
Mrs. R. J. Boyd, Lincoln
Sara Creamer, Lincoln
Mrs. Royd D. Schilling, Lincoln
Albert Schrekinger, Lincoln
Don Welke, Lincoln
Frank Hoyt, McCook
Mark Fenyo, Omaha
Harl R. Jarmin, Omaha
Paul C. Jensen, Omaha
Lester M. Schumaker, Omaha
Mrs. Edward J. Teets, Omaha
Louise C. Vacanti, Omaha
Valley View Jr. High, Omaha
William Britton, Oshkosh
Mrs. R. L. Bogard, Ralston
Mrs. Walter Tucker, Scottsbluff
Forrest Hesselgesser, Valentine
James L. Lynch, Hawthorne CA
John Ballard, Hemet CA
Mrs. Pete E. Corrao, San Diego CA
Dr. Tom Tonniges, Bridgeport CT
Claude Cramer, Buhl ID
Karen Vierneisel, Chicago IL
Mrs. Allan Mogg, Graylake IL
Thomas Mesner, Iowa City IA
Mrs. Gilbert Mansen, Irwin IA
Rick Pryor, Covington KY
William B. Boyer, Minneapolis MN
Kay Wilke, Spearfish SD
Macseen M. Zimmerman, The Dalles OR
John R. Sillito, Salt Lake City UT
Mrs. G. A. Roulston, Cheyenne WY

EXPLORER WINTER 1972

OHIO HOPEWELL TRADE

GARY A. WRIGHT
Department of Anthropology
State University of N. Y. at Albany

Two burials from Mound City showing mica cutouts from the Appalachians, and a marine shell from Florida.

ONE OF THE MOST FAMOUS of the prehistoric cultural developments of the eastern United States is generally termed *Hopewell*. Prior to a few years ago, particularly in Ohio, little was known about Hopewell except that they buried their dead in mounds, constructed earthworks, had well-decorated pottery, imported exotic raw materials, and had a highly developed art and complex ceremonial system directed apparently toward mortuary activities. It was generally assumed that there was a single Hopewell Culture, since many of the cultural traits diagnostic of Hopewell were found in areas as far apart as Missouri, New York, and Florida. The center of this Hopewell Culture was to be found in the Scioto valley, Ohio, because the "purest expression" of these diagnostic traits was seen here.

More recently, there has been a trend away from considering Hopewell as a single cultural system. These regional variations, for example in the Illinois valley, the Scioto valley, southern Wisconsin, and elsewhere, are now interpreted as different cultural systems. It is clear that the level of cultural complexity was not the same in, say, Ohio as in Illinois. There are major differences in how people in each area were organized to exploit their environments, in utilization of surplus goods, and in social organization, even though they show certain stylistic features in common such as ceramic designs. Attention is now being focused on how the prehistoric inhabitants in each region interacted with their respective natural environments, among themselves, and with their neighbors. Here, we will examine one aspect of Ohio Hopewell, their long-distance trade, and how it affected other parts of the local cultural system.

Radiocarbon dates indicate a time span for Ohio Hopewell from about 200 B.C. to A.D. 500. These C-14 dates and ceramic studies by Dr. Olaf Prufer suggest four principal phases. The relative chronology and some of the best known sites arrange in this fashion according to Prufer:

Latest Hopewell:	Hilltop enclosures
Late Hopewell:	Turner, Newark, McGraw
Middle Hopewell:	Seip, Howell, Harness
Early Hopewell:	Tremper, Mound City (some mounds)

In some respects Ohio Hopewell is indeed the apogee of this cultural development. In south central Ohio are found the largest earthworks of this time period. They may have walls up to five feet in height and enclose ten to hundreds of acres. Inside and near these earthworks there are mounds containing burials of individuals with large quantities of exotic raw materials and craft items placed in the graves as gifts. For example, at the type site, the Hopewell Mound Group, Ross County, the earthwork encloses 111 acres and includes within it twenty-five major burial mounds.

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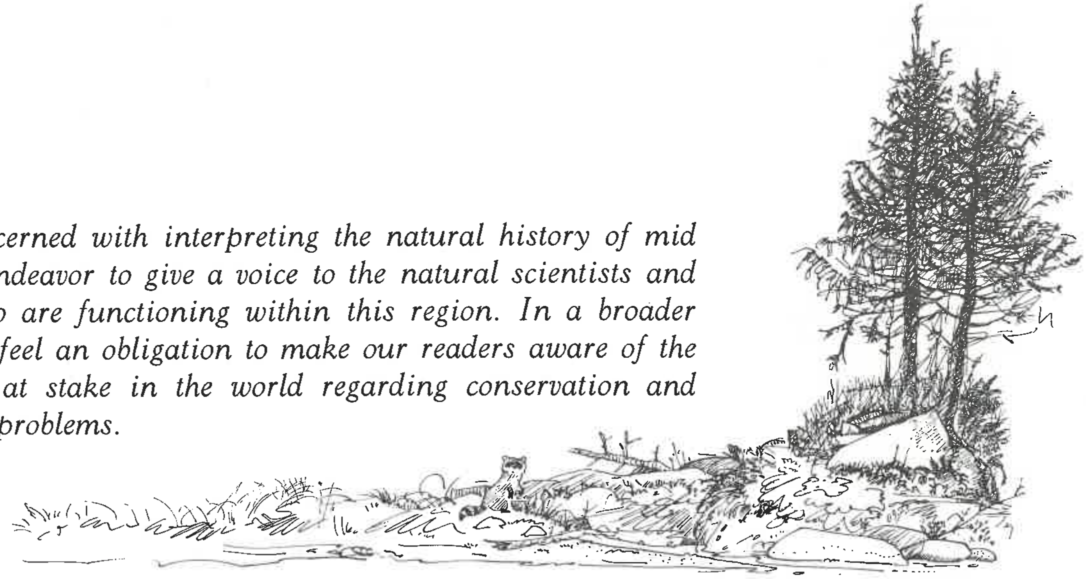

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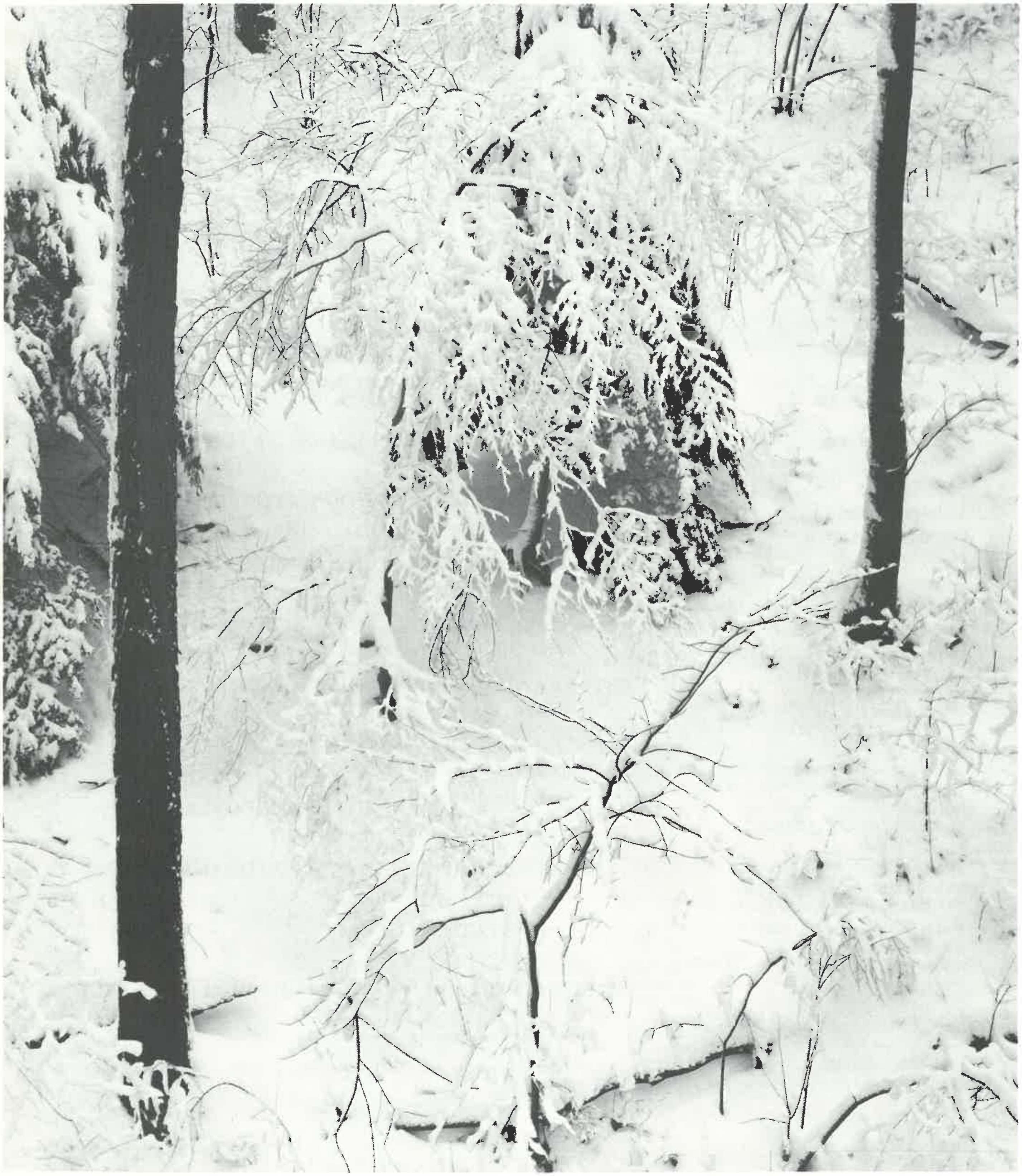
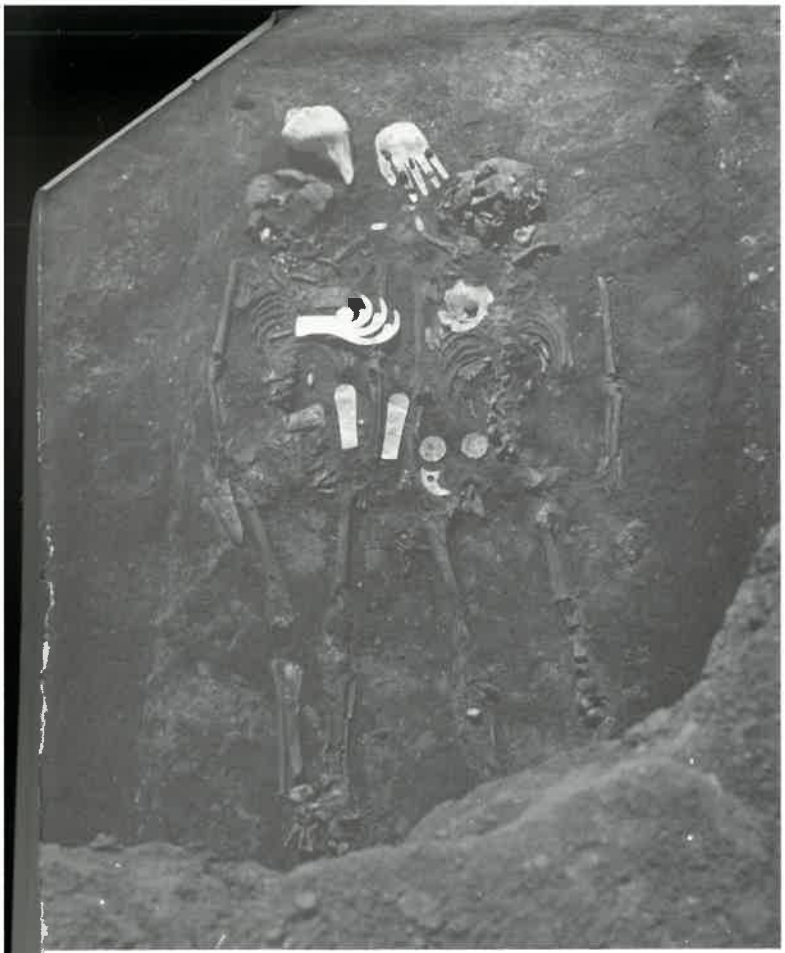




Photos courtesy Ohio Historical Society.

Many archaeologists profess to see remarkable similarities between Hopewell and individual cultural traits from various regions of Mexico, and have even suggested a Mexican origin for Hopewell. One list provides fifteen such similarities. One of these is the use of obsidian. Our interest in prehistoric trade was stimulated by the question: did Hopewell receive its obsidian from Mexico?

Obsidian is a volcanic glass which forms through a rapid cooling of silica-rich magma. This rapid cooling prevents crystallization and results in a glassy texture. It is generally black in color, but green, gray, brown, and red are not uncommon. Like flint and chert, it has a conchoidal fracture and thus may be manufactured into implements in the same fashion as those materials. Its color and glassy texture, however, often give it an aesthetic value far above its mere utilitarian worth.

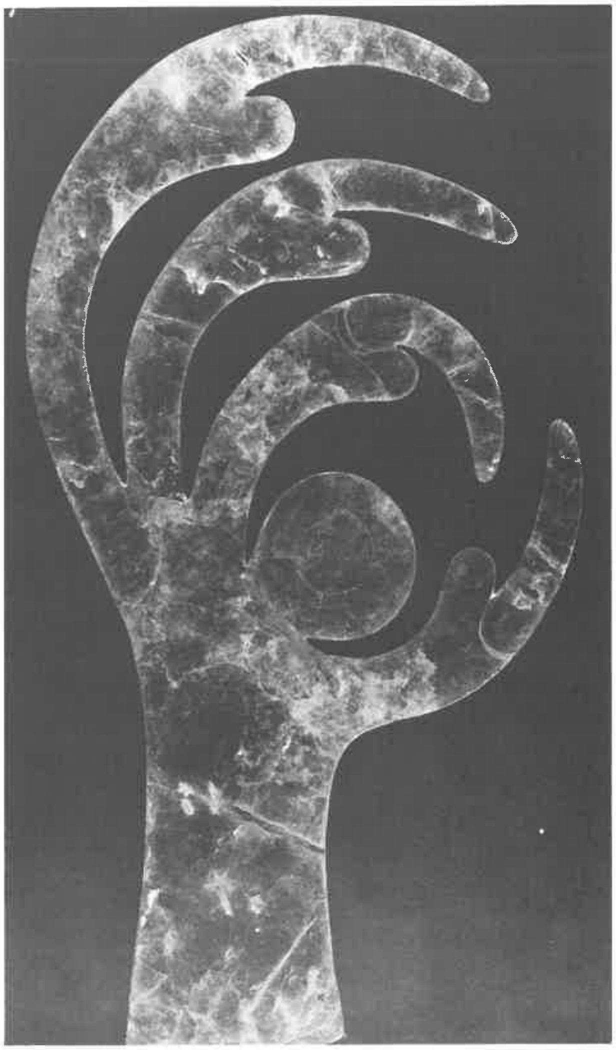
We began our study by analyzing obsidian from Hopewell sites using a technique called *neutron activation*, a process adapted to the obsidian studies by Dr. A. A. Gordus of the University of Michigan under a project headed by Dr. James B. Griffin. This technique allowed us to determine the content by proportion of about twenty elements in both obsidian artifacts and in sources. We found that two sources were represented by the Hopewell artifacts, that is, the element contents segregated into two well-defined chemical groups. For example, they differed on the basis of the manganese content, one group showing a value considerably below the other.

We then looked at these same twenty elements represented in major obsidian flows in Mexico. The most important source in central Mexico was Cerro de las Navajas, located north of Mexico City. Its manganese content was well outside the range of both Hopewell groups. The major source in the Maya area of Guatemala is called El Chayal. Its manganese content was again well outside the range of both Hopewell groups. Similar problems were found with all of the other Mexican obsidian flows: they were chemically different in one or more elements and thus could not have been the Hopewell sources.

We then turned our attention to other volcanic areas in North America, including those of Alaska, the Pacific Coast region, the southwestern United States, and the Rocky Mountains. We found a perfect match for each Hopewell obsidian group in Yellowstone Park. It was clear that the Hopewell obsidian came from what is now Yellowstone Park and not from Mexico. This, of course, in itself does not invalidate the Mexican origin hypothesis, but it does fail to give it any support.

With the obsidian sources localized, we could then turn to an examination of other raw materials brought in by long-distance trade. By the phrase "long-distance trade" we mean trade that must be carried on across intertribal boundaries. In order to obtain the desired commodity, a man must trade with members of another tribal group. This requires a different type of relationship than would be necessary if the source of the raw material were located within the tribal boundaries and could be acquired by trading with kinsmen or neighbors of his own tribal group.

In addition to obsidian, the long-distance trade system of the Ohio Hopewell acquired large quantities of raw materials from a number of areas in the United States and Canada. According to Griffin, these raw materials and their most probable sources include: copper from the Lake Superior deposits; silver, both associated with the copper as a byproduct and also possibly from deposits located near Cobalt, Ontario; meteoric iron from a number of sources outside of Ohio; Indiana hornstone from Harrison County, Indiana; chert from Union County, Illinois; galena from northwestern Illinois or Missouri; a mottled brownish chalcedony from either the Knife River quarries in North Dakota or from gravel deposits in southern Manitoba; mica, quartz crystal, aventurine,



Claw cut out of mica.

and chlorite from the southern Appalachians; marine helmit shells (*Cassis*) from east Florida; whelk (*Busycon*), tulip (*Fasciolaria*), olive (*Oliva*), and dwarf olive (*Olivella*) marine shells from the Florida Gulf coast; and shark teeth, alligator teeth, barracuda jaws, and marine turtle shells from west Florida.

A further link in the trade system with the southeastern United States is seen in ceramics. Simple, check, and complicated stamp pottery is known from Ohio Hopewell sites. Stylistically, these vessels are similar to pottery types produced in the Deptford and Swift Creek cultures found in the area from southeastern Tennessee to western Florida. The vessels from Ohio were made of micaceous clays and include nonlocal tempering materials suggesting that they were manufactured in the southeast and traded northward as finished products.

The next questions to consider are: what items were fashioned from these raw materials and how were they incorporated into the cultural system? Since the variety of artifact types is quite extensive, only a partial list may be given here. Copper, for example, is found in the form of gorgets, celts, breastplates, ear spools, foundations for headdresses, awls, beads, axes, adzes, and jackets for panpipes. Two-dimensional figures were sometimes drawn on copper sheets and zoomorphic figures were often cut from these sheets. Mica sheets were placed in the graves, used for figure drawings much like the copper sheets, or had zoomorphic figures cut from them. Swastikas were cut from both copper and mica. Obsidian occurs as very large projectile points and large curved knives, as well as waste material, cores, and smaller implements. Indiana hornstone appears as large chipped discs. Projectile points were manufactured from the quartz crystal. The shark and alligator teeth, barracuda jaws, pearls, small marine shells, and turtle shells were utilized in various forms of decoration.

Meteoric iron was manufactured into ear spools or used as plating for copper ear spools. It occurs in the form of beads, buttons, rounded cones, panpipes, and awls. There are also one axe, one adze, and one human ulna (arm bone) plated with meteoric iron foil.

In some cases a few of these artifacts show signs of wear. However, the majority of them seem never to have been employed for utilitarian purposes. Thus, it appears unlikely that copper implements were used for clearing forests, or obsidian points for hunting. Their inclusion in large quantities in burials, their internal redistribution within the society, and the forms that these raw materials eventually took, such as decorative objects, suggest that they were not imported into Ohio to function in subsistence activities. Their redistribution in the society provides a clue to the role that they played.

In the Ohio Hopewell we see the culmination of a trend toward the reorganization of the social structure that began during the Late Archaic. This reorganization is reflected in the way trade goods were distributed within the society. Among many groups of people whom we generally think of as "primitive," one method of gaining status is through the redistribution of trade goods. Generosity becomes the characterizing feature of a well-thought-of individual. The more a man gives away, the higher in status he rises in the eyes of his neighbors and relatives. Further, wealth brought in from outside the tribal boundaries is redistributed freely among the groups' members, hence operating against any tendency for status differentiation to appear within the group on the basis of differential access to material wealth.

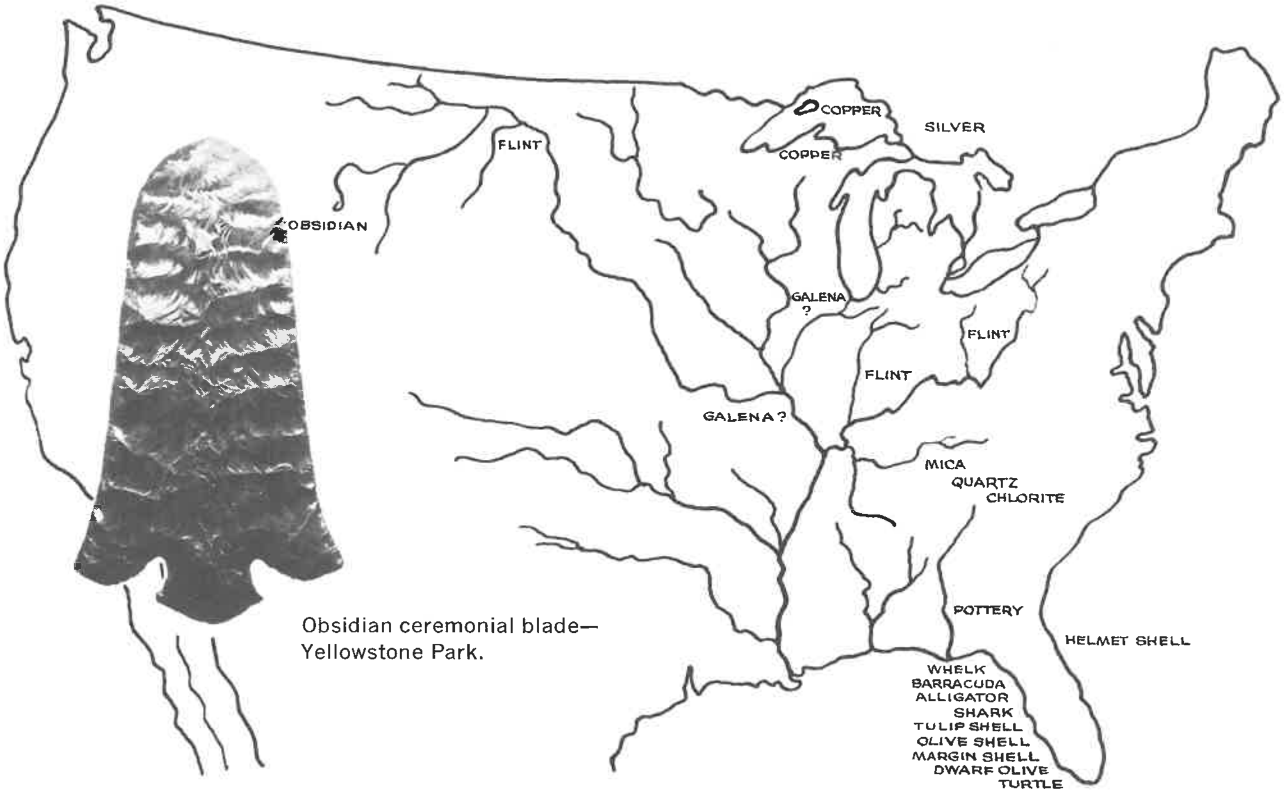
By the Late Archaic, however, we find hints of accumulation of trade goods by individuals. By about 2000 B.C. at Indian Knoll in Kentucky, for instance, we see differential treatment of burials, with certain individuals receiving as grave furniture disproportionate amounts of nonlocal or exotic items. This trend continues through Early Woodland (e.g. in the Adena) and reaches its acme in Ohio Hopewell.

At the Hopewell type site, a crematory basin was excavated in which there was a partially cremated adult skeleton with two sheets of mica and a few pearl beads. At the south border of the burial, in a space measuring 6 feet by 7 feet, was a deposit of obsidian weighing close to 300 pounds. It included implements in various stages of manufacture, cores, and waste products. Also, there were two cut mica figures and a cut and polished piece of chlorite. By weight there is more obsidian in this one burial than has been recovered in all the Hopewellian sites outside of the state of Ohio, and it represents about 60 percent by weight of all the Hopewellian obsidian known from within the state. The idea of accumulation may be emphasized here by pointing out that the only other burial in this mound, also a cremation, contained no grave goods of any type. Other Hopewellian sites in Ohio show less obsidian but still in concentrated patterns.

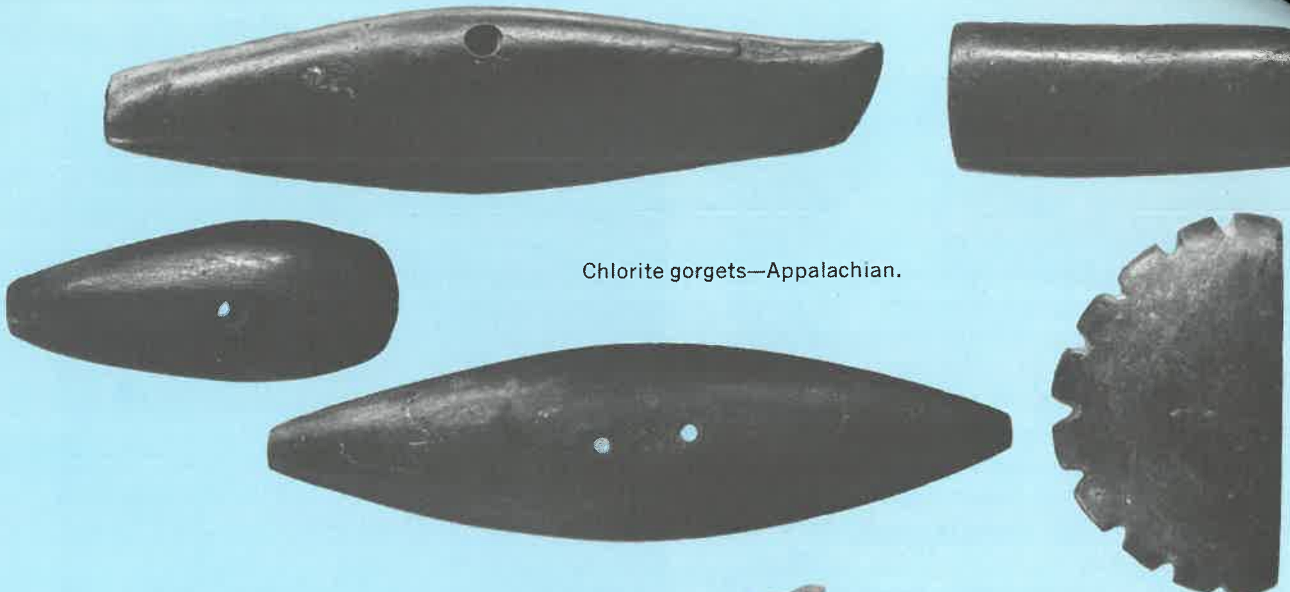
Obsidian is not the only craft item or exotic raw material that was being accumulated by certain individuals within this society. Other burials had raw materials such as copper and Indiana hornstone, and artifacts such as discs and effigy pipes in large amounts. At these sites there is evidence that the pipes had been ceremonially "killed."

Rarely are any of these trade items found on the village sites of Ohio Hopewell in the same forms as they are recovered in the burial mounds. Mica is known from the McGraw village site in the Scioto valley, but as fragments, the debris left from the manufacture of cut-outs and other artifacts. Meteoric iron has been found only in burials. Prufer's archaeological survey of village sites in the Scioto valley recorded single quartz fragments from but three sites. Only one village site had obsidian, and then only two flakes of this exotic raw material.

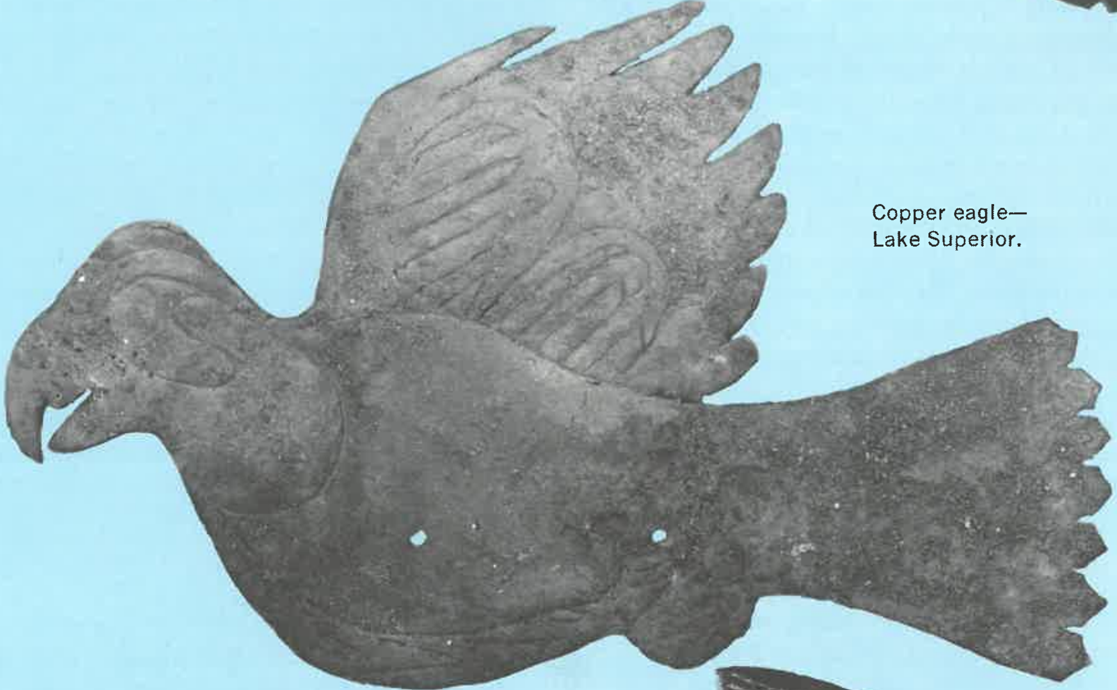
It seems clear that these trade goods functioned largely as status items. Not all members of the society had access to them, and only certain individuals were allowed (or required?) to remove them from the society at death by taking them to the grave in the form of offerings. In what type of social structure might we expect to find this kind of activity? For an answer we must turn to other types of data.



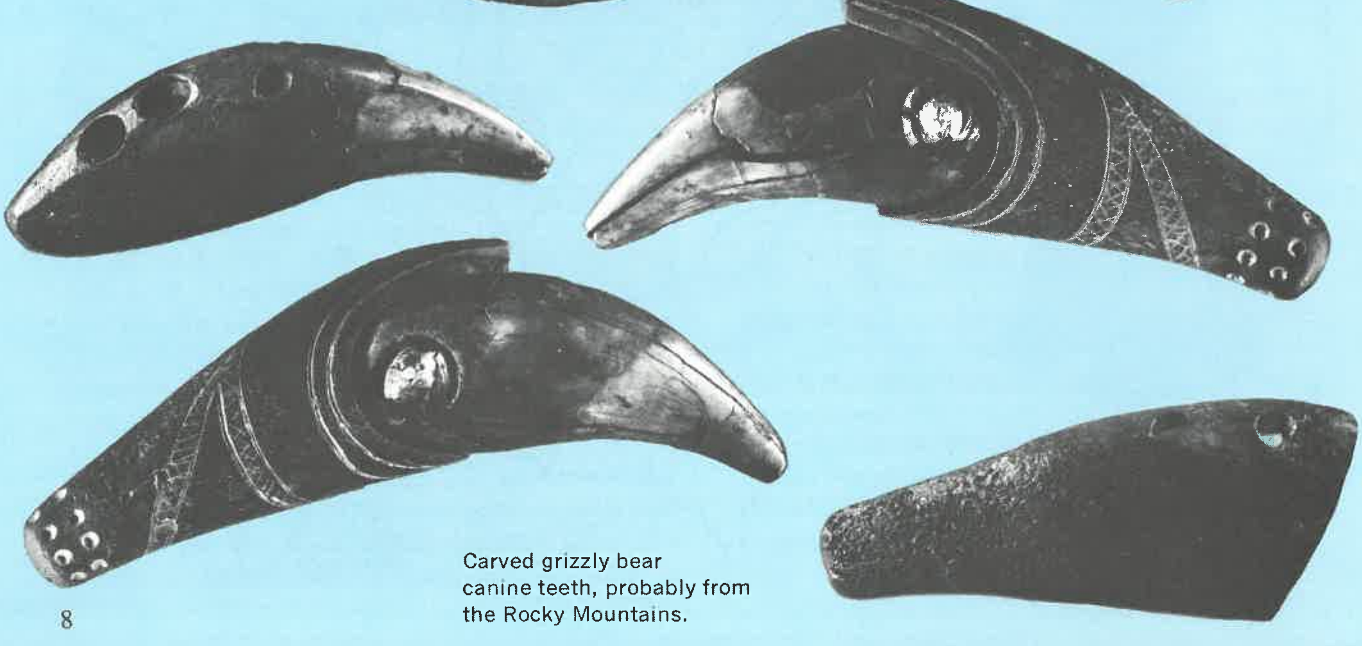
Obsidian ceremonial blade—Yellowstone Park.



Chlorite gorgets—Appalachian.



Copper eagle—Lake Superior.



Carved grizzly bear canine teeth, probably from the Rocky Mountains.

The settlement pattern of Ohio Hopewell is still poorly known. The best known sites are the large earthworks and associated burial mounds. Some of these earthworks have village debris located outside the perimeter of the earthworks. A number of archaeologists have argued plausibly that these village remains probably represent the debris left by members of the society who were called upon to construct the earthworks themselves. That is, many of them do not represent villages that were occupied the year around by the local inhabitants, but by the workers who were there temporarily. A recent survey by Prufer, as well as his excavations at the McGraw site, suggest that villages were generally situated in the valley bottom lands and on the middle terrace of the Scioto valley. The same general pattern was noted for Hopewell villages in the Paint Creek valley, a tributary of the Scioto. Villages were small and widely dispersed. Rarely are any of these trade items found in these village sites. Thus the available data show large ceremonial earthworks and burial mounds, and small dispersed villages.

What type of social structure might have been employed to link these earthworks, mounds, and villages together? A typical structure is one called a *ramage* system. Here, lineages are arranged in a pyramidal fashion, with the status of the lineage directly dependent upon its closeness to the mythical main line of descent. The closer the founder was to the main line, the higher in status will be the lineage. Further, every member of each lineage has an ascribed status position to which he is born. A first son of the first son will occupy a higher status position than the second son of the first son. He holds this position not because of good deeds nor because he is an excellent hunter (achieved status), but simply by right of birth (ascribed status). These positions should not be thought of as social classes, however, as every member of the society has a separate status dependent upon his lineage membership and his position within the lineage. Each individual, in essence, constitutes his own social class.

Why are these status positions important to the society? As surpluses from local subsistence activities grow, so do the managerial problems within the society. If surpluses allow men to be freed from subsistence tasks such as hunting, fishing, or farming, there must be mechanisms to channel them into new jobs such as craftsmanship, to see that they are fed since they no longer produce all (or any) of their own food, and to collect the new items they are making and to redistribute them. In short, the more complex the society becomes, the greater the need for administrative personnel to tie the various parts into one economic and social system. Decisions have to be made and implemented.

High-ranking individuals have call upon the production of the other members in the society. Subsistence goods may be called in and then redistributed. Often, but not invariably in a ramage system, lineages may operate as subsistence specialists, with the entire economy being controlled by a redistributive network. There is still no evidence to suggest that this high degree of specialization was reached among the Ohio Hopewell. However, more important for our own purposes are these status differentiations. High-ranking members are usually set off from others in dress and ornamentation. Trade goods and raw materials brought into the society need not be (and usually are not) redistributed. Some of the surplus from local production may be channeled into subsidizing craftsmen to turn raw materials into status items which also are not redistributed. This results in accumulation of wealth at the top of the social hierarchy. The possession of trade goods and exotic raw materials becomes a symbol of status and authority.

It is not necessary for these items to be passed on at death to the deceased's lineal descendants. In fact, it is better for the trade system if they are buried or ceremonially killed. Both are seen in Ohio Hopewell and result in the necessity for the new high-ranking members to acquire new status items on their own. If they were simply inherited, there would be no need for the trade system to continue: by destroying them, by taking them out of circulation, the trade system is forced to continue to function in order to replace the necessary badges of authority. "Conspicuous consumption" is vital to the operation of this type of long-distance trade.

Might these status items or symbols change through time? There is some reason to believe that this was the case in the Ohio Hopewell. A distributional study of obsidian by Griffin indicates that this raw material functioned in the system only between A. D. 100 and 200, or less than about one-sixth of the total Ohio Hopewell time span. When all of the obsidian had been consumed, no more was acquired. It is my impression that pipes become more rare in burials later in time. From the more than 260 burials at the Mound City Group, only 40 pipes were recovered. This number is far less than was found in fewer burials at Mound City and Tremper which date somewhat earlier. An intensive study of the burial data would be required in order to see if such trends are observable in other raw materials or craft items.

In exchange for these raw materials, a number of items were sent out of Ohio. Quantities of local Flint Ridge flint have been found at archaeological sites in New York, Pennsylvania, West Virginia, and perhaps Mississippi. It has been suggested that Ohio Hopewell craftsmen took some imported copper, fashioned it into artifacts, and then these items were, in turn, put back into the trade network to acquire additional raw materials. Copper artifacts have been recovered at sites contemporary with Ohio Hopewell throughout southeastern United States and from a region that stretches from New York to Iowa and Missouri.

A process similar to that which we see with copper may have occurred also with meteoric iron. It too may have been traded in, manufactured into craft items, and then put back into the trade sphere. Meteoric iron artifacts are known from two burial mounds in Illinois, the Mandeville site in Georgia, and two sites in Florida, including the important Crystal River site. This raw material both within and outside Ohio is always recovered in association with burials.

An item of major importance to the long-distance trade was undoubtedly the platform pipe fashioned of local Ohio pipestone. The major quarry area for Ohio pipestone is in Scioto County, just south of the Scioto River concentration of Ohio Hopewell sites. These pipes have been found distributed from New York to Iowa, and Wisconsin to southwestern Illinois.

In conjunction with these pipes, tobacco for smoking in them might also have been traded. We may point out that, although some pipes exhibit signs of having been smoked, no tobacco is known from Ohio Hopewell sites, but tobacco is not the only plant that was smoked, according to ethnographic reports of the contact period. In the Great Lakes area, the leaves, bark, roots, and flowers of some twenty-seven additional plants such as several species of sumac (*Rhus*), hawthorn (*Crataegus*), aster (*Aster*), and others were either smoked alone or were mixed with tobacco. By the time of European contact, however, tobacco was widely used in the eastern United States and was an important commodity in a trade system which involved the exchange of agricultural products for furs.

It is certain that some agriculture was being practiced by this time. Corn is known from a few mounds and from the McGraw village, and both gourds and squash were cultivated by the Early Woodland period. Three native plants, the sunflower (*Helianthus*), marsh elder (*Iva*), and chenopod (*Chenopodium*), were also domesticated prior to Ohio Hopewell. Tobacco seeds are extremely small and the leaves do not preserve well so tobacco, both for smoking and as a trade item, remains a possibility but it will take better recovery techniques than those used in the past actually to demonstrate its presence in Ohio Hopewell.

What were the mechanics of this trade system? One generally assumes that primitive trade is carried out through intertribal barter. However, this actually is very seldom the case. In order for a trade system to function smoothly, hostility among the participants must be kept at a minimum. Any interaction between two ethnic or tribal groups may engender hostility simply because they are different peoples. If trade is carried on only by barter, suspicions of "cheating" and "raw deals" may arise and result in a state of hostility. This would cause the collapse of the relationships among the groups that are necessary for the system to continue.

Certain types of "border mechanisms" have evolved to permit peaceful exchange of economic commodities across the tribal or ethnic boundaries. One of these mechanisms is generally called *trade friendships*. Rather than barter, the exchange was phrased as gift-giving between friends of different tribes. Gifts were presented to a trade partner, and at their next meeting the partner reciprocated, usually by giving more than he received, thereby putting his partner in debt to him. Thus rather than attempting to "get something for nothing," one partner tried to keep the other in a state of indebtedness to him. It was this imbalance that sustained the system by forcing the partners to meet again.

Gift-giving phrased in this fashion is common among the trade systems of Melanesia and Polynesia. It is also known from the period of European contact in the Great Lakes region. The Jesuit Father Sagard reported that when friends from different tribes met, they always exchanged gifts. No bargaining was permitted and they even complained when anyone attempted to haggle over a gift. Outwardly they seemed satisfied with the presents they received. It was not an exchange of value for value but an expression of their friendship for each other. It served far better than barter would have to keep goods moving from tribe to tribe throughout the Great Lakes.

One common form this system takes is to project fictional kinship lines across the tribal boundaries. Thus, two partners might become "brothers," receiving in turn all of the rights, responsibilities, and status of the fictional brother. Meetings between trade friends often occurred during ceremonies. Tribes from the surrounding area would be called in to participate and to exchange presents. The Huron Feast of the Dead was one example. Although it was Huron tribesmen who were buried, members of several neighboring tribes were invited to participate. First they exchanged gifts. This was followed by the ceremony. After the ceremony described by Father Sagard, 1,200 additional presents were distributed to the participants.

Intertribal marriage is another example of a mechanism to facilitate the exchange of goods and raw materials. The marriage partner became an affinal relative. It solidified a kinship line across the tribal boundaries along which trade goods might flow easily. This approach to trading was common in such distant areas as the northwest coast of North America and Burma.

It is interesting to consider some of the facts about Ohio Hopewell in the light of these observations. They had a well-developed mortuary complex based on status differentiation, they had an effective long-distance trade system, and the stylistic elements common to Ohio Hopewell are found over much of the eastern United States. We would suggest that these are not independent variables to be listed merely as "Hopewell cultural traits." The long-distance trade was an integral part of the status differentiation. Accumulation of exotic raw materials and craft items provided symbols of differences in status among the society's members. Trade goods continued to enter the Scioto valley, since the old symbols were destroyed at their owner's death either by burial with him or through ceremonial killing. This took them out of circulation, forcing new high-status individuals to acquire new symbols.

A network of the distribution of these stylistic elements may be superimposed over the trade routes that were used. Because of social interaction among the participants who were exchanging these raw materials, these stylistic elements were able to spread along the trade lines. The ethnographic literature lists a number of examples of this nature. It usually took the following form: higher status individuals of other tribes who were participating in the exchange system would adopt the status symbols, ceremonies, dress, and sometimes even the language of their more highly evolved neighbors. If the trade took place as an integral part of the Ohio Hopewell mortuary complex, the participation of other tribal groups would assure that the ceremony, the proper way to bury the high status individual, was known to them, and they might adopt as much of it as their own surplus accumulation would allow. In many of its formal aspects, the mortuary complex of the Illinois valley Hopewell emulated that of Ohio Hopewell, but it lacked the high degree of status-grading and raw-material accumulation found in the latter area.

The long-distance trade of the Ohio Hopewell was not the *cause* of the status differentiation, but was a reflection of its existence. We have noted that status differentiation may be seen by the Late Archaic, nearly 2000 years earlier; it reached its high point during Ohio Hopewell however. This trade functioned to maintain the differentiation among individuals by providing a mechanism by which certain members of the society could acquire badges or symbols of authority consonant with their ascribed status positions.

Trade in a prehistoric society such as the Ohio Hopewell is not something that is best studied as an isolated system, particularly when it is used as a diagnostic trait of that society. Merely listing what items were exchanged tells nothing about how the trade was integrated into the culture itself. In no known society does long-distance trade stand apart from the rest of the culture. We have suggested that here it was a vital part of the mortuary complex, the status differentiation, and the spread of Hopewell stylistic elements across the eastern United States. Since both goods and ideas were moving freely during the height of Ohio Hopewell, we have also suggested that this trade was not carried out by intertribal barter which can operate to block the exchange of goods and to impede the exchange of ideas, but by other means such as trade friendships and ceremonial exchange.

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Letter From
SAWDUST

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NO WIND was there to disturb the falling white flakes. They simply steadily continued moving downward, and no matter where I looked, all I could see were more flakes coming toward me: silent snowflakes, landing gently, wreathing the hemlocks with leis of the purest white blossoms. A thick, white storm but a kindly one and ideal to be out in, since it was not very cold. I had a pruning saw and clippers with me to demolish grapevines. While we welcome grapevine tangles in many places, we do attempt to keep them out of the hemlock trees. Hence, I was working at the edge of Sawdust's largest grove of hemlocks, with piles of snow breaking loose and spraying down the back of my neck, as I untangled, cut, and wrenched the vines, hoping my strength would undo the vigorous growth of last summer.

The shredded, gray, papery remains of a previously globular hornet nest still hung on one of the hemlock branches. Its tiered interior, once so meticulously assembled and full of life, was now torn and empty except for the snow filling up each small six-sided cell.

It is surprising how promptly, after the hornets have deserted the large nest in the fall, the nests are opened and the abandoned larvae are eaten. I have always wondered what animal or bird takes advantage of this situation to assail these paper vaults. A similar thing happens to the underground paper nests of yellow jackets because I have frequently found layers of their comb scattered on the ground alongside a scooped out hollow, following the first killing frost. Occasionally in the winter, I will come upon a hibernating white-faced hornet queen sheltered within a decaying log, but never have I cupped one in my hand to see if she will respond to its warmth.

Much of particular interest to us has been observed in this hemlock grove. The magnolia warbler and the solitary vireo have each nested here as well as the Canada warbler on the steep bank below. Screaming bluejays once drew my attention to the only long-eared owl ever seen on Sawdust, as it sat in one of the hemlocks. There is a fox den at the far end of the grove. For years the hay-scented fern flourished on the edges and the frail spidery blossoms of the Indian cucumber-root were bright pins amidst the brown carpet of hemlock needles, but with changing light conditions, these plants are dwindling. In contrast, there is a bird or pin cherry tree (*Prunus pensylvanica*) growing up between the hemlock trees to record size for Sawdust and perhaps the state as well. This species of cherry is confined to the northeastern counties here in Ohio; it is a nice addition to our woody flora since it has such showy white flowers in the spring, followed by light red fruit.

As I continued my guerrilla activities in that snow-clad microcosm, it seemed to me that the rest of the world had temporarily departed since no sounds, except my own, desecrated the stillness. I found myself listening for a faraway car or cow, a chipping cardinal —just any noise. Finding none, I resumed working with a complacent smile.

We have always been grateful that the lumbermen spared this grove of hemlocks when our place was logged out. Since the cutting took place before we

EXPLORER
FALL 1972

Boney Spring before excavation.

Pleistocene Springs in Missouri

R. BRUCE McMILLAN

Curator of Anthropology, Illinois State Museum

SINCE THE MID-1960s a group of scientists has been working perseveringly to collect biological, geological, and archaeological data from Missouri's lower Pomme de Terre River basin before it is flooded by a massive reservoir to be named for former United States President Harry S. Truman. The multi-disciplinary research program, sponsored during earlier years by the University of Missouri, was tri-sponsored during the past summer (1971) by the Illinois State Museum, the University of Arizona, and the Los Angeles County Museum of Natural History. The funding for the program was granted by the National Science Foundation.

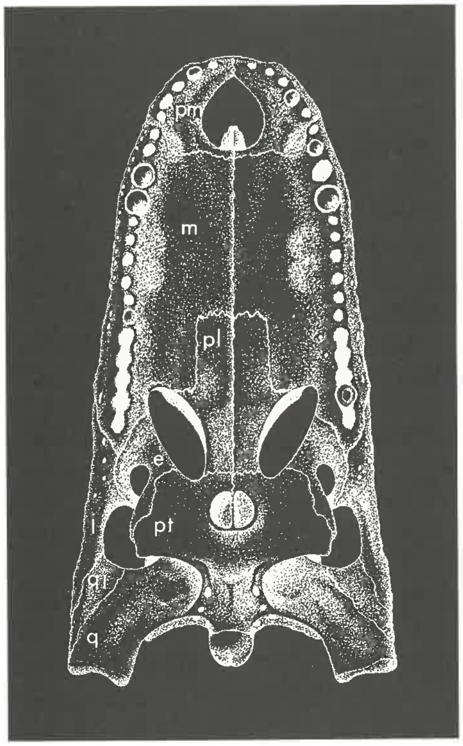
The Pomme de Terre drainage, located 125 miles southeast of Kansas City, once formed a part of the sinuous border between the grasslands of the Prairie Peninsula and the oak-hickory forest-covered hills of Missouri's northwestern Ozarks before the native biota was disturbed by modern agriculture and lumbering. It is in a ten-mile stretch of this terraced bottomland that a number of artesian springs seep to the surface; because of poor drainage they have formed swamps or bogs. The scientific activity has been focused on the springs' rich peat and clay deposits which contain abundant late-Pleistocene plant and animal remains. Radiocarbon dates indicate that the stratigraphic records from the springs span the last 30,000 years.

The Pomme de Terre spring deposits are not new to the scientific community, for they were recognized almost 130 years ago. During 1840, in one of the springs, Albert Koch discovered and reported the famous Benton County, Missouri mastodon which is now mounted in the British Museum. Koch, a showman who rivaled P. T. Barnum in fame, captured the curiosity of a 19th century public by parading his grotesquely mounted *Missourium* or *Missouri Leviathan*, as he called it, from city to city across the eastern United States, sometimes having a three-piece band playing in the rib cage. The issue that gained the most public attention, and which promoted a polemic among the savants of the mid-1800s, was Koch's claim that man-made artifacts were found in indisputato the air above—a behavioral pattern that undoubtedly played an influential role in crocodilian survival through time. The unusual nostrils of *Albertochampsa* lead one to suspect a special behavior that also may have had a definite survival value during times of competition with other predators.

If *Albertochampsa* was indeed derived from some earlier, broad-snouted crocodile it is likely that its sense of vision was not too different. As in living crocodilians, it would seem reasonable that vision was more aerial (seeing above water) than aquatic. This would likely have been the case with all earlier types that were even less removed from their terrestrial heritage. The conventional location of the eye openings in the skull would support this idea.

Olfaction (sense of smell) on the other hand is known to be a vital telesthetic sense in hunting reptiles, such as *Chelydra*, the snapping turtle, and may also have played an important part in food detection for *Albertochampsa* in the dimly lit waters of a Cretaceous swamp. This could be an explanation for the extreme anterior position of the nasal opening. Above the water's surface one would suspect that *Albertochampsa* responded to prey much like its modern day kin.

Drawings by Jeffrey Birch, SMM.



Restoration of the underside of the skull of *Albertochampsa*, an ancestral alligator. Note the large rear teeth presumably used for crushing turtle shells. Locations of missing teeth in this fossil are shown in silhouette. Approx. length of skull 9½ inches.

In stalking, living species often employ a technique of lying on a stream bank or partially submerged in water near the shore. The unwary who come to drink often become the prey of the hunter. Even the most swift-footed gazelle of the African savannah may be snatched from the stream bank, dragged into the water, and eaten by the crocodile. Both visual and olfactory detection probably work together to trigger the split-second reflexes needed for capture of such prey.

In the Cretaceous, of course, there were no gazelles nor any other mammals that would provide a suitable meal, though a number of small nimble dinosaurs, such as *Thescelosaurus* for example, were about. Some such dinosaurs were small bipeds about the size of a turkey. *Thescelosaurus* and its diminutive kin probably did not succumb as a race to predation by contemporary alligators, such as *Albertochampsa*, but nevertheless vanished at the close of the Cretaceous period along with numerous other reptiles including all of the remaining dinosaurs. The age of great reptiles ended less than 70 million years ago and only a few cold-blooded types survived—some like *Champsosaurus* only for a time. A few that had evidently acquired the right combinations of genes, behavior, and perhaps some good fortune along the way survive today.

But even for these few, namely the crocodiles and alligators, their good fortune may be running out. Hunting and overdevelopment of their habitats by man are without question prime causes in their decline today. Some believe that certain species are rapidly nearing extinction while others may have already essentially become extinct.

We may never have a good answer to "What became of the dinosaurs?" but we will have a pretty good idea of "What became of the alligator."

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Mastodon mandibles in bone bed at Trolinger Spring.

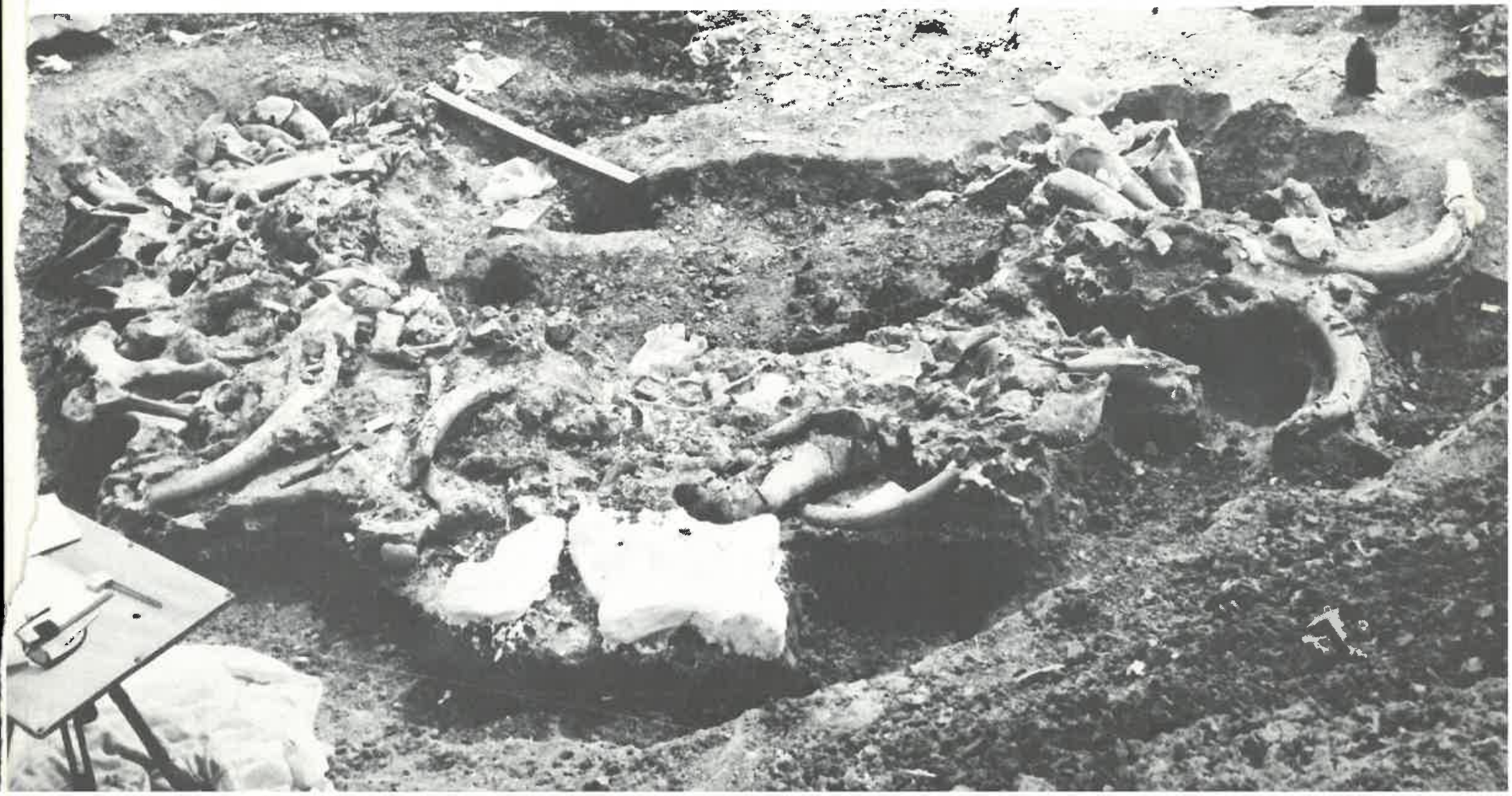
ble association with the "antediluvian beast." To most, including many intellectuals of this period almost two decades before Darwin's *On the Origin of Species*, such a claim for man's great antiquity was unthinkable.

Research during the past summer at the site of Koch's original excavation revealed that his claims for cultural objects co-occurring with mastodon remains may not have been exaggerated. There is solid evidence, however, that the associations were fortuitous, and that the man-made artifacts and mastodon bones occurred together only in the unconsolidated spring feeders, the funnel-shaped areas where the water emitted to the surface. Outside the feeders at the Koch Spring and one other spring, there was stratigraphic separation of cultural debris above the Pleistocene faunal materials. The bones predated the archaeological components by several thousand years.

Excavations last summer at the Koch spring revealed that during the original digging most of the bone bed had been exhumed either by Koch's men or by subsequent diggers. Fortunately, stratigraphic exposures outside that area of Koch's digging did provide excellent profiles for collecting plant fossils and pollen which are presently being analyzed by the program's palynologist, Dr. James E. King of the Illinois State Museum.

A second site, Boney Spring, not far from the Koch Spring, provided a much more complete faunal and floral record since it was undisturbed. An extensive faunal bed composed of the bones of large extinct vertebrates completely circled the spring's feeder. By far the most numerous remains were those of the American mastodon; in fact, the 26 individuals represented in the spring make it one of the largest deposits of these former forest dwelling proboscidians ever found. A cast of one of the large males is presently being produced under the direction of Dr. Everett H. Lindsay and Jeffrey J. Saunders at the University of Arizona's Laboratory of Paleontology and will

A portion of the vertebrate bone bed at Boney Spring.
Bones in foreground are already cast in plaster jackets.



Spruce log protruding from beneath bone bed at Boney Spring. Tusk to left of log has dropped to deeper depths in the spring's feeder.

Femora from large mastodon, Boney Spring.

Chert artifact located near bones near feeder, Boney Spring. Evidences indicate that cultural material is intrusive into the spring's feeder.

soon be available for purchase to museums or other educational institutions throughout the United States.

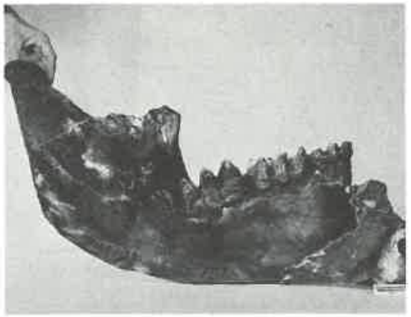
Other large vertebrate remains found at Boney Spring were those of sloth (*Paramylodon*), giant beaver, tapir, horse, and deer. Radiocarbon dates on wood from the bone bed date the deposit between 14,000 and 16,000 years ago.

Stratigraphic related pollen chronologies from five springs in the valley, dated by the radiocarbon technique, have demonstrated three macro-changes in the vegetation of the western Missouri Ozarks over the past 30,000 years. The interstadial vegetation of 30,000 to 25,000 years ago was probably a pine parkland with an attendant mastodon-muskox-horse fauna. During the period following 23,000 years ago, when the Wisconsin ice reached its maximum southern extent, the Missouri Ozarks were clothed in dense spruce forests. There is not only pollen evidence for this phase, but spruce logs dating approximately 16,500 years ago have been recovered just below the bone bed at Boney Spring.

Following the close of the Wisconsin the area was soon colonized by the oak-hickory forests characteristic of the region today.

The research into additional springs will continue this fall. Hopefully, by the time the valley is inundated beneath the waters of the Harry S. Truman Reservoir, the cooperating scientists will have derived reasonable models of the past environments of the western Ozarks from this important series of paleoenvironmental sites.

Mastodon mandibular section from Trolinger Spring.



Inverted mandible and tusk section of mastodon, Boney Spring.

EXPLORER
SPRING - 1968

Indian History

SACRIFICES TO PROGRESS

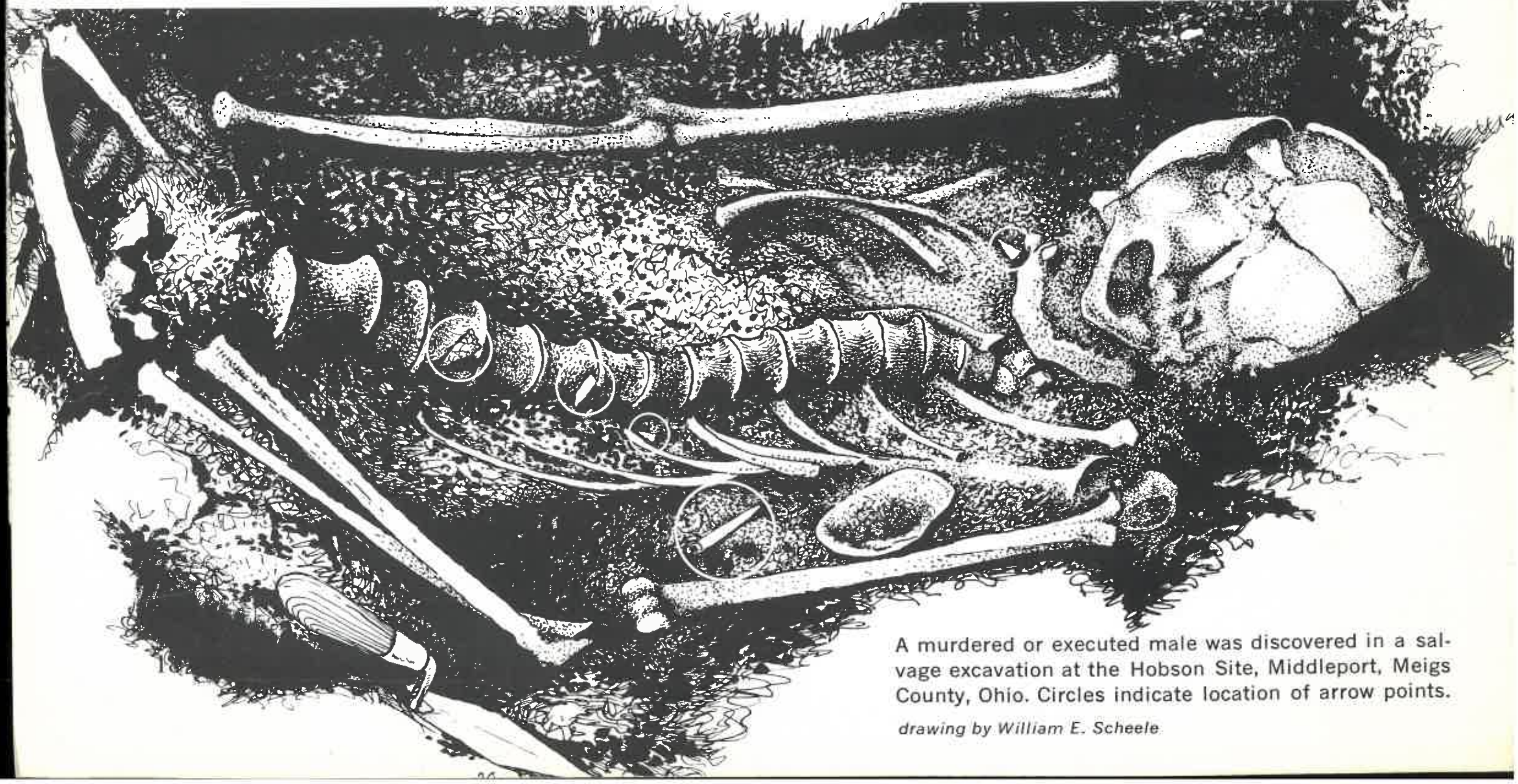
by JAMES L. MURPHY
Research Associate in Archeology
Natural Science Museum

ALTHOUGH THE ARCHEOLOGIST is often thought to live entirely in the past, oblivious to all around him and preoccupied solely with long-dead cultures, there is at least one aspect of today's world which he cannot ignore. The much-publicized "population explosion" is fraught with significance for the archeologist, for housing developments and industrial expansion have destroyed many of the best archeological sites in America, and this destruction is spiralling upward at an ever-increasing rate. Unless matters take a turn for the better—which seems extremely unlikely—the archeologist may become as extinct as the alchemist.

Always consigned to picking up the pieces, the archeologist may soon find that there are no more pieces to pick up. In Ohio alone, probably a week does not pass without a significant site being destroyed. In many cases, such destruction is accidental for the people responsible do not realize that excavation for a new home or for the new shopping center down the street is obliterating an important aboriginal site. In other cases, particularly where industry is concerned, those responsible may know but seldom care.

The result is the same in either case: each year there are fewer pieces of the puzzle left, less and less of the past that can be recaptured. Ohio, undoubtedly one of the richest archeological areas in North America, is particularly hard hit in this respect. Archeologically, it remains more exploited than explored so that what has chanced to remain is all the more important to the scientist. It is particularly regrettable, therefore, that what has accidentally been preserved in Ohio is being destroyed at a faster and faster rate with only minimal efforts to preserve or even to study these vanishing sites.

For example, a very important Fort Ancient site lay on the outskirts of Middleport, Ohio, on the bank of the Ohio River in Meigs County, until the summer of 1965. For over ten years, the city of Middleport had planned to build a sewage disposal plant on the site, but not until the very day that construction began was a qualified archeologist notified. By that time, all that could be done at the site was literally to pick up the pieces. With mixed emotions, amateur archeologists and sight-seers alike watched huge earth-moving equipment slice through a prehistoric Indian cemetery and village site.



A murdered or executed male was discovered in a salvage excavation at the Hobson Site, Middleport, Meigs County, Ohio. Circles indicate location of arrow points.

drawing by William E. Scheele

couldn't stand up without bumping his head. This wasn't bad enough but another difficulty was that this arrangement left nowhere for the smoke of their fires to go and the result was a degree of air pollution that would make our worse, modern problems look puny. Maui's remedy was simple and direct, he pushed the sky up to where any reasonable man could see it belonged.

He fished up the Hawaiian Islands from the bottom of the sea and he had the equipment for the job. Anyone can see his fishhook low in the south in the summer sky and certainly it looks more like a fishhook than a scorpion which is what the mainlanders claim it is. After he had fished up the islands, he decided to put them all together into one body of land. But to do this it was first necessary to dislodge old Mr. One-Tooth who lived at the bottom of the sea and held the islands in place. Here Maui had the help of Hina, a very attractive mermaid, who swam down with Maui's line, got old Mr. One-Tooth to open his mouth by asking to see his marvelous dental ornament, threw the hook into his mouth, wrapped the line around his tooth, then gave a couple of jerks on the line to let Maui know it was time to start towing. Topside, Maui gave his brothers the word to start paddling and off they went with the islands bouncing along behind like a string of huge fish while Maui pondered about the best way to assemble them. He had warned his brothers not to look back under any circumstances but after a while the temptation was too much and they stole a glance over their shoulders. They should have known better for this is guaranteed to break most any charm, and so the islands broke loose and tossed around in a most frightening way until old Mr. One-Tooth, his attention divided between his aching tooth and his sense of responsibility, managed to get them under control and brought them to rest in their present position. It was one of Maui's few failures and after all not really his fault.

Maui's adventures go on and on. A quotation from Katherine Luomala sums him up: "He is no narrow specialist in just one kind of trick, he can match his magic with any old-world hero—and win. He is Maui-of-a-thousand-tricks. He meddles in every department of nature and human activity. He fishes up islands as Thor pulls up the Midgard serpent; he regulates the sun like Joshua; controls the winds like Aeolus. He steals fire for mankind like Prometheus, and performs feats of strength like Hercules. He insults hoary members of the pantheon as does Loke, and combines good and evil in his nature as does Manabozho. Like Moses, he is exposed to a watery death as an infant. He originates the first dog by remodeling a greedy brother-in-law. He raises the heavens. He tries to conquer the goddess of death. Tupuatupua, as the Tuamotuans say, Super-super-man.

"Perhaps when statehood becomes a reality for the islands (this was written in 1949) Maui-of-a-thousand-tricks will join the company of Paul Bunyan, Manabozho, Hiawatha, and the other great heroes born and bred in the imaginations of the many different peoples who make up a great country. Not the least of the gifts of the spirit which the islands can contribute to the states are its beautiful and ancient myths and heroes and the joyous stories about Maui."

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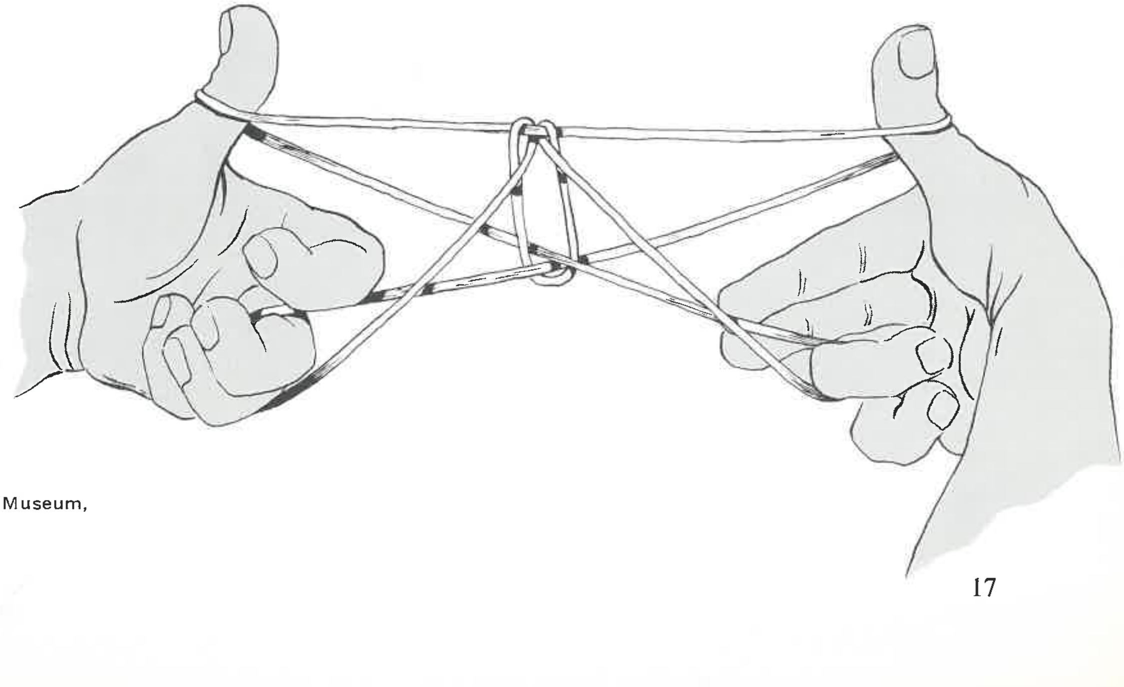


Traditional Hawaiian string figure (these are sometimes accompanied by chants) which makes the famous lasso "with which Maui caught, and broke off, one by one, the legs which the sun put over Haleakala as he climbed out of the pit of night to start his day's journey 'round the world, until the sun agreed to travel more slowly and allow Maui's mother time to do her day's housework."

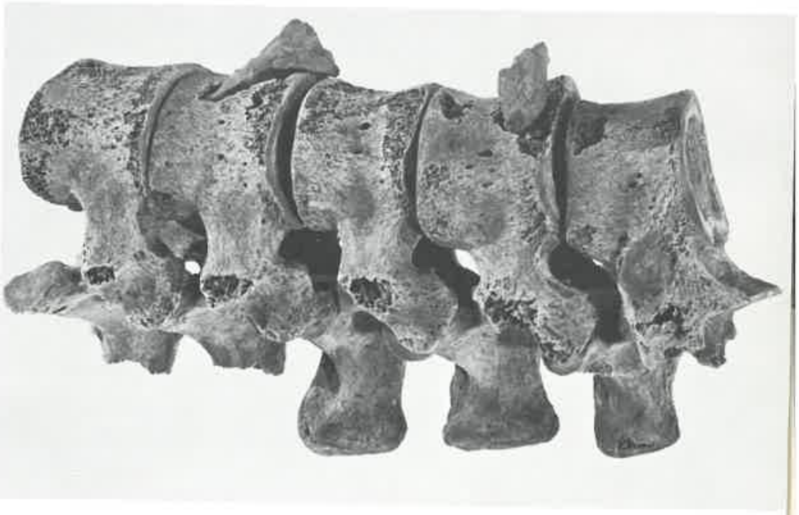
from *String Figures from Hawaii*
by Lyle A. Dickey, Bernice P. Bishop Museum, Bulletin 54.

In an out-of-the way corner of the site a single burial could be excavated, that of a young male who had been executed or murdered. Rarely are such burials met with, particularly one in which the evidence is so overwhelming: two triangular flint points imbedded in the vertebrae, another flint point in the neck, and a flint and an antler tip point in the rib cage. One can only speculate about the nature of the other dozen or so graves which were destroyed. A single burial in an out-of-the-way portion of the site could be excavated, potsherds and arrowheads could be retrieved from the path of the bulldozer, but only a fraction of the valuable information which this site offered could be recovered. Even this modicum of information would have been lost if a member of the surveying crew had not possessed the intelligence to recognize an Indian site and had the interest to notify an archeologist. A report on the salvage archeology conducted at this site will be published by Cleveland's Natural Science Museum in the *Kirtlandia* series.

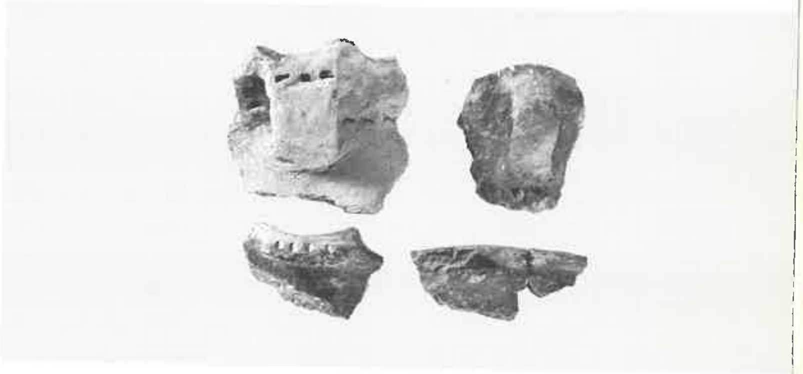
At Athens, Ohio, home of Ohio University, where one might expect a more enlightened attitude, conditions are much the same. A private landowner, Mr. Ralph Daines, anxious to have two mounds on his property properly excavated, had a difficult time finding anyone qualified to do the work; when one of the Daines Mounds was partly excavated, the findings included the oldest known occurrence of corn in eastern North America. What might have been found in an adjoining mound will never be known: a construction firm, intent upon building university housing, destroyed the thousand-year-old mound in a single morning. When the author asked one construction worker to dump the mound's primary burial to one side so that it might be examined, the reply was "We're using this for fill, buddy," whereupon the mound and its contents were evenly distributed over the entire working area and subsequently buried. Ironically, the mound site was actually out of the path of the construction work proper; but all that is left today are a few flint chips and human bones littering the earthen slope behind a new apartment complex.

The story is much the same—even worse in fact—when one enters the northern half of the state. Here, along the shores of Lake Erie, archeologists have been primarily concerned with identifying the remains of the historic Erie Indians and relating the Erie culture to older, prehistoric remains. The Tuttle Hill site at Independence, the hilltop fortification most likely to have provided the key to many of the archeologist's questions about the Eries, was partly excavated in 1930; before further, more refined excavations and interpretations could be made, the entire site was carted away for garden soil and a large industrial plant erected on the site. The Cary site near Bedford has been virtually destroyed by gravel operations, a fate in store for many a site yet remaining in northern Ohio. The Reeves site at Wil-

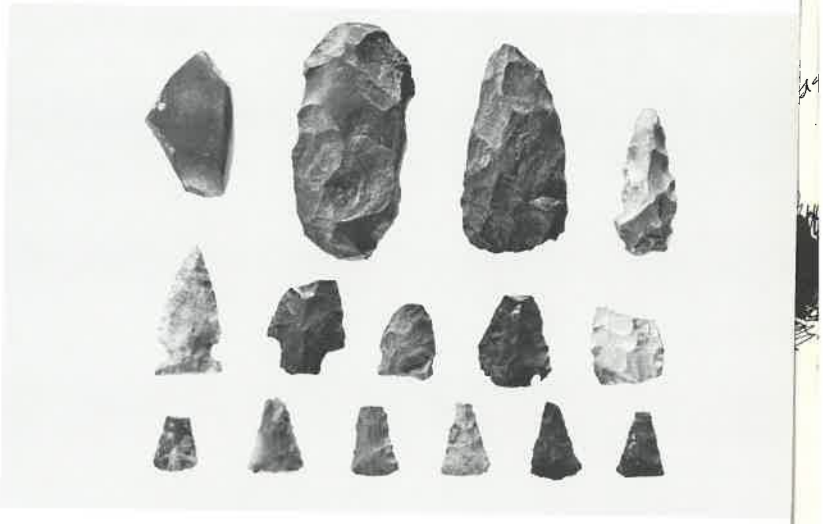
ARCHEOLOGICAL FINDS from the Hobson Site, Middleport, Meigs County, Ohio



Fort Ancient triangular flint points lodged in the centra of the lumbar vertebrae.



Decorated and plain Fort Ancient potsherds; note the large, crude strap handles.



Stone artifacts including a small hematite celt (upper left corner), Archaic stemmed and notched points, and Fort Ancient triangular points.

loughby is now largely covered by a residential area. Super-highways and reservoirs have taken their toll as well. Were the proposed Grand River Reservoir to be built, Ohio archeology would suffer an incalculable loss, for dozens of sites as yet untouched by trained personnel would be flooded.

In the immediate Cleveland area, most sites have already been engulfed by the expanding city. A few have been preserved, almost inadvertently, in the park system, but housing projects and industrial development have destroyed most known sites. Destruction began as early as 1820 when, it is recorded, Dr. Theodatus Garlick salvaged a few Indian relics from a mound at the corner of Euclid Avenue and East Ninth Street. The destruction has continued unabated to the present, with no relief in sight.

Under such circumstances, the archeologist considers himself lucky to reach a site before it is totally obliterated. If he has time to excavate the site as thoroughly as it deserves, he is indeed fortunate. In the face of oncoming bulldozers, toothbrush and trowel must often be replaced by shovel and spade in an attempt to save as much material as possible. Field techniques that would normally make the archeologist shudder because of their crudity must sometimes be accepted, for any sample is better than none at all.

Such an attitude does not justify careless excavation techniques when there is time for more careful methods to be used. An unfortunate phenomenon, not peculiar to Ohio archeology, is the fact that many important sites are destroyed or badly damaged by amateur archeologists who either do not know proper excavation techniques or else are interested only in adding showy artifacts to their personal collections.

Those sites which have survived are usually badly "potholed" by amateur relic collectors, riddled with irregular pits and disturbed areas, virtually useless to the archeologist. Small wonder then that the amateur is often held in contempt by the professional archeologist, for many such amateur archeologists reduce the science to the level of grave robbing. Occasionally, however, amateur archeologists display a concern for accuracy and a care in excavating that rival the attitude of a trained archeologist. The late Arthur George Smith of Norwalk, Ohio, was an outstanding example of a man whose painstaking and careful work rendered the distinction between amateur and professional practically nonexistent. More recently, the Sugar Creek Chapter of the Archaeological Society of Ohio has undertaken a major excavation of an important Whittlesey-like site near Newcomerstown, Tuscarawas County, Ohio. Some of the members have shown much patience and zeal in the less exciting aspects of digging. Even more outstanding is the remarkable work done by the Aboriginal Explorers' Club of Wellsville, Ohio, spearheaded by Harry Cline, which culminated in the establishment of the finest private archeological museum in Ohio.

In an attempt to salvage as much as possible from the fast-disappearing sites of northeastern Ohio, the Natural Science Museum has revived an archeological survey program begun in the 1950's. The aim of the survey is two-fold, for it is attempting both to locate new archeological sites and to excavate previously known sites that are in danger of destruction.

The past summer has been spent in excavating part of a Late Prehistoric "Erie" site at Fairport Harbor, Lake County, Ohio, which will, when analyzed, yield considerable new information about the prehistoric Erie who inhabited this region around 1300 A.D. The Museum also plans to continue excavation of known Erie sites in the hope of delineating their history before all of the remaining shreds of evidence have disappeared.

Without regard for archeology, I-90 slices through Waite Hill, a 4000-year-old hilltop fortification, Lake County, Ohio.

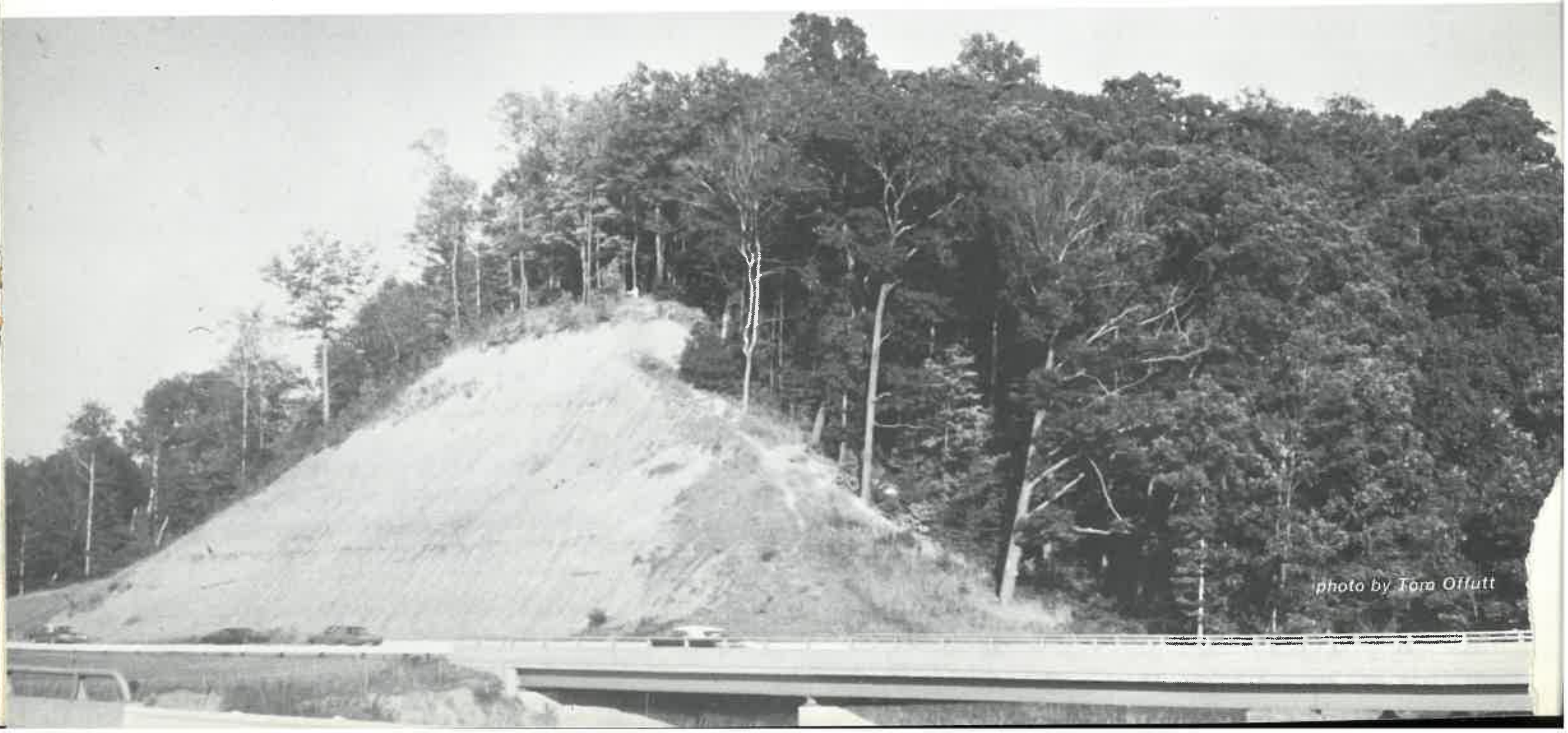


photo by Tom Offutt

EXPLORER
WINTER 1970

Archaeological Investigations at Dickson Mounds

WAYNE F. SHIELDS
Associate Curator of Anthropology
Illinois State Museum, Springfield, Illinois

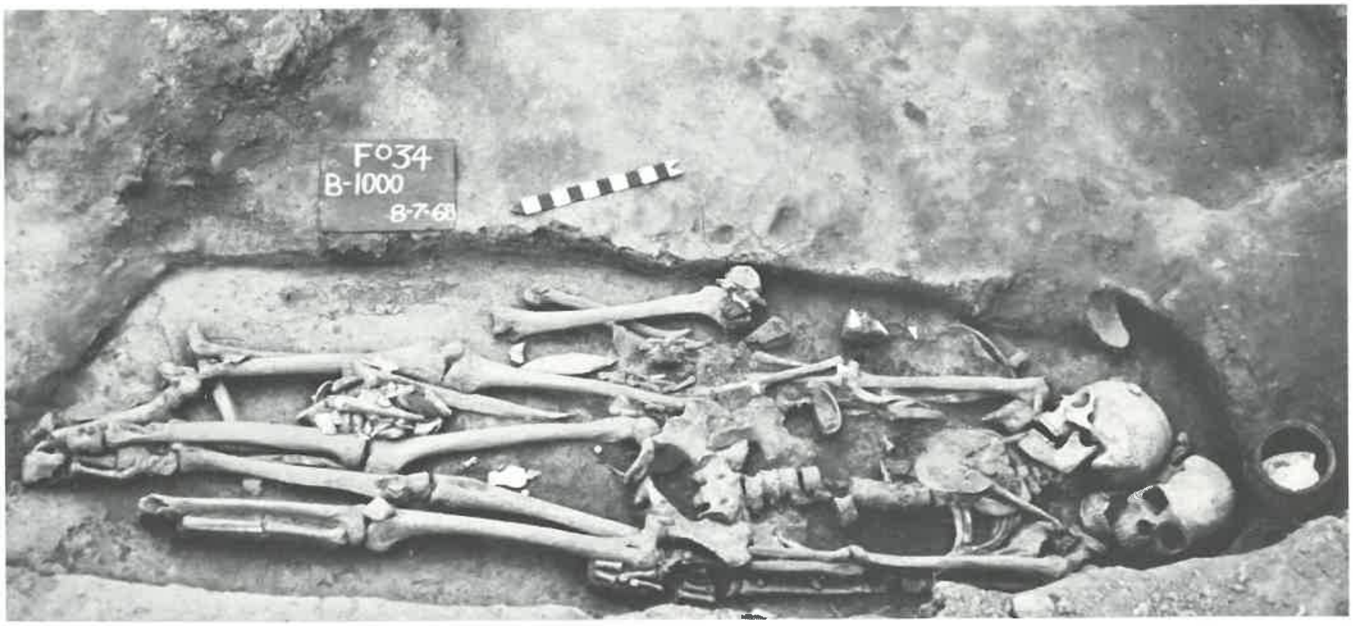
The Dickson Mounds Museum building during construction. The building will be used as a museum of anthropology and for archaeological research.

Dickson Mounds, a branch of the Illinois State Museum, is located along the Illinois River approximately four miles north of Havana, Fulton County, Illinois. The principal archaeological feature located within the 63.75-acre plot that constitutes the Dickson Mounds area is a single earthen, mortuary tumulus named for the family that first excavated and preserved there a number of the Indian burials *in situ*. Although it is probable that the major human occupation of the mound dates from not more than a millennium ago, there is evidence of prehistoric human occupation within the museum grounds to suggest that man has lived there possibly as early as ten thousand years ago.

Because of the somewhat unique burial exhibit and the potential of the locality as a field laboratory for archaeological study, the Illinois State Museum acquired funds through the State Legislature to construct a new museum building at Dickson Mounds.

Before construction could begin, it was imperative that the entire area which might be disturbed by the building activities be archaeologically investigated. This salvage work was initiated in the summer of 1966 by trenching

Burial number 1000 excavated prior to construction of the museum. Note the copper breastplate and numerous items buried with it.



essential ecotactic will be the strict sacrifice by the individual in his use of non-renewable energy and the products made with energy.

Specifically, I am talking about the return to a simpler life style. The era of the compost pile, the clothesline, and hand dishwashing may return. Again we are faced with the problem of whether we will accept this, and again I will answer that it will come only with a change of culture and values. The problem is that Americans in particular enjoy the life of luxury and the personal use of the products that technology has brought to our civilization. But, if indeed there is a society in the future, it will not be marked by thousands of candlepower telling us that McDonald's has sold five billion hamburgers.

Recycling and the use of resources are intimately tied up with energy use. Americans, as is often said these days, have developed the most efficient culture for turning resources into waste. We mine our non-renewable supplies of copper and iron, we cut our forests for wood and paper, and at the same time we pile empty beverage cans across the land, burn tons of waste polluting the air, and take up acres of land to pile cans, bottles, tires, and old appliances in dumps. The woods we stop by on a snowy evening is all too often marred by the rusting hulk of an old car body.

What is the needed ecotactic? The resources we *must* use in the future will have to be recycled—ending our current one-way consumption. Paper plates, plastic spoons, and paper towels will have to be replaced with the old-fashioned kind that we wash and reuse. We will not see ads such as the one International Paper recently ran in major magazines stating that "Tomorrow's baby may live in the same house you do, but he'll probably live in a totally different world from the one you live in. Because everything the baby wears or touches—virtually the entire environment in which he lives can be disposable."

We will have to use not only less energy but less resources. What we do use will have to be recycled: cans and cars remelted, glass crushed and reused, paper collected and remade into more paper. The "eco-home" of the future will have very little use for a trashcan.

Is this feasible and probable? Not under our present culture of "use once and throw away." The problem is twofold: laziness of the individual American and the profit motive of the producer who finds it cheaper to produce wastes than to retrieve and reuse them.

So we conclude that the third alternative, a decrease in consumption, is almost as discouraging as the previous two. But it is as essential to the solution as alternatives one and two.

A WDCR (Hanover) and Outing Club Earth Day clean-up program.

To many of us, the question of ecotactics boils down to the reordering of our society. We would not see Vermont's antibillboard law constitutionally challenged for we consider it the constitutional right for every citizen to live in an aesthetically sound environment. We would not see the Pacific Northwest sacrifice the salmon species because of ever-increasing power needs without questioning why so much power was needed. Sometimes we are encouraged when a government bans a jetport; often we are discouraged when it approves a pipeline or the SST.

Two months ago, there was a massive display of concern about the environment, but in the words of the national Earth Day Coalition, "things have only gotten worse." The high improbability that the needed changes will be made carries over to a high improbability that the crisis will be solved. Alternatives do exist which we could enact before it is too late, but we will not see this action under our present set of values. Some of the values we have tried to determine this weekend will soon disappear, because as Hardin says:

> The technology stands ready, but the trouble starts with some individual, you, me, whose response to a situation is to give highest priority to his personal chance of profit, or his family's, or his country's.

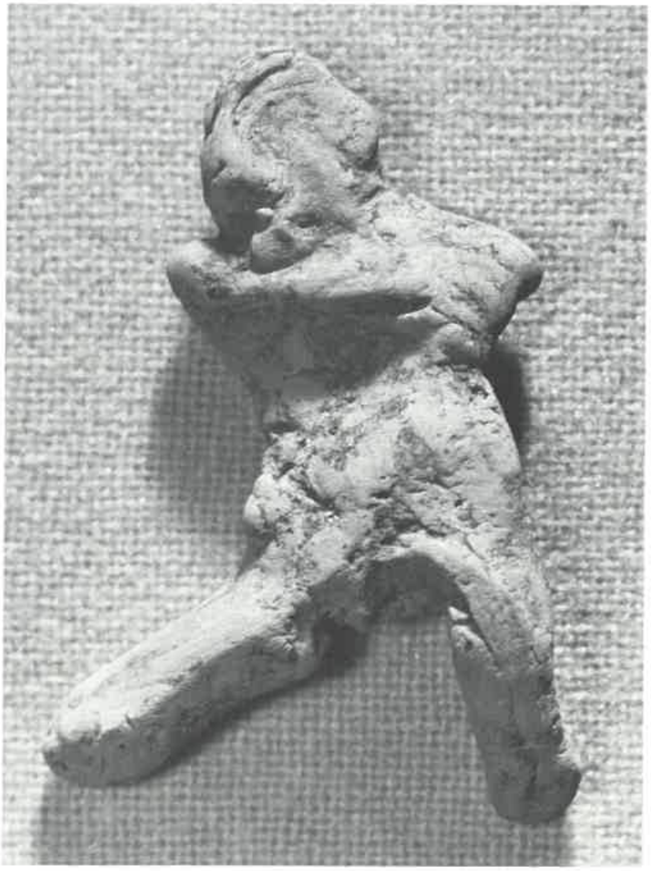
Why don't I give up in despair? Because, as I mentioned earlier, I am willing and committed to working to at least prolong the apocalypse. It is partly because I seem to enjoy what might seem discouraging work, but it is more deeply that I am unwilling to admit defeat in the battle which may be for life's survival itself.

an undisturbed section of the burial mound. Excavation of the mound, as well as a preliminary investigation of the adjacent village site, continued in 1967. Salvage excavations in the area where the new museum building was to be constructed were completed in 1968, and excavation of the parking lot area, entrance and exit areas, and along the water line right-of-way was nearly finished during last summer's field session. This season will complete the salvage program necessitated by the construction of the new museum complex.

The recovery of these materials during salvage operations provides a mass of data which will contribute greatly to the knowledge of the prehistoric Indians in the central Illinois River valley. Perhaps the most significant product of all the excavation work performed to date is the recovery of 1,041 human burials, representing one of the largest samples of human skeletal material from a single cemetery site in the New World. Of this number, the 234 skeletons excavated by members of the Dickson family in the late 1920s are still *in situ*. A sample of this size from a single population permits detailed pathological studies on the nature and effects of diseases, nutrition, and other biological variables within the population. Furthermore, factors such as mortality rates and age and sex ratios can be meaningfully computed. The human skeletal material recovered during the salvage operations is currently being studied by physical anthropologists at the University of Massachusetts and at Indiana University.

A number of artifacts occurred with the skeletons as burial accompaniments. These included a variety of partial and complete pottery vessels differing in shape, size, and material used in manufacture. Studies are now underway to determine whether the variations in ceramics represent temporal or functional differences—or perhaps both. Other mortuary items with burials were necklaces, bracelets, shell spoons, ear spools, combs, and beads of shell, bone, pearl, and clay. Tobacco pipes, hunting tools, sewing kits, and woodworking implements were also found.

Excavations in the adjacent village site have also been rewarding. Approximately 375 food-storage pits of various sizes and shapes, later filled with refuse, were uncovered. These usually contained pieces of pottery—occasionally a whole vessel—plus stone, shell, and bone tools. An unusual artifact from one pit was an anthropomorphic clay figurine. Large quantities of small animal and plant remains recovered by water-screening soil from the pits will provide useful information on the food economy of these people; some evidence regarding the past local environmental conditions may also be derived from these data.



Anthropomorphic clay figurine recovered from storage pit at Myer-Dickson village site.

The remains of 13 rectangularly shaped structures were defined on the village site—most of which were probably dwellings. These Indian houses were constructed by placing vertical wall posts in trenches. The posts were then stablized by refilling the trenches. It is probable that a horizontal pole framework was then attached to the wall posts, brush or grass was then employed as the final covering. The walls appear to have been vertical with either gabled or arched roofs.

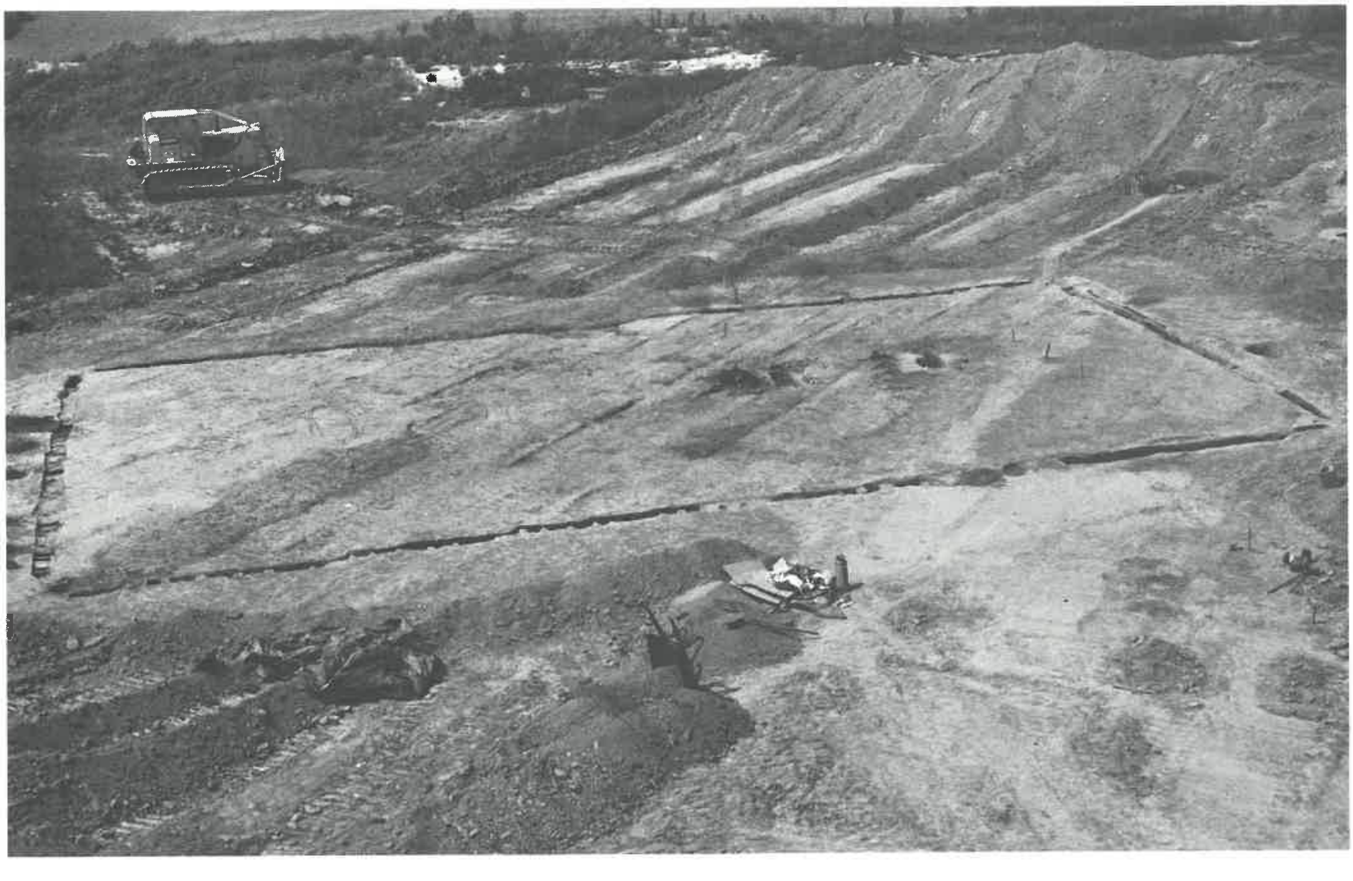
The houses ranged in size from 12.65 by 15.30 feet to 48.60 by 82.40 feet. The smallest, which partially burned, provided a sufficient quantity of charcoal for radiocarbon dating. In additon, the charring tended to preserve the materials, thus enabling a more accurate study of the construction techniques. The largest structure, unusual because of its size, differed in the technique employed in its construction, a pattern more typical of that employed by peoples living farther south. This large structure had five large, centrally placed post pits evenly spaced along its long axis, containing posts of 12 to 16 inches in diameter. Ramps into each post pit indicated that the ends of the large center posts had been loaded horizontally into the pits and then the posts were raised to an upright position. Stains in the soil where the wall posts have decayed indicated that the walls were vertical as opposed to slanted, thus suggesting a gabled roof. The entrance was located on the southwest side of the structure where there were indications of a small porchlike projection. The absence of a hearth and the dearth of storage pits within the structure suggest something other than domiciliary usage; we suspect that the house functioned as a community structure for social or religious functions.

Statements at this time about the origins, the various cultural affiliations, and the demise of these people would be at best hypothetical. It can be said that the people who built the mound lived there from approximately 600 to 1000 years ago. They subsisted on a variety of fish, birds, mammals, wild seeds, and corn, although corn does not appear to have been a significant part of their diet. They were competent potters and utilized several kinds of raw materials in fashioning their tools. The treatment of the dead with accompaniments of many shell beads suggests a practice of body ornamentation of both sexes, presumably during life as well as after death. Their architectural structures were relatively sophisticated and apparently permanent.

The processing and analysis of the excavated material is currently underway—a project that will take some time. Wood charcoal samples are being prepared for radiocarbon analysis, and burned clay from hearth areas has been collected for archaeomagnetic dating. Dates from these analyses will provide a sounder chronology than that already possessed.

In addition to the archaeological research projects, new exhibits relating the story of man during the past 12,000 years in the New World are in process. Hopefully, these new displays and the original exposed burials will be ready for viewing by the public in the summer of 1971.

Large structure prior to excavating the center post pit.
Structure floor measured 48.6 by 84.2 ft.



EXCAVATIONS AT MULBERRY ROW, MONTICELLO

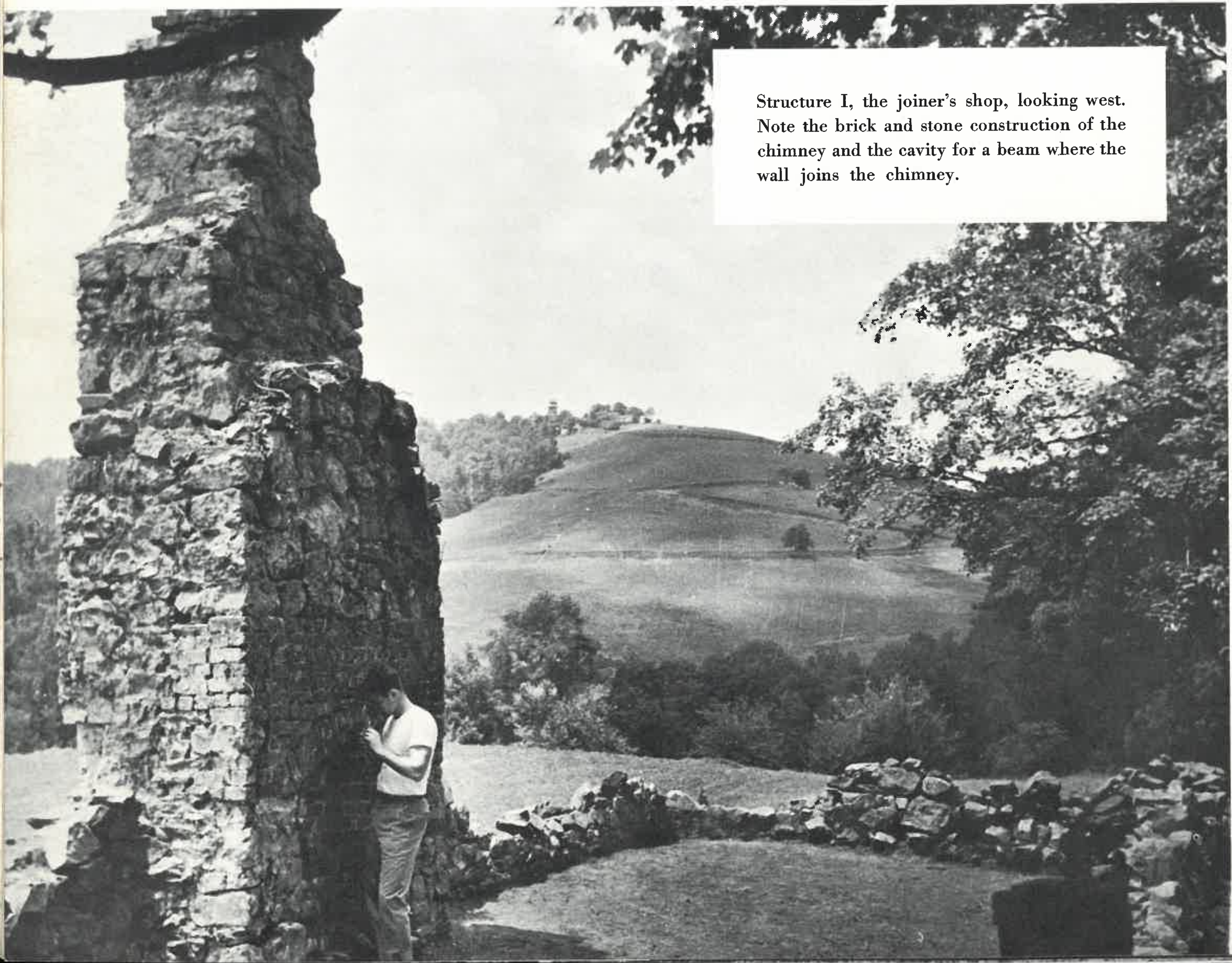
by ORIOL PI-SUNYER, PH.D.

assistant professor of anthropology

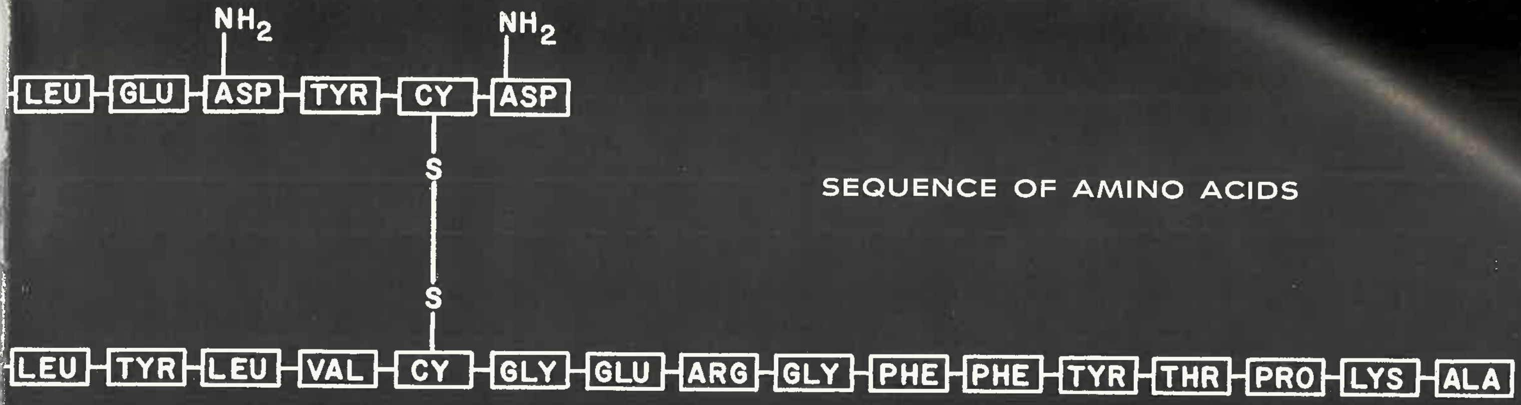
Case Institute of Technology

THE EXPLORER AUG. 1963

Every year, the warm summer weather draws a flood of visitors to the national shrines and historic places of America. These visits do much to maintain a contact with the nation's past, to further a sense of identity with its great men and enduring institutions. Yet, the



Structure I, the joiner's shop, looking west. Note the brick and stone construction of the chimney and the cavity for a beam where the wall joins the chimney.


NH2
NH2
LEU GLU ASP TYR CY ASP
S
S
LEU TYR LEU VAL CY GLY GLU ARG GLY PHE PHE TYR THR PRO LYS ALA

SEQUENCE OF AMINO ACIDS

AMINO ACIDS IN INSULIN

GLY–GLYCINE
ILEU–ISOLEUCINE
VAL–VALINE
GLU–GLUTAMIC ACID
GLU/NH^2–GLUTAMINE
CY•S/S•CY–CYSTINE
ALA–ALANINE
SER–SERINE

LEU–LEUCINE
TYR–TYROSINE
ASP/NH–ASPARAGINE
PHE–PHENYLALANINE
HIS–HISTIDINE
ARG–ARGININE
THR–THREONINE
LYS–LYSINE

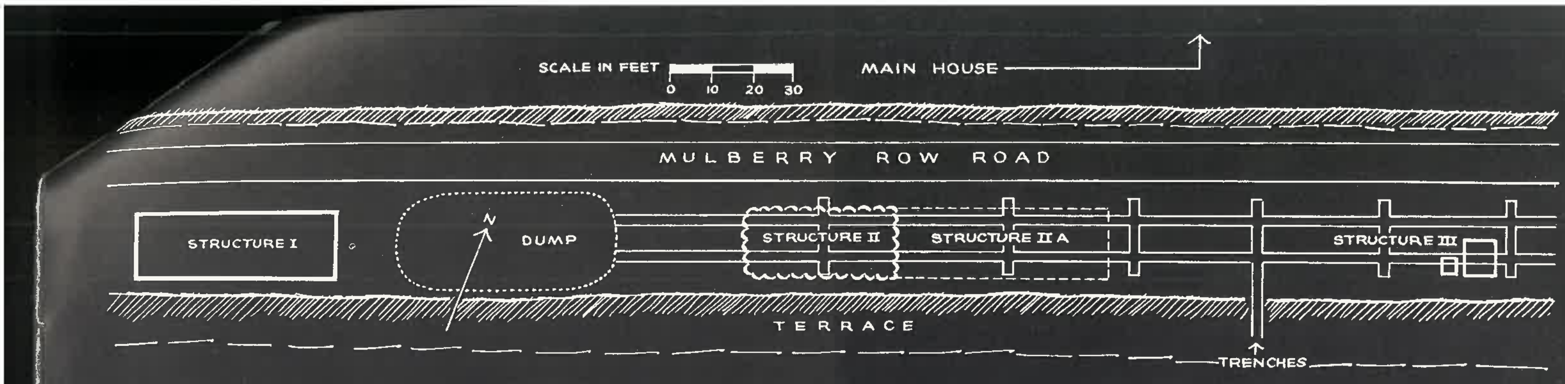
PRO–PROLINE

If we look at the microscopic picture of a cell, we can observe changes in the appearance of the central nucleus from time to time. At times the dark-staining, granular, nuclear material becomes organized into distinct thread-like structures. Because these bodies absorb certain stains, they are called *chromosomes*, which literally means "colored bodies." When a cell duplicates itself, these chromosomes go through a remarkable series of maneuvers which results in each cell of the division having a complete new set. Biologists, after many years of studying chromosomes, came to the conclusion that they must be the bearers of life's genetic information vital for the operation of the cell and for the determination of the species. Each species of plant and animal has its own number of chromosomes, and the chromosomes themselves have distinctive shapes and sizes. The specialized reproductive cells from each parent contain one half the number of chromosomes found in normal body cells. When egg and sperm come together in fertilization, the fertilized egg completes its set of chromosomes with one half of the set coming from each parent.

When chromosomes were examined with the electron microscope, they were observed to contain a great deal of fine structure. The giant chromosomes in the salivary gland of the pesky fruit fly, *Drosophila*, have been studied in great detail and were found to consist of a string of dense regions stretched out along the chromosome like beads on a string. Through very ingenious experiments, geneticists have been able to make maps of the regions of chromosomes involved in transmitting specific characteristics from generation to generation. For example, in the fruit fly certain regions of the chromosome are involved in making the eyes red and others determine the shape of the wings.

Ordinarily, by a random and very slow process, slight alterations can occur in the material of the genes of all cells. If these cells are involved in reproduction, the altered gene may be transmitted to succeeding generations resulting in what is known as a mutation. The mutation may be noticeable, as in the case of a deformity, or it may be very subtle and never be detected. The rate of production of mutations can be increased by a number of outside influences such as X-rays, radioactivity, chemicals, and ultraviolet light. In the case of X-rays, it has been shown that the number of mutations increases in proportion to the amount of radiation.

An important discovery concerning a major function of genes was made by George Beadle and his associates working with the orange bread mold, *Neurospora*. Beadle found that many artificially-produced mutants of *Neurospora* had one thing in common. The mutation interfered with the production of certain specialized proteins, the enzymes, powerful biological catalysts necessary to the normal chemistry of the organism. By feeding the mold a diet containing the substances whose production had been blocked by the loss of the enzyme, the mold could grow in a normal way. Beadle's experiments with molds showed that the genes, which had long been postulated as the smallest units of heredity, possess a function of very great importance in controlling the production of specific proteins and enzymes necessary to the carrying out of certain steps in the complex life chemistry of the cell. ■ *(to be continued)*



PLAN OF MULBERRY ROW EXCAVATION SHOWING LOCATION OF STRUCTURES.

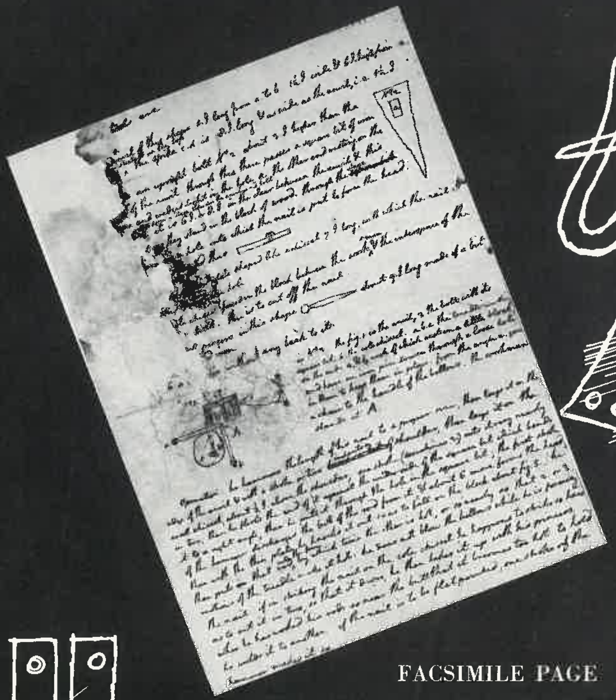
very ease and speed of modern travel which permit visits to numerous localities in the course of a short vacation is not always conducive to a proper understanding of a way of life that not only lacked many of the comforts we take so much for granted, but was for the most part led within the narrow boundaries of a single town, county, or plantation.

The visitor who now parks his car in the Monticello parking lot and spends a few hours admiring the refined simplicity of the Monticello facade, the elegance of the interior furnishings, and the beauty of the formal gardens—all maintained by the Thomas Jefferson Memorial Foundation—can hardly be blamed for not realizing that Monticello in its prime was essentially a small isolated world.

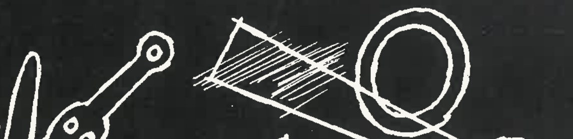
Like most plantations of the time, it was a community organized to meet most of its domestic needs for food and manufactured products — in short, a miniature economic and social system. In a letter of 1812 to the Polish patriot Kosciusko, Jefferson vividly depicts the workings of one of his plantation enterprises, the textile plant:

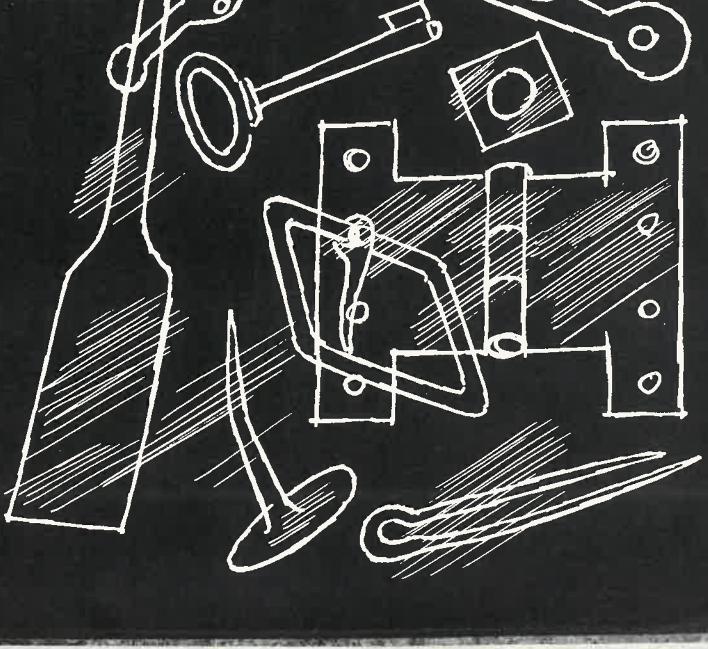
> "My household manufactures are just getting into operation on the scale of a carding machine costing $60 only, which may be worked by a girl of twelve years old; a spinning machine, which may be made for $10, carrying six spindles of wool, to be worked by a girl also; another which can be made for $25, carrying twelve spindles for cotton; and a loom with a flying shuttle, weaving its twenty yards a day. I need 2000 yards of linen, cotton, and woolen yearly to clothe my family (ie. those resident on the plantation), which this machinery, costing $150 only, and worked by two women and two girls, will more than furnish."

Artifact illustrations based on original drawings by James A. Bear.



FACSIMILE PAGE FROM THOMAS JEFFERSON'S INSURANCE DECLARATION, 1797.





Activities of this type—smith's shop, carpentry ("joinery") shop, "nailery" for the manufacture of nails, as well as various types of service and maintenance undertakings — were not carried out within the main mansion, but in a number of subsidiary structures situated along Mulberry Row, a tree-lined avenue to the south and west of Jefferson's residence.

Over the years these "outhouses," as Jefferson called them, were allowed to fall into ruin. Being strictly small utilitarian workshops and dwellings for the servants who operated them, they lacked the esthetic interest of the main mansion, and household manufactures lost much of their economic importance in the years following Jefferson's death.

The location and general function of these structures are recorded in Jefferson's insurance declarations. But for the average interested visitor to Monticello, the loss of these buildings means that a significant aspect of plantation life is missing.

Jefferson devoted much of his energies to planning and running his household industries. The zeal with which he began the manufacturing of nails is evident in a letter written to a French correspondent in which he confesses that "my new trade of nail-making is to me in this country what an additional title of nobility or the ensigns of a new order are in Europe."

In the summer of 1957, the Thomas Jefferson Memorial Foundation engaged me to excavate a portion of Mulberry Row. The immediate task was that of locating buildings, determining as far as possible their use in Jefferson's time, and collecting what artifacts the excavation might yield. It was hoped that the work would at some future date provide the basis for a program of reconstruction.

The location gives the dimensions of the structures (I, II, II A, and III) excavated in the course of the dig. The structures face Mulberry Row and back on to an incline that slopes down to a broad terrace. The photographs illustrate the technique of excavation: two main parallel trenches run the length of the dig and are cross-cut at intervals by shorter perpendicolar trenches.

The ideal situation in any archeological venture is one in which neither time or money are at a premium. Given such conditions, the archeologist may proceed by stripping the whole area in which he is interested of vegetation and overlying soil. It is seldom, though, that resources permit such an expensive approach.

Fortunately, archeology has developed methods of exploration that achieve almost the same results at a saving. One that is well suited to a physical setting such as that at Mulberry Row is a grid of trenches laid out net-fashion over the area in question; the assumption being that most features below the level of the ground will come to light in one or another of the trenches. In most instances just a small portion of the hidden structure is found in this manner—a piece of wall, a strip of floor, etc. Once this stage has been reached, the rest is fairly easy, for all that the excavator need do is to follow the feature revealed by the trench until it is all uncovered. The excavation of one of the structures, Structure I, did not even require this type of exploration. Enough of the chimney and stone walls remained above the level of the ground to make the outline of the original building clearly discernible.

Unlike excavations of prehistoric remains, the archeology of historic localities is simplified through the use of documentary materials. In the case of Mulberry Row, a number of Jefferson documents, especially an insurance declaration of 1796, give descriptions of the buildings as they stood in his time. These documents are especially valuable in helping resolve problems of identification. The archeologist's initial task, though, remains that of excavation. Identification can only be attempted once the structure is revealed. It is usual at first, therefore, to give buildings a neutral designation ("Structure I," etc.) in order to beg the question of their function.

Excavation revealed Structure I to have been a solidly built house with external measurements of 18 by 51 feet. The floor is a simple affair of packed clay. The walls are made of unfaced stone coursed with little or no mortar. A brick and stone fireplace in a good state of preservation faces the entrance on Mulberry Row. Features of some significance are four cement-lined cavities in the structure of the chimney which at one time must have served as supports for wooden beams. Two cavities still show clear imprints from the timber.

Artifacts from the structure and vicinity amounted to some fragments of china and glass, a small assortment of iron hardware, some miscellaneous metal, and two metal buttons. While these finds do not offer much help in identifying the building, the location and structural features of the house fit in well with one described in the 1796 insurance declaration: "a joiner's shop, 57 feet by 18 feet, the underpinning and chimney of stone, the walls and roof of wood." Apart from a discrepancy

PHOTOS BY THE AUTHOR

in length, the rest may be taken as an exact description. Wood construction of the upper walls may be inferred from the fireplace cavities.

Structure II was located 97 feet to the east of Structure I. At first the trenches showed nothing more than two parallel strips of closely packed rock 37 feet in length. When the soil was cleared from between the trenches, and the packed rock followed to its limits, the feature proved to be a rock platform 37 feet long by 18 feet wide.

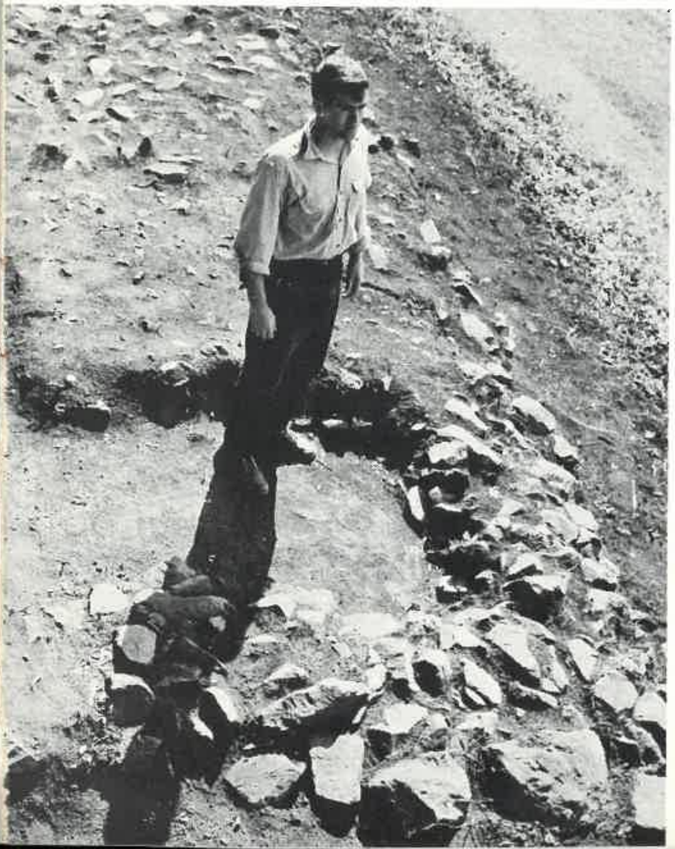
Unlike Structure I, Structure II and the surrounding areas (including Structure II A) was revealed as a veritable mine of cultural materials. Many of these remains suggest nail-making activities and include no less than 35.5 pounds of finished nails, 60.5 pounds of nailrod (the long iron strips from which nails were cut and shaped) and 65 pounds of assorted metal objects.

In laying out the following the parallel trenches after the excavation of Structure II, we found that the soil for some fifty feet immediately to the east of Structure II showed unmistakable signs of disturbance. Unlike the typical soil of the area—a hard packed clay of vivid red hue — this was of a darker color, loose and full of charcoal fragments. Furthermore, fragmentary remains of glass containers, tools and metal artifacts were mixed with the soil. If we add to these indications the further fact that the area encompassed by the soil and debris was a very strict rectangle 50 feet by 18, the evidence strongly suggests that what we have are the remains (floor area) of a structure.

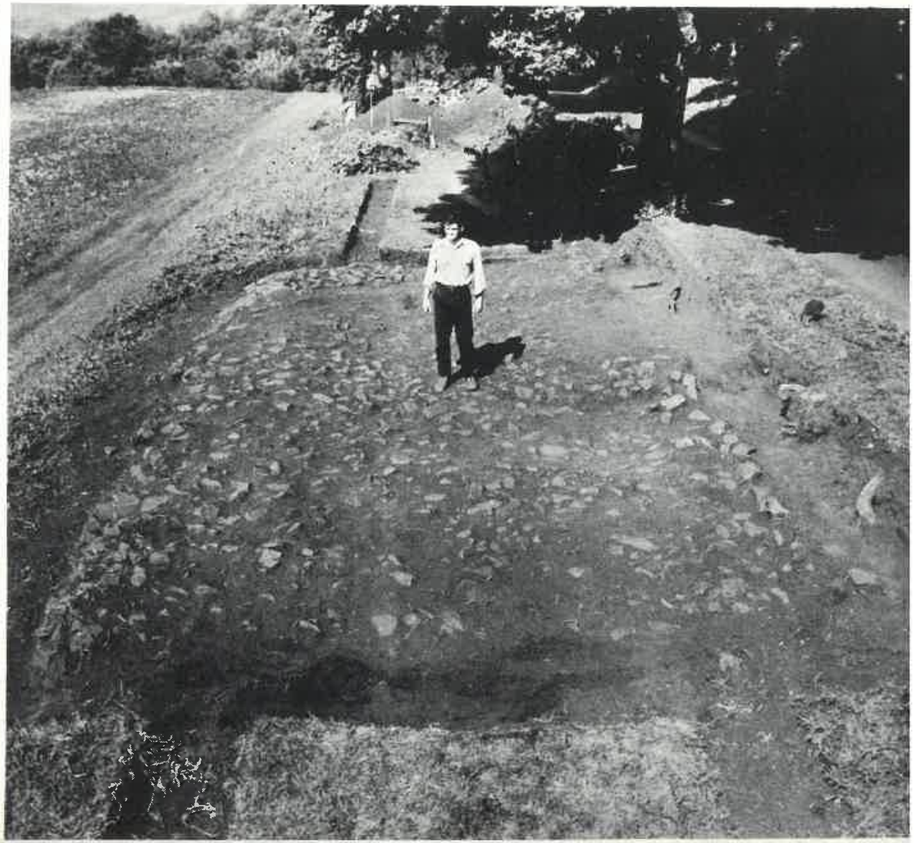
Two considerations influenced the designation of this structure as "II A" instead of the apparently more logical III: its immediate proximity to Structure II. and the fact that the evidence, although it tends to suggest a separate building, is not totally conclusive.

The rock platform of Structure II has the exact dimensions of one of the buildings ("smith and nailer's shop") described in the 1796 insurance declaration and, given that Structure I is correctly identified as the joinery of the declaration, measurement puts it within a foot of the location of the smith and joiner's shop of the document. Very strong supporting evidence for identification comes from the wealth of metal artifacts and the debris of nail-making activity.

The southwest corner of the rock platform of Structure II, the nailery. The man is standing on the original level of the bank of undisturbed clay revealed by the test pit.



The rock platform of Structure II. Mulberry Row is on the right (north): terrace on the left. The dark soil in the foreground was the first indication of Structure II A.



The same insurance declaration mentions a building to be added to the nailery "50 feet by 18 feet for the nailers, to be built immediately, and making one building (with the nailery). It is to be included in the valuation as if it were already built." Evidently, this building is the same as our Structure II A. The location is as it should be, and the floor area of the building is identical.

Structure III combines considerable architectural detail with somewhat puzzling remains. It consists of two distinct entities, a brick floor and what we will be satisfied in describing as a brick chimney base. The floor is a rough rectangle, 7½ by 9½ feet, of unmortared brickbats and whole bricks laid directly on the undisturbed clay. The northern and eastern edges of it show clearly that these are the terminal edges of the floor, while to the south and west it peters out in a jagged line of bricks. To the south, the floor could not possibly have extended very far because of the sudden drop into the terrace below. It is much harder to assess how far the original floor extended to the west.

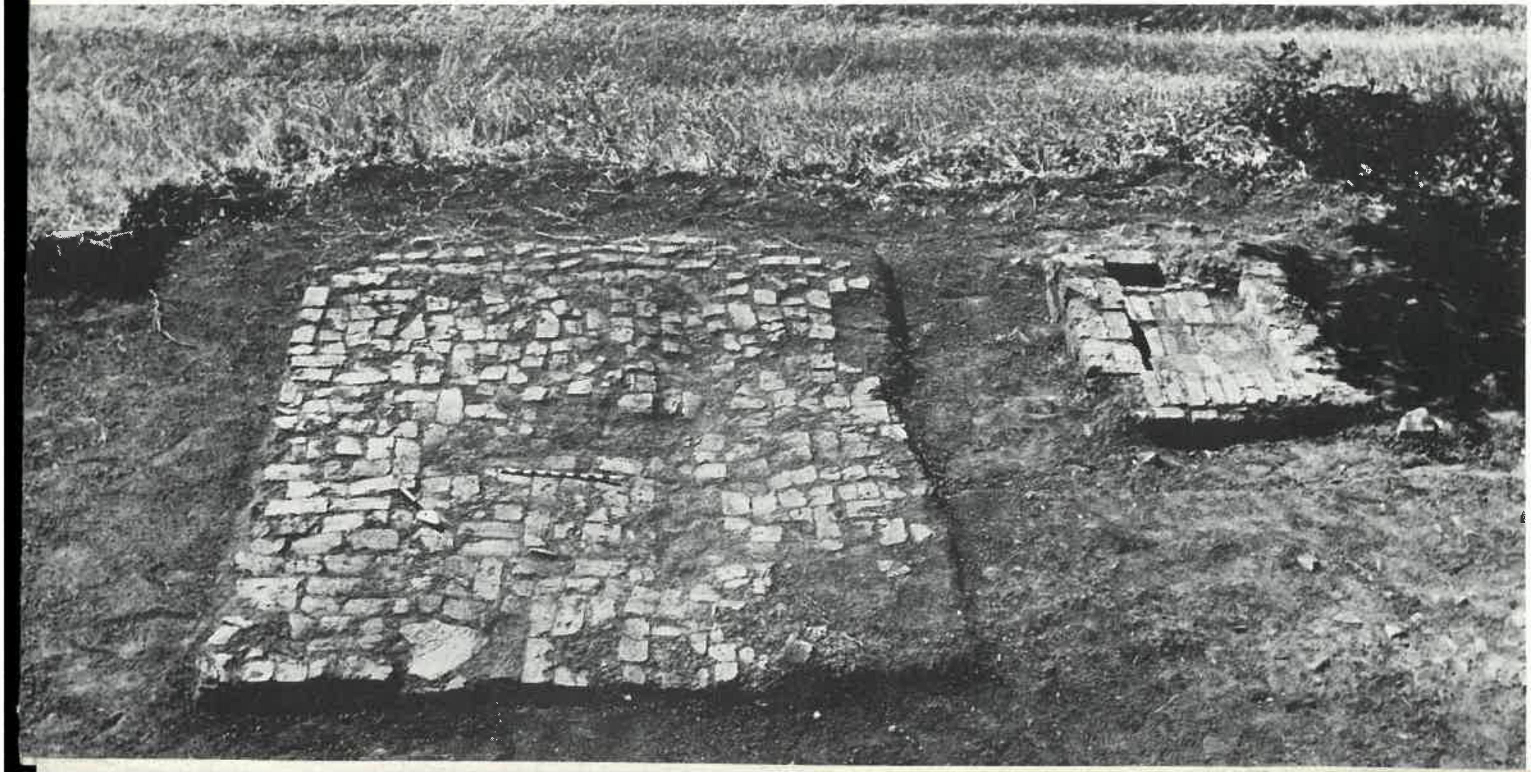
It is likely that the bricks, which at one time must have gone beyond the present western limits, were removed to be used as fill or incorporated into some other structure. Bricks all had to be produced locally, and as such represented a commodity of some value. Probably the floor extended for the same distance to the west of the chimney base as it now extends to the east. Such a plan (similar to that for Structure I) would put the fireplace in a central position jutting out into the floor area from the south wall of the building.

The chimney base may be described as a shallow, rectangular brick pit with a floor made of closely fitted, unmortared bricks. In contrast to the floor, the sides (or walls) of the pit are stoutly mortared together. On three sides, the cement shows the clear imprints of another course of bricks. On the north side (the side opening out into what may have been the center of the room) no such continuity is evident; in fact the mortar has been carefully smoothed off, a feature in keeping with the hypothesis of its being the front or threshold of a fireplace.

The structural features of the pit further reinforce the assumption of a chimney. Airtight construction is desirable in chimneys, while the weight of overlying bricks requires that the base of a brick chimney be strongly built.

Structure III is located 129 feet to the east of Structure II, a distance that would place it in approximately the same location as "a house 16 by 10½ feet, of wood, used as a storehouse for nailrod and other iron" referred to in the 1796 insurance declaration. While the exact dimensions of an undisturbed Structure III must remain a matter of conjecture, a floor plan of this area fits in well with the archeological findings.

The strongest evidence for identification with the



Brick floor and chimney base of Structure III, the storehouse for nailrod. Note how the brick floor peters out on the right (west) edge. It is probable that the bricks were removed for use as fill or for the construction of another building.

building in the Jefferson document comes from the materials collected in and about Structure III. The quantity of nailrod from the building and its environs—some 62 pounds— is greater than that recovered from any other locality on the site. Concentration is also higher than elsewhere, for Structure III (even in its postulated original form) must have been a very small building. Furthermore, no less than five nailrod binders —a good indication of storage—were collected from this spot. If we add the 70 pounds of miscellaneous metal, most of it having the look of scrap iron, identification with the building in the insurance declaration appears beyond reasonable doubt.

Metal objects represent the overwhelming majority of artifacts recovered in the course of the 1957 dig. Of these, items associated with the manufacture of nails must take pride of place both in terms of gross bulk and historical significance. We know from documentary sources that Jefferson made wrought nails for plantation use as early as 1775 at his Chadwell Branch estate and that he first made nails at Monticello in 1794. Production continued until 1812. This was therefore a long established industry, and the Mulberry Row finds include examples of every stage of the nail-making process from raw material to finished product.

The basic raw material was the ubiquitous nailrod; thin strips of square or rectangular-sectioned metal shipped in from Philadelphia. This rod, varying in length and diameter according to the type of nail for which it was intended, came in sheaf-like bundles, each with its nailrod binder, simply a measured piece of rod wound around a bundle and twisted securely together. While the excavation did not bring to light any intact bundles, enough binders were recovered to permit fairly accurate reconstruction. Such bundles weighed approximately 50 pounds and were probably 10 feet long.

Aside from the binders and nailrod, the excavation yielded "blanks" of various sizes — unshaped small pieces of nailrod—and a full range of nails ranging from the 30-penny, or as Jefferson wrote it, *XXXd,* of about four inches, to the *IVd,* or one inch. Nails were intended both for plantation use and for sale to neighboring farmers and merchants. In a year of peak production, 1800, sixteen boys from ten to sixteen years of age were employed as nailers—heating nailrod at a forge, cutting and shaping the nails—all working under the supervision of a master smith-overseer.

The same supervisor was in charge of the smithy attached to the nailery ("smith and nailer's shop"), and many of the recovered metal objects found in the vicinity of structures II, II A, and III should probably be referred to this department of his activities. Substantial quantities of iron scrap such as broken tools, hardware, fragmentary horseshoes, and pieces which cannot be identified with any degree of certainty must represent a portion of the raw material used in the smith's trade. It must be kept in mind that iron was valuable and at times hard to get, hence as much use as possible was made of scraps and old and broken implements. Scrap iron was supplemented by bar iron and strap (sheet) iron produced from dealers. A few examples of such metal were also recovered.

While simple agricultural tools and a portion of household fittings were made on the plantation, various finds indicate a sophistication well beyond the reach of a plantation smithy. These, together with fragments of glass and china, support the documentary evidence that Mulberry Row was not only a manufacturing, but also a residential section of the plantation.

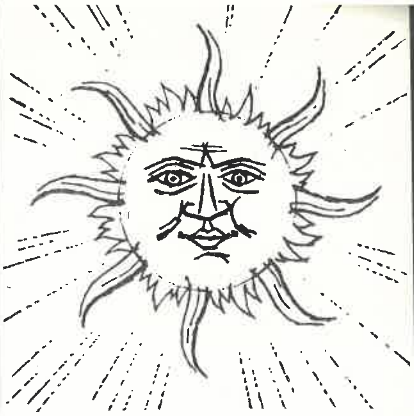
The density of these artifacts—a total of 99 clearly identified tools, iron hardware (some probably locally made) household objects, and fragmentary pieces of china, glass, and bottles—is not so great as to suggest that the area was extensively used as a dump. Many can be positively identified as of late eighteenth or early nineteenth century provenance, including fragments of English china, four metal buttons of English manufacture and one United States military button of the period 1792-1810.

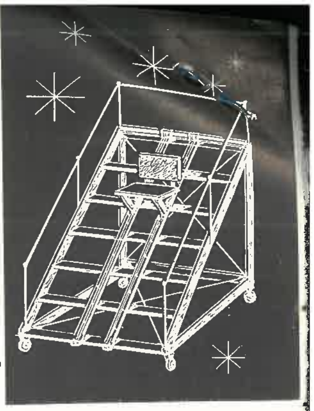
While some articles may have been lost or dumped in the area by members of Jefferson's family, it seems likely that the majority found their way to Mulberry Row after they were considered unfit for use in the main mansion. We may hypothesize that the occupants of Mulberry Row received them as presents from Jefferson's family or obtained them from household servants.

In conclusion, we should note that the structures excavated at Mulberry Row represent but a fraction of those in use at the time of Jefferson. The 1796 insurance declaration mentions no less than eighteen buildings — some residential, others workshops, stables, and storage sheds.

The visitor to Mulberry Row will today find little to remind him of the 1957 excavations. In order to protect them the structures are again covered with a mantle of earth and grass. A number of the artifacts, though, remain on display at Monticello, home and last resting place of Thomas Jefferson. ■

THE OBSERVING STAND





by DAN SNOW, director

Ralph Mueller Planetarium and Observatory

With the coming of summer we all spend more time outdoors, some of it after dark when we can see the stars. They are the same ones that were in the sky last summer, but they have been out of sight for a long time, and so a review seem appropriate.

If it is a nice night and you decide to look at the stars, don't expect the full glory of the heavens to burst into sight the moment you step out of the door. Give your eyes a chance to get accommodated. Most of this will happen within the first ten or fifteen minutes, but there will be some increase in dark adaptation for about half an hour.

The dominating feature of the summer sky is the Summer Triangle. In July it is high in the east in the early evening, and by August it is overhead. It is marked by three bright stars in three different constellations. The westernmost of these is Vega, the brightest star in the summer sky, and the constellation is Lyra, the Lyre. As the daily motion carries the stars westward during the night, Vega passes within about two degrees of the zenith, a fact that makes its identification easy.

Hanging below Vega, a parallelogram of faint stars is visible if the night is clear and dark. The long sides are to the east and west, and the short ones north and south. The middle of the south side is the location of the Ring Nebula. In a telescope of moderate size, this object looks like a dim planetary disc. There are many nebulae that have this appearance, and this accounts for the name given to them—planetary nebulae. In a larger instrument, the origin of the Ring Nebula's name becomes obvious; it looks like a cosmic smoke-ring. If the night is clear and the telescope large enough, a faint star can be seen in the very middle. The Ring was once part of this star. Sometime in the past a vast explosion blew off a portion of the gaseous material of the star in the form of this ring which is still expanding into space. We just happen to be in the right position to see it head-on and as a ring. From some other part of space it would have an elliptical appearance or would even look like a bar seen edge-on.

Lyra memorializes the original harp. Legend has it that Mercury fashioned it from a tortoise shell and then traded it to Apollo for the caduceus. Apollo gave it to his son Orpheus who extracted such exquisite music from it that the trees bent over to hear better, and even the stones of the field gathered around to listen. It was this talent that has made his name a synonym for all that is the best in music. After his death at the hands of a band of enraged and jealous Thessalian women, the gods put his instrument in the sky as a memorial to his skill.

To the south, Altair marks the apex of the triangle. This star is in Aquila, the Eagle. This was the eagle who swooped down on the dreaming Ganymede and bore him away to Olympus to be the cupbearer of the gods. Of the several birds in the sky, only the eagle was able to reach his place under his own power; all the others required help from various deities.

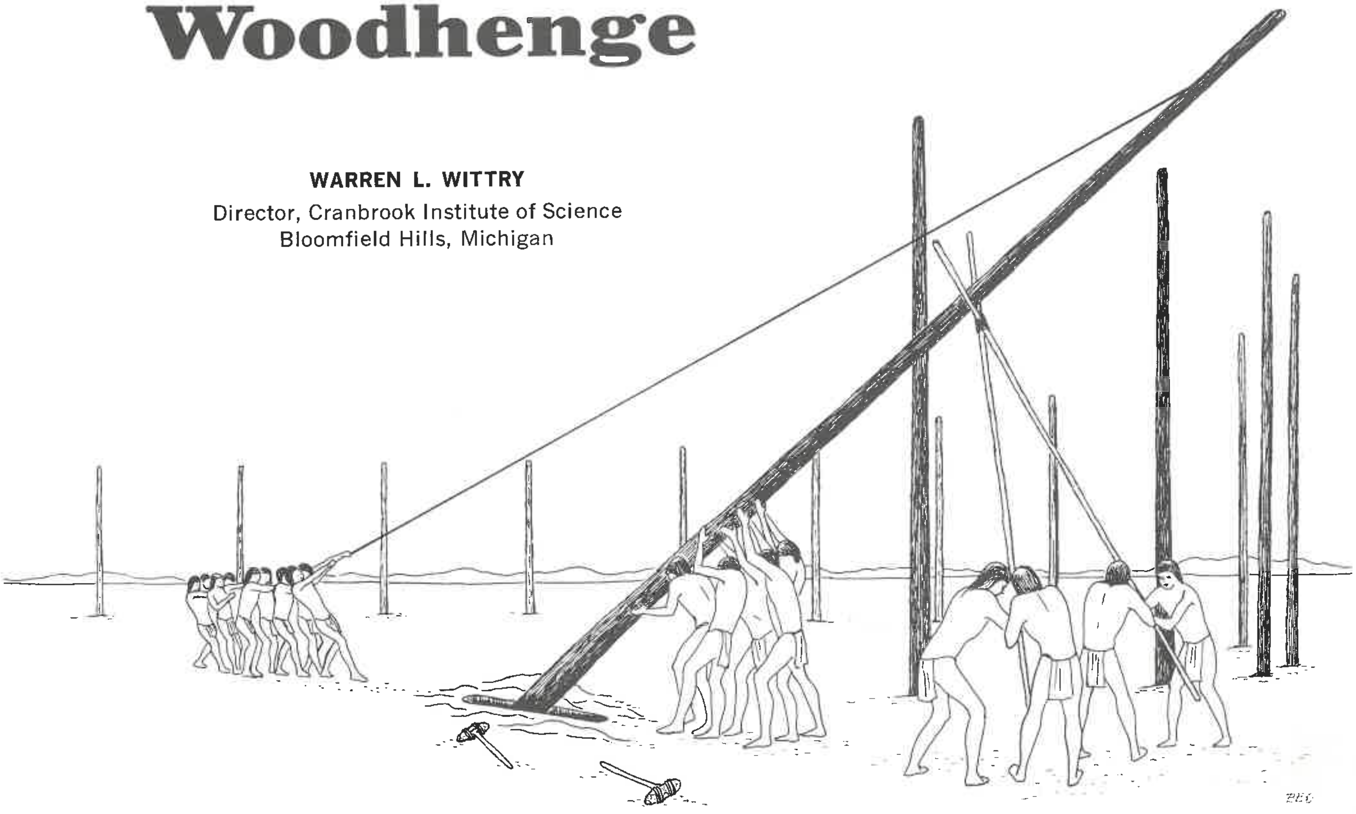
If the night is clear and moonless, one can find — a short distance east of Altair — a small group of stars in the form of a lower case Greek sigma. This is Delphinus, the Dolphin. One story tells that he earned his place in the sky by rescuing the poet Arion. Arion was bound for Corinth when the ship's crew plotted to murder him. He succeeded in jumping overboard, however, and rode the handy dolphin bareback into Corinth.

In an Italian star catalogue of 1814, two of the stars in the Dolphin carried the strange names of Sualocin and Rotanev. These names gave later commentators a great deal of trouble when they tried to trace their origins. Some very exotic and far-fetched derivations were forthcoming, but it was the Reverend T. W. Webb who pointed out that if they were spelled backward they came out *Nicolaus Venator* which is the Latinized

EXPLORER
WINTER 1970

An American Woodhenge

WARREN L. WITTRY
Director, Cranbrook Institute of Science
Bloomfield Hills, Michigan



Drawing by Betty Odle

SEVERAL CENTURIES AGO, the largest Indian town in North America flourished on the broad fertile terrace of the Mississippi River opposite the present city of St. Louis. It was a dispersed town with hamlets, house clusters and individual houses spaced by cornfields, lakes and creeks. In five locations within the town there were large ceremonial centers with plazas and temples elevated on high earthen pyramidal mounds. This great town was no longer occupied in 1673 when Joliet and Fr. Marquette canoed down the Mississippi. About 1698 a settlement of the Cahokia tribe was established at the mouth of a creek now called Cahokia Creek. It is from the name of this creek, which flows through the central part of the site, that the prehistoric town derives its modern name.

In its heyday, the Cahokia site represented a relatively high state of culture compared to that possessed by the midwestern Indians at the time of the coming of the Frenchmen. Why this great town with thousands of inhabitants was abandoned shortly before the Historic Period is not known. But archeologists are working on the solution of this problem, as well as many other problems connected with reconstructing the story of Cahokia.

A visitor to the site today cannot possibly imagine the town in its original state. If he were to climb to the top of Monks Mound in the central ceremonial group, he would see dense clouds of smoke from modern factories, acres and acres of housing development, and broad belts of concrete highways. If he were looking for them, he might discern a few high places which in former times supported the temples and chief's houses. Nothing else is there to remind the eye of thousands of thatched houses and peaceful cooking fires or the periodic awe-inspiring ceremonies in which, we can postulate, the entire populace participated as performer or spectator. Even the mounds have suffered the ravages of time and the forces of nature. Some have been removed by the power shovel; most of

Neolithic sun worship site found

N-P 9-9-84

Associated Press

EXETER, England — Archaeologists studying aerial photographs of parched fields in southwest England said Saturday they have found the site of a circular monument built about 5,000 years ago — more than 1,000 years before the famous Stonehenge monument on Salisbury plain.

Frances Griffith, a member of the archaeology department of Devon County Council, said the site on the banks of a stream on the northeast boundary of Dartmoor was spotted only after water levels dropped dramatically as a result of this summer's drought.

"It is a very significant and exciting find," she said.

The former monument is believed to have been used by sun worshippers and unlike Stonehenge, which is made of stone, is thought to have consisted of huge upright timbers with bases set deep in the ground.

Miss Griffith said the outline of the ring of huge post holes surrounded by two concentric ditches was revealed in photographs taken by her department during an aerial survey of the area.

Nothing remains of the posts above ground today and she said the outlines would be recognizable only to an expert and would pass unnoticed to untrained observers. But she said members of her department had definitely identified the site as neolithic.

TH of the Indiana State Museum and
the anizations join the *Explorer* group.
Thi n and adds a fifth state, Indiana.

INDIANA STATE

Indianapolis, Indiana

State Museum.

conducts
gh the Museum.

A resurgence of histor generated by Indiana's ses celebration in 1966, can be the fact that a first-class m being developed in downto olis. Until then, the stat of stuffed birds and assor been variously housed in itol building with conseq of most of the items of ge value.

In an effort to prese heritage before it was legislature provided funds sition of a building suitab purposes. This turned o former Indianapolis City was leased by the state an renovated and remodeled.

In January of 1967, the opened its doors to the enough exhibits prepared the staff's plans for the fut was enthusiastic and since strides have been taken comprehensive museum pr cial emphasis has been pl hibits which supplement th schools' study of Indiana dent groups are guided Museum by volunteers train this educational objective.

In September of this year,

the 43rd est Mu- lis. The d lunch- itorium the old ed that come a

An indispensable adjunct to the Museum is the Indiana Museum Society which has been responsible for sponsoring many projects which are not provided for in the state budget. The latest of these is an outstanding Museum Shop which limits its selection to objects having an authentic application to the history of Indiana.

BURPEE MUSEUM

Rockford, Illinois

Burpee Natural History Museum.

The Burpee Museum of Natural History was established to provide the residents of Rockford and vicinity the opportunity to see and enjoy exhibits and collections pertaining to the natural sciences and the out-of-doors. As the only natural history museum in the immediate area, it also serves more distant communities. Exhibits in the fields of biology, geology, paleontology, anthropology (American Indian), and Illinois wildlife are featured.

The original collections which formed the nucleus of the present Museum were acquired in the early 1940s: these consisted of the Beattie Collection, at one time displayed in the Rockford Public Library, and the diversified collections of the Rockford Nature Study Society from the Mandeville House Museum of Rockford.

The Museum is supported by a trust fund established by the estates of the late Harry and Della Burpee of Rockford. Housing and utilities are furnished by the Rockford Park District in their present administration building, a turn-of-the-century mansion. The Museum does not receive city or other tax support.

The Rockford Natural History Association is incorporated to aid and support the Museum and its projects. During the fall and winter months, the Museum and this Association co-sponsor a series of Wildlife Adventure Film Programs in cooperation with the National Audubon Society.

the others have been rounded by the plow; only a few retain approximately their original truncated pyramidal form.

Though long a mecca for Indian relic collectors, there had been little work by professional archeologists at Cahokia. In the 1920s Warren K. Moorehead conducted excavations during four seasons. His workmen dug mainly in mounds, but a few village and burial areas were also sampled. Fieldwork in the 1960s was intensive because the Federal-Aid Highway Act of 1956 contained a provision for the salvaging of archeological remains which would be destroyed by construction of certain highways.*

The central ceremonial group originally contained over 100 mounds. According to several radiocarbon age determinations it was occupied for at least 750 years, from about 800 A.D. until about 1550 A.D. The group was, and is, dominated by Monks Mound, the largest prehistoric earthwork in North America. The base of this great mound covers 16 acres and it rises in a series of four stepped terraces to a height of 100 feet above the river bottom. To the east, south, and west of Monks Mound there were plazas surrounded by lesser mounds. In the plaza to the west, recent excavations uncovered six successive ceremonial structures ranging from 50 to over 200 feet in diameter. That these were public, rather than private, structures is unquestioned, though their exact functions may never be known. Also within the central group, 3,000 feet west of Monks Mound, was another area which for a time was devoted to public structures. Here were located, in succession, four huge circles of spaced wooden posts, not unlike the large circles of spaced stone pillars or wooden posts in western Europe and England called "henge monuments"† built during the late Neolithic Period. The method of erecting the huge posts at Cahokia was exactly parallel to that used in erecting the posts and stones in Europe. I do not propose any historical connection between the European henges of the second millennium B.C. and the Cahokia henges of 1000 A.D. Rather, the structures of these two areas, widely separated in space and time, do show similarities in form, method of construction and, possibly, in function. In this brief article I shall describe one of the four henge structures so far discovered at the Cahokia site.

To make a long story short, during the seasons of 1960 and 1961 we discovered a number of long oval-shaped pits which slanted downward from one end to the other. We called these pits "bathtubs" because of their general shape and initially we were perplexed as to their function. A number of theories were proposed, but the one which we eventually adopted was that they were *post pits*, that is, pits which were dug in order to erect rather large wooden posts. The evidence for this came from the north ceremonial center near Mitchell, Illinois, where my colleague, James W. Porter, found the base of a cypress log still remaining in one of these peculiarly shaped pits.

Some months after my 1961 fieldwork was completed, I detected that some of the scattered post pits in the area 3,000 feet west of Monks Mound could be separated into segments of perfect circles. Four such circles ranging from 240 to about 480 feet in diameter have so far been discovered. There yet remain some post pits which obviously are not parts of circles and which had some other function, either as single posts or in combinations as yet undetermined. Post pits occur also in the larger houses and these undoubtedly contained roof supports. That the circles, however, are not a matter of my imagination is attested by the discovery of additional parts of Circle No. 2 by Dr. Robert L. Hall during the 1963 field season. The circle is believed to be the second in the sequence of four which have come to light so far. It must be pointed out that only a few acres of this vast site have been excavated, so our sample is a very small one.

Circle No. 2 can be approximately dated because one of the post pits of Circle No. 3 was superimposed on one of its post pits. A radiocarbon date on Circle No. 3 indicates that it dates to about 1045 A.D. (M-1341). Thus, Circle No. 2 was built prior to that year, but probably not long before, and I have arbitrarily selected 1000 A.D. as the date of Circle No. 2.

This American Woodhenge was 410 feet in diameter. It was a very precise circle and most certainly was laid out with the use of a peg and rope compass. Though we uncovered only slightly less than one-half of the original circle, we can reconstruct it to have had four of its posts at the cardinal points and a total of 48 posts evenly spaced about its circumference. The post pits averaged 7 feet long, 2.2 feet wide, and a little over 4 feet deep.

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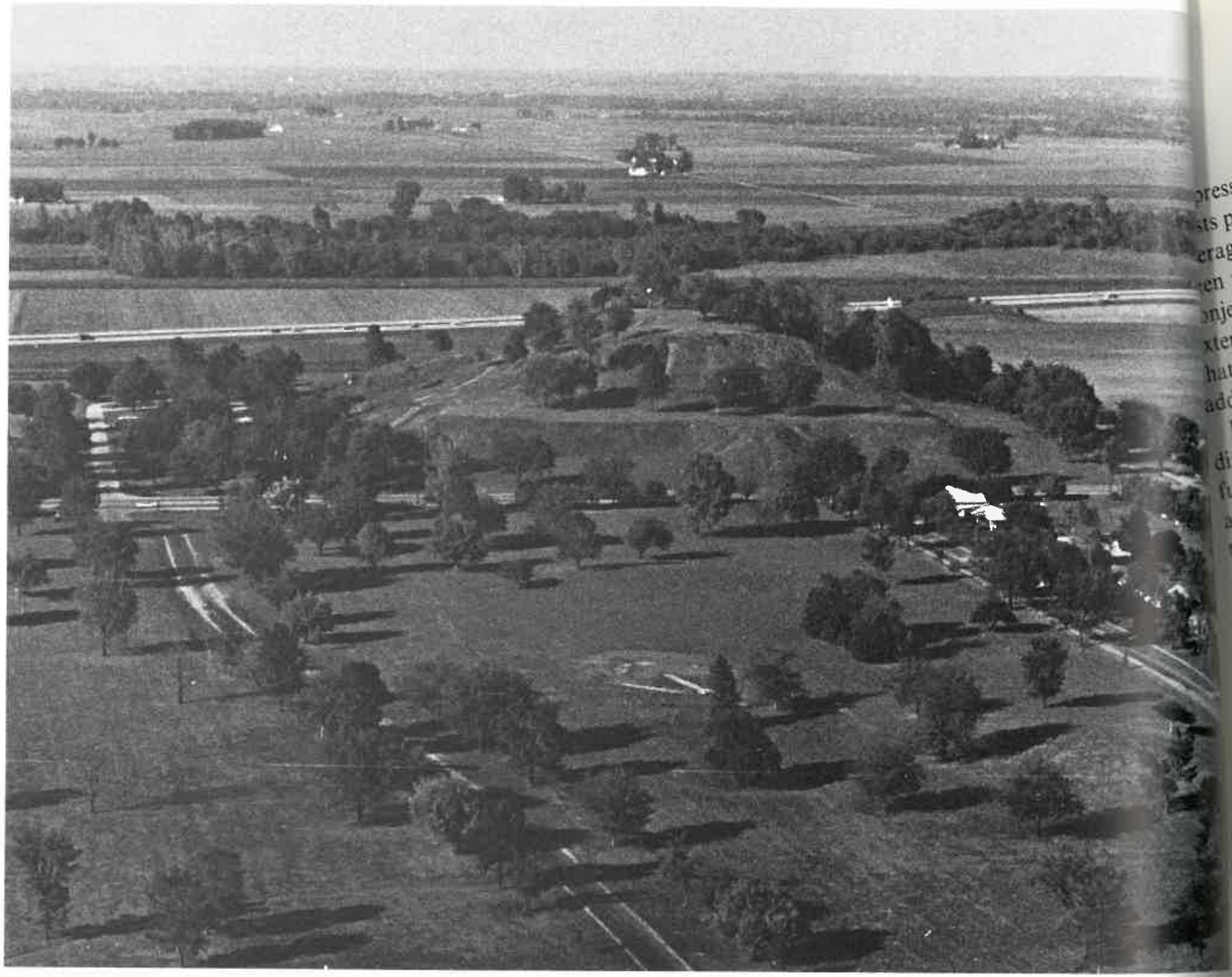
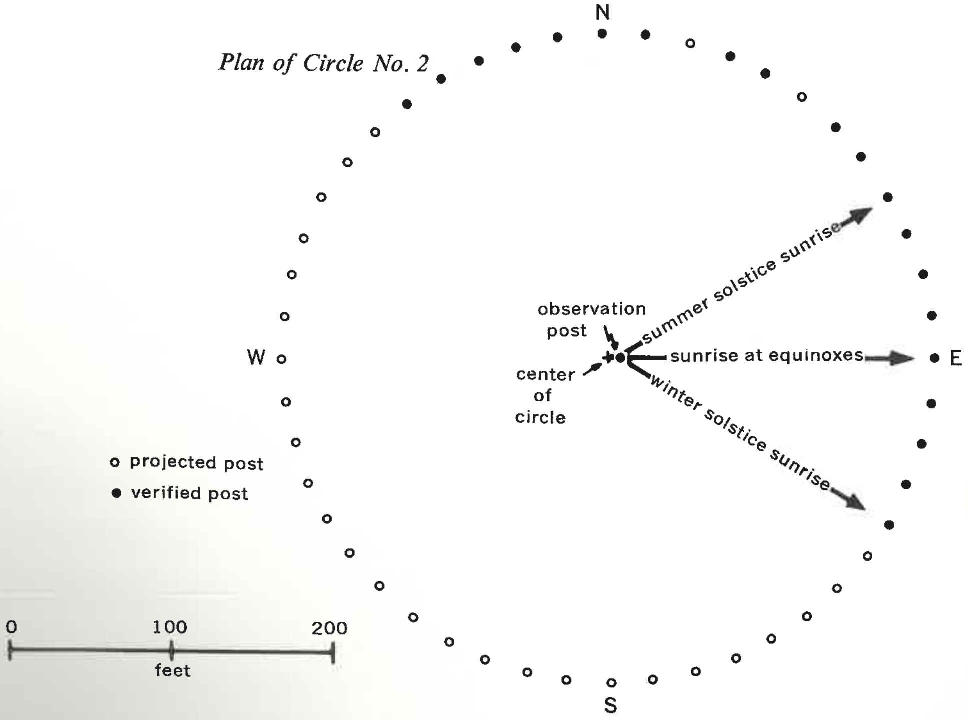
*This work has been for the most part under the auspices of the Illinois Archaeological Survey in cooperation with the Illinois Division of Highways and the U.S. Bureau of Public Roads. Subsequent analyses of the data have been partially supported by Illinois State Museum, National Science Foundation, and Cranbrook Institute of Science.

†The term "henge," apparently originally applied to the lintel or "hanging" stones at Stonehenge in England, has been extended to include other circular structures of stone or wood posts.



Monks Mound as seen from the air, September 23, 1963.



Plan of Circle No. 2

ressions at the deep ends, where the weight of the ts pressed the ends into the soil, showed that the posts raged 2 feet in diameter. Posts of this size could have en relatively high, but their actual heights can only be njectured. In the illustrations they are represented as tending about 30 feet above the surface. It is possible at earth was heaped up around their bases to give dditional support.

From the center of the circle there was an angular istance of 7° 30′ between adjacent posts. Dr. Hall's urther exploration of the circle in 1963 also covered the rea of the center, and there a post was located five feet to the east of the true center. Now this is most interesting, for an observer on this post would see slightly different ngles toward the eastern side of the circle. Looking east, he would see a post in that direction, but looking at the fourth post to his left he would be looking, not 30° north of east (as he would if he were at the true center) but at an angle slightly greater than 30°.

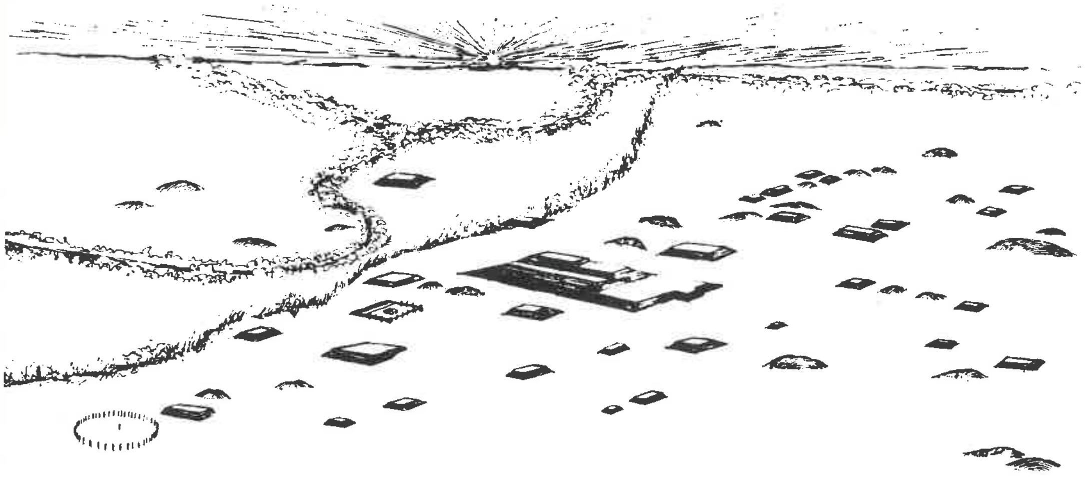
If my calculations are correct, the angle represented from the post near the center of the circle to the second post would be the angle upon which the observer, at approximately 1000 A.D., would see the sunrise on midsummer day, the summer solstice. The variables which must be taken into account are: (1) the latitude of the observer, (2) the inclination of the ecliptic, (3) refraction, and (4) the relationship of the point of observation to the horizon.

Taking these factors into account we have (1) the latitude of the observer as North 38° 39′ 5″, (2) the inclination of the ecliptic at 1000 A.D. was 23° 34′ 12″, (3) refraction varies according to the density of the atmosphere and may for these purposes be assumed to have been about 30′ or roughly equal to the sun's diameter, and (4) the horizon must be considered as an artificial one since the bluffs some 20,000 feet to the east are approximately 125 feet higher than the river bottom. To obtain a clear view of the rising sun, therefore, the observer, presumably situated on the central post, would need to have his eyes a little lower than the height of the posts of the circle.

The unknown heights of the posts, together with our ignorance of what the ancient Cahokians defined as sunrise (was it the first appearance of the upper limb or when the lower limb just touched the horizon or post?) are important factors which only allow us to suggest the possibility that this Woodhenge structure and three others like it at Cahokia were used as sun calendars where observations of the solstices and equinoxes served to define a tropical year.

If such was the case, they were the only known devices of their kind north of Mexico in aboriginal America.

Reprinted from Cranbrook Institute
of Science *News Letter*, May 1964.



Perspective of the Central Group,
looking northeast.

Burials found in a tomb beneath a Hopewellian mound, Calhoun County, Illinois. Skeletons (left to right) were those of an adult male, child, and a roseate spoonbill.

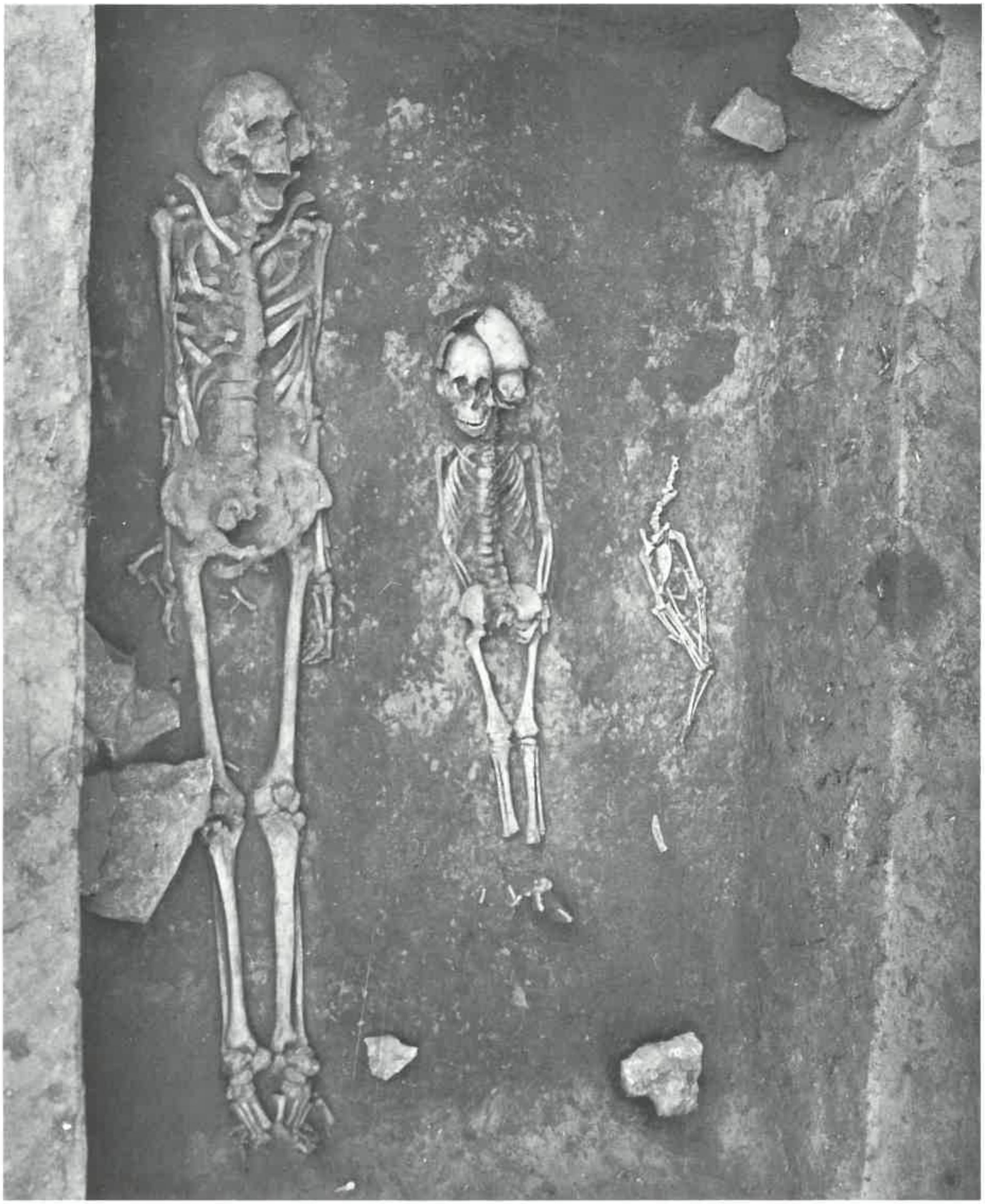


Photo courtesy of Gregory Perino

BIRDS with INDIAN BURIALS

PAUL W. PARMALEE
Assistant Museum Director, Illinois State Museum
Springfield, Illinois

WHEN MAN FIRST BEGAN to take note of the vast numbers and varieties of animals which occurred with him in the environment, whether it was in the Great Plains, deserts or in the hardwood forests of eastern North America, birds soon became an integral part of his life. They often provided a basic source of meat in the food economy for many people of varying cultures. However, in numerous instances birds held a certain aesthetic or symbolic place in the lives of aboriginal man above their basic use as food—perhaps more so than did any other class of vertebrates. The Indians of eastern United States, for example, often utilized the feathers, claws, wings, and heads of various species for decoration or ornamentation and as symbols of beauty, strength, or status (as in the case of a medicine man or priest).

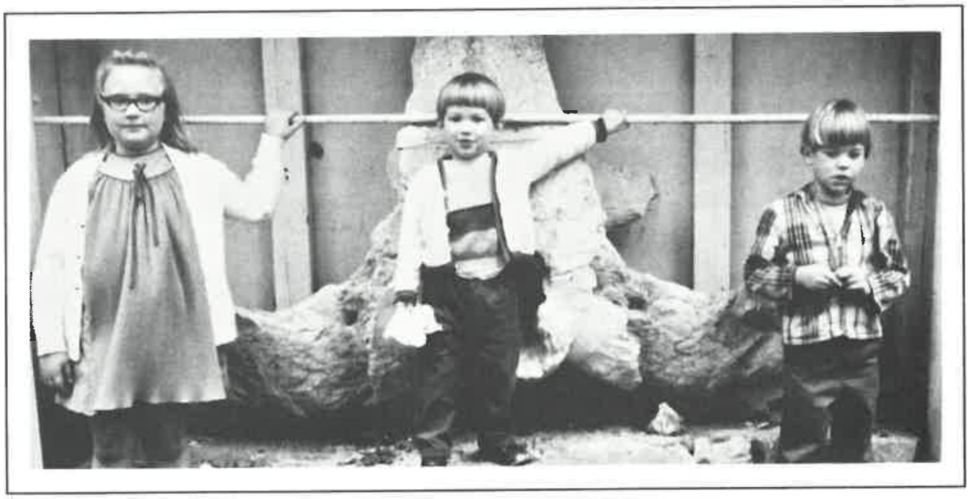
Midden deposits associated with prehistoric village sites in the Midwest usually yield quantities of bird bones along with those of fish, turtles, and mammals—all that remain of the animals eaten hundreds or even thousands of years ago. From the standpoint of species distribution and individual use by the Indian, the bird elements recovered with human burials are typically the most fascinating. The species most often included as grave offerings were the hawks, owls, eagles, and the raven; however, such artifacts are generally uncommon to rare. All that remains of the original interred parts of these birds is a wing or leg bone, or possibly a beak and/or skull, the feathers and soft parts having long since decomposed.

Mr. Gregory Perino, representing the Thomas Gilcrease Institute, Tulsa, Oklahoma, excavated a series of seven Hopewellian burial mounds (Gibson Mound Group) that had been built probably during the period of A.D. 150-250. These mounds, situated on the west bluff of the Illinois River approximately one-half mile south of Kampsville, Calhoun County, Illinois, held from several to as many as 50 human burials. Most of them contained specially constructed tombs near their centers at or just below the ground level, a characteristic typical of the mounds constructed by the Hopewellian people. Mound 3 measured approximately 35 by 47 feet and did not exceed three feet in height above the natural ground level. A total of 28 human burials was recovered in the mound. Near its center, a tomb in the form of a rectangular, 18-inch-deep subfloor pit, approximately 5 by 8 feet, had been first dug into the natural knoll that formed the base of the mound. At least a one-log-high crib had been placed around the edge of the pit, and green clay was used as chinking between the logs and the ground. As added cover, limestone had been placed on the roof logs which were originally positioned lengthwise with the tomb.

The factor which made this particular burial tomb unique was that, along with the adult male (over 50 years) and a child (about 5 years), the body of a roseate spoonbill, *Ajaia ajaia*, had been interred with these humans. The skull of this adult bird was missing, but since there was no evidence of prior human disturbance or burrowing activity by rodents, it can only be assumed that the head was removed by the Indians before placing the bird in the tomb. The adult, child, and bird were approximately one foot apart, and part of a cut mica figure lay at the feet of the bird.

The roseate spoonbill, one of the most colorful of the wading birds, occurs primarily in southern Florida and in the Gulf Coast areas of the United States; only rarely does an individual wander north into the Midwest. The well-known ornithologist, Robert Ridgway, reported (*The Ornithology of Illinois, 1895*) observations of this bird in the Mississippi River bottoms south of St. Louis during the mid-1800s. However, no spoonbills have been recorded for Illinois since the turn of the century. Archaeologists have reported and illustrated numerous Hopewellian-period pottery vessels from the Southeast and the Midwest which possess the stylized "spoonbill motif" pattern. The flared mandible and long neck of these conventionalized birds gave rise to the name "spoonbill," but whether the first design was fashioned after the spoonbill duck (shoveler) or the roseate spoonbill—or possibly even some other species—will certainly never be known.

Perhaps these people recognized this bird as the model or form used as a decorative motif on many of their pottery vessels, thus holding it in special reverence. The roseate spoonbill from Mound 3 may have represented simply a thing of beauty to the Indians or a ceremonial object or hunting trophy: one can only speculate on the reason for its inclusion in the tomb. Regardless of the reason, the fact that a bird, one which was probably uncommon to rare locally, was awarded the same burial rites as those of humans is especially intriguing.



Mr. R. A. Stone, traveling through Pennsylvania, notices this bone in the town park of Martinsburg. Lines his children up and takes a snapshot of it—but what is it?

Ask the Experts...

JOHN GUILDAY
Associate Curator, Section of Vertebrate Fossils
Carnegie Museum, Pittsburgh, Pa.

IF THERE IS ONE THING that most people (those who have heard the word at all) know about a paleontologist, it is that this individual is endowed with the ability to reconstruct long-extinct animals of great proportion from a single bone fragment. Let's see how it's done. To make it easy, let's start with not just a fragment, but a bone six feet wide and four feet long.

Your name is R. A. Stone. You are traveling through Martinsburg, a small farming community just south of Altoona, in the Allegheny Mountains of Pennsylvania, when this wheelbarrow-sized bone, enshrined in the town park, catches your eye. You put Robin, Bobby, and Paul in front of it for scale, fold out your six-foot ruler, and snap some pictures of the thing. But *what* is it? Try the Museum. They will know.

Curator Mary Dawson, Section of Vertebrate Fossils, Carnegie Museum, Pittsburgh, inspects the photographs. She promises you, sagely, that the Museum will definitely investigate. Since there are no living animals bearing bones of such size running around in Pennsylvania today, the answer might be an interesting one. It looks superficially like the skull and horn cores of a large cow-like animal of almost elephantine proportions. You will be notified.

Now paleontologists, like everyone else these days, tend to specialize. Curator Dawson, with an enigmatic grin, now shows the photographs to Curator Guilday, whose forte is supposed to be the Ice Age and all of the animals thereof. He goes up like Snoopy, with ears straight out and feet flailing, his switchboard signaling "a large cow-like animal of almost elephantine proportions." Now there are some large (but not *that* large), ox-like animals from the late Pleistocene of Pennsylvania. They are closely related to the modern muskox (Family Bovidae, Subfamily Ovibovini), but do not even begin to approach the size of this horrendous thing. Just south of Altoona? Hollidaysburg. Frankstown Cave. The quarry men. Could it be possible?

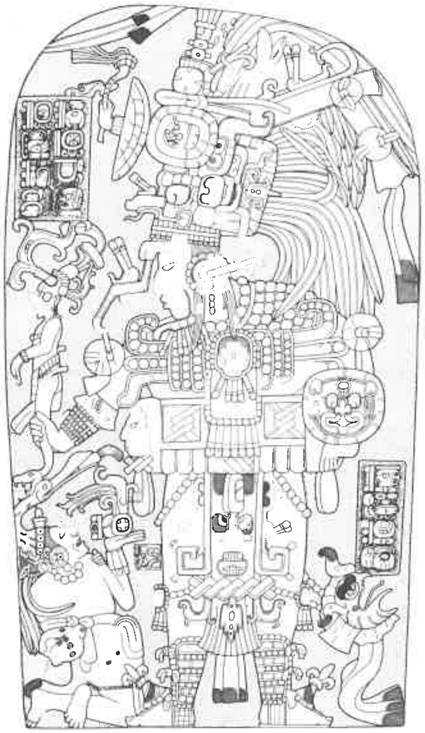
In April, 1907, the American Lime and Stone Company of Blair County quarried into a cave 15 miles north of Martinsburg that had been sealed off for thousands of years. Frankstown Cave, as it came to be known, contained one of the largest collections of skeletal parts of Pleistocene vertebrates from the central Appalachians—thirty-six species of amphibians, reptiles, birds, and mammals, ranging from mastodons and ground sloths to mice, bats, and shrews. Carnegie Museum scientists were called in to investigate, but too late to do little more than to pick up the pieces from the quarry dump. Curator O. A. Peterson's report on the cave and its

Peru Marks a Milestone in the Antiquities Trade

BONNIE BURNHAM

A small reception, held on August 5, 1982, at the Peruvian Embassy in Washington, brought together a group of archeologists, scholars, customs agents, lawyers and journalists to mark the recovery of about 700 artifacts that had been seized in the United States and were about to be returned to Peru. The date was a fitting one for a celebration of this order, for exactly 10 years earlier, on August 11, 1972, the Senate unanimously ratified the UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property. Although this treaty has never become law in the United States or in most European countries, it has had a profound influence on both legal and professional matters relating to the international trade in art.

The Peruvian recovery grew out of a fortuitous event. On January 16, 1981, a young man arrived at Dulles Airport on a flight from Lima. Returning from a short visit, he had four suitcases that he was declaring at the customs clearance station. A U. S. Customs agent, working at the station that morning, later told the *Washington Post* (August 5, 1982) that "the odor coming from the suitcases practically drove us out of the search room." Evidently, the smell was generated by a large group of antiquities—many freshly removed from burial sites—that included unusually large, well-conserved textile fragments, pottery associated with a broad range of Peruvian sites and cultural groups, a complete feather cape and a gold mask of questionable authenticity. The sheer size of the lot, 154 objects in all, and the fact that some of the pottery was marked with numbers that were initially thought to be museum accession numbers led the customs agents to suspect that they were dealing with a major haul of contraband material.



Machaquila stele II that Guatemala recovered in *United States* v. *Hollinshead*, the first time a foreign government sued in U. S. courts to recover cultural property.

The young man—a New York antiquities dealer named David Bernstein—declared the objects as pre-Columbian antiquities, but stated that the value of the collection as merchandise for eventual sale was negligible. He declared the shipment's total worth at $1,785.

Later that day Clifford Evans, the well-known curator of Andean archeology at the Smithsonian, examined the objects and refuted Bernstein's low estimate of their value. Evans, an out-

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BONNIE BURNHAM is the executive director of the International Foundation for Art Research, Inc., New York, New York.

MUSEUM NEWS

spoken opponent of museum acquisition of antiquities lacking provenance, was appalled by this large quantity of high-quality material entering the country. He told the customs authorities that the lot contained several objects whose value surpassed anything in American museum collections and was worth several hundred thousand dollars. Bernstein was arrested and charged with falsifying a customs declaration, a misdemeanor. Customs then turned the shipment over to authorities who investigated the ownership of these Peruvian artifacts and several hundred other pre-Columbian objects that were seized from Bernstein's home in New York after his arrest.

Vessel from the Chavin culture of northern Peru, c. 800 B.C.

Peru claimed ownership of the antiquities on the basis of its 1929 Law for the Defense and Conservation of Archaeological Monuments, which names the state ultimate owner of all cultural property found on Peruvian soil. Bernstein prepared a defense based on the traditional interpretation of United States common law, which generally upholds foreign title claims (regarding objects stolen from museums, monuments or inventoried collections), but does not enforce other countries' export regulations. Eventually, the case was settled. In June 1982 Bernstein dropped his claim to all the objects in his collection and pleaded guilty to the misdemeanor; in return, the government dropped any further investigation and prosecution of the case. The outcome of this incident is significant for future U. S. trade in antiquities and for Peru's hopes of curtailing illicit traffic.

In the 10 years since the UNESCO Convention was ratified, great progress has been made for the convention and its tenets. Most of this progress has been achieved outside the arena where the proposed enabling legislation is still actively debated. In the late 1960s and early '70s, Latin American countries fell prey to unleashed archeological looting, which they believed to be stimulated in large part by an active American market. In response to appeals from Latin America, the United States signed a broad bilateral treaty with Mexico in 1971 to expedite the return of cultural property claimed by

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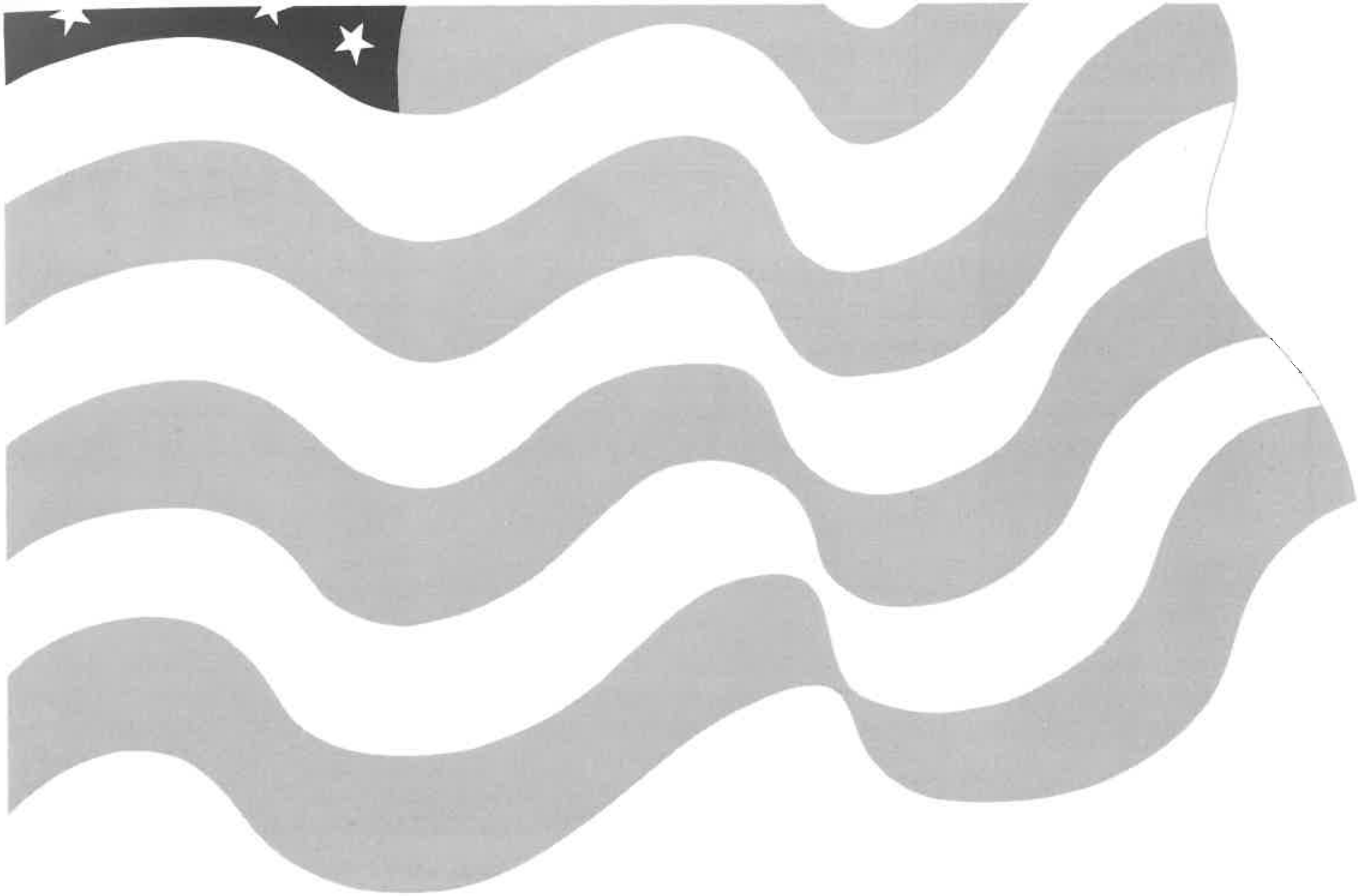

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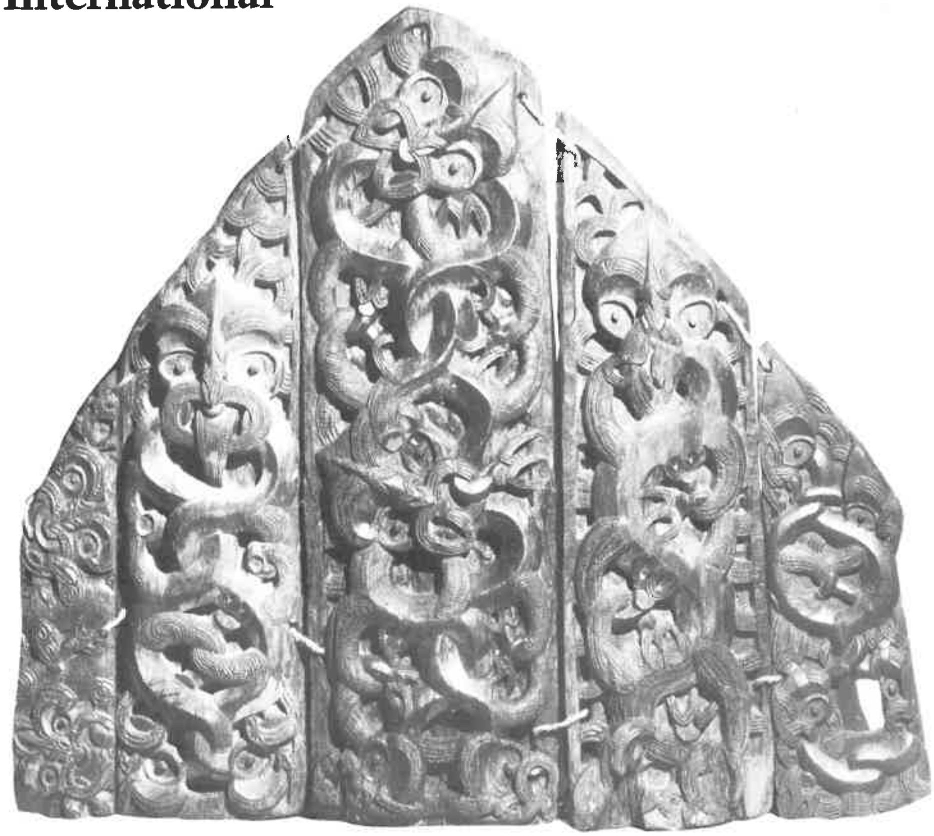

A legal dispute involving a Maori Store Front, which was illegally exported from New Zealand in 1973 and recently appeared on the English market, may be as significant in England as the *McClain* case was in the United States. The House of Lords will rule on the ownership of the Store Front in early 1983.

Mexico. The next year, Mexico changed its cultural property laws. All pre-Columbian objects—whether movable or monumental, buried or exposed, from public or private collections—were claimed as property of the state. In October 1972 the United States adjusted its response to the looting problems in Latin America and passed a domestic law to prohibit the importation of monumental pre-Columbian sculpture from 10 Latin American countries. In comparison to the Mexican treaty, which, until recently, was subject to vague interpretation, the latter law has been influential in stopping all acquisition of looted monumental material by American museums and in drying up what was once an active domestic market in pre-Columbian stone sculpture.

Shortly after this law went into effect, an important victory was won by Guatemala in the recovery of a Machaquila stele from the American dealer Clive Hollinshead. *United States* v. *Hollinshead* is considered a landmark case, for it was the first time a foreign government sued in U. S. courts to recover cultural property.[1] It was a harbinger of others to come: *Republic of India* v. *Norton Simon*, *German Democratic Republic* v. *Elicofon* and other incidents resolved out of court all concerned foreign claims to cultural property that had entered U. S. territory.

The 1977 decision, *United States* v. *McClain*, clearly indicated that, with or without the UNESCO Convention enabling legislation, legal interpretation of foreign cultural property law had evolved in the United States. In the *McClain* case, a U. S. court upheld Mexico's general claim of title to all cultural property found on Mexican soil. At face value, the decision does not alter existing legal precedents in the United States. The United States, for example, claims title to all cultural property found on federal land and would probably not hesitate to litigate to recover it from abroad.[2] The implications of the *McClain* case, however, are more widespread. Professor Paul

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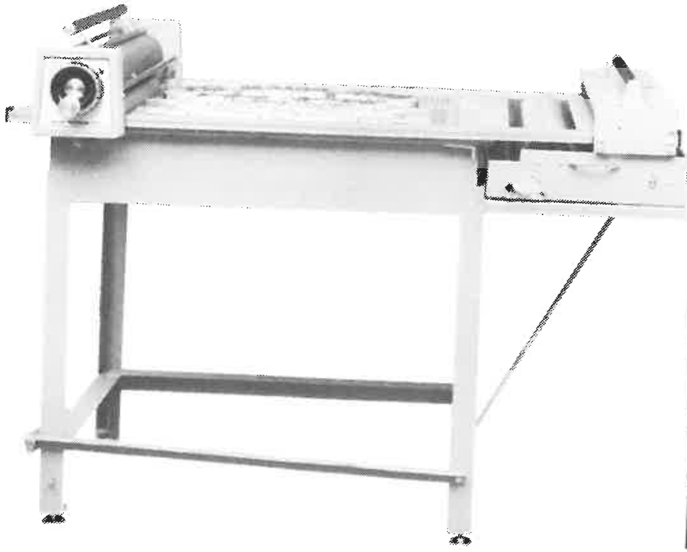

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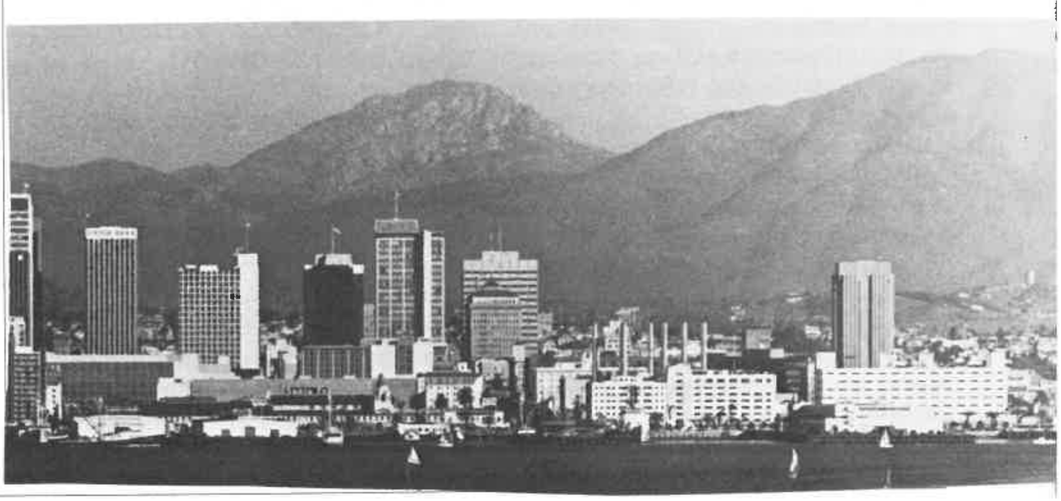

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Indian relics in creek. Found collection there. Otoe? spear.

Out Frederick to Riverside Road. Turn south past Vernon Kneib's - over track to bridge. Up creek to west. 1/2 mile or so to where artifacts are found - Inquire for permission.

5-17-83

Chemo luminessence
can measure age of paint

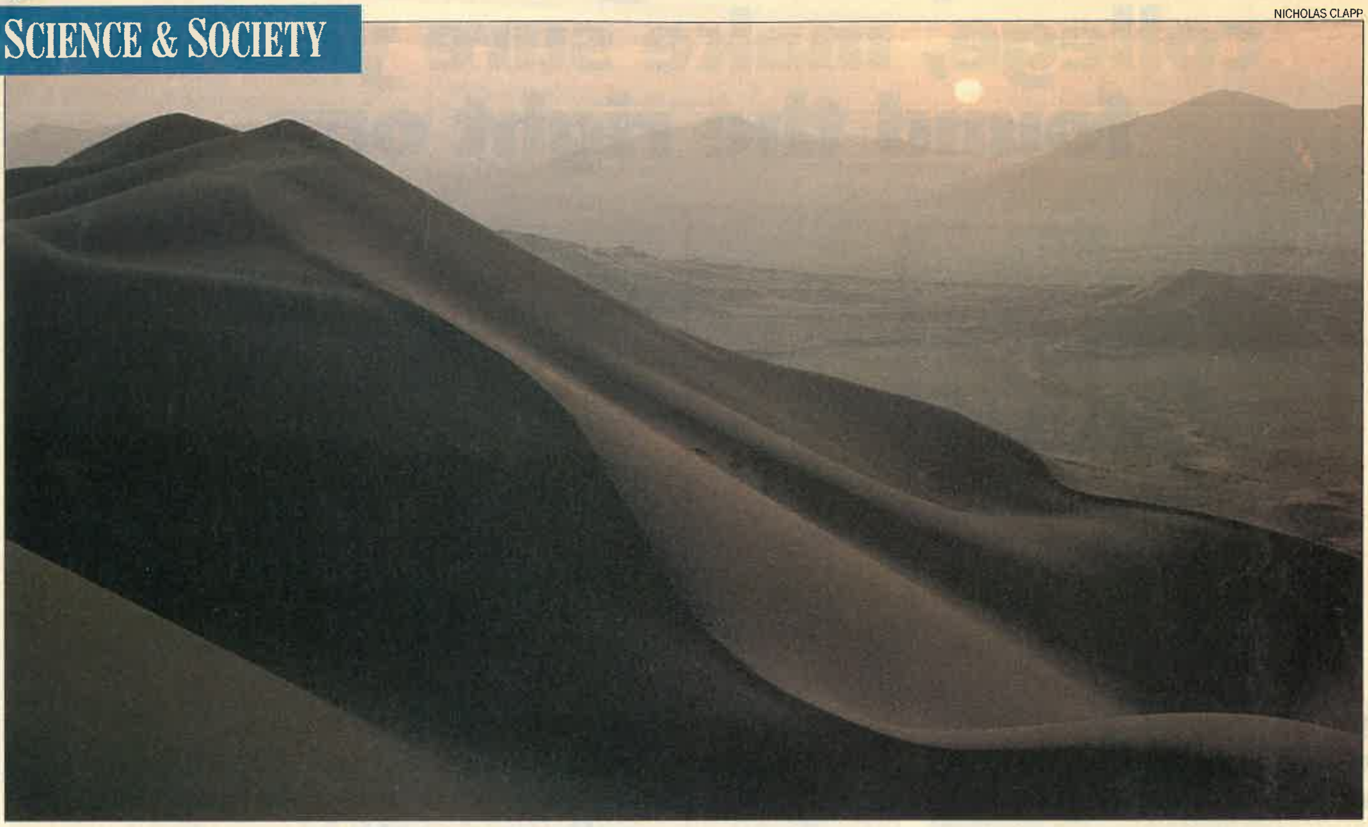
Bill Little
Pueblo, Colo
contract archaeologist
Will work on Dillon, Colo site this summer
North of highway at timberline below
Loveland Pass. Anasazi - early
Worked at Chaco
" " " Aztec
" " Lowry
& go to Chaco now Investigating plague!
[illegible]

JACOB LEHMER
902 S 12TH ST. JO. MO.

FOUND 5 MILES SOUTH OF FOREST CITY MO
WEST LEWIS TOWNSHIP
JOHN PRUSSMAN FARM
CAMP SITE
FIRE PITS

Can Nebraska pot from Nebraska site, near Amazonia be returned from Kansas? It did belong to Fenn Ward but was last seen in the Highland Mission museum. (Mentioned this to Stan Sohl at AAA meeting (KC - May - 78) and he said to write him and he would check into it.

How the heck did Fenn get it?!
It is from AND-1



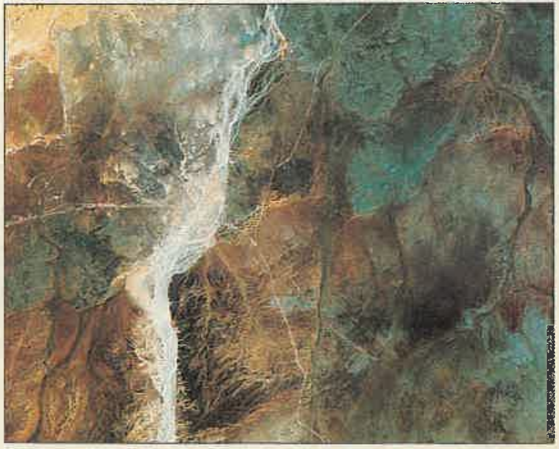
NICHOLAS CLAPP

Finding lost worlds

Archaeology has gone high tech, opening new windows on the past

One spring morning, archaeologists Payson Sheets and Tom Sever were sitting at their camp in the jungle of Costa Rica, looking through a set of aerial photographs of the surrounding terrain. On one photo, they noticed a thin, dark-red line that appeared to meander from an ancient cemetery, cross a stream and wind around a hill toward the remains of an ancient village. Rushing to the location shown on the image, Sever and his team began digging. It was not long before they hit pay dirt: the remains of an ancient footpath used by the people who lived there some 2,500 years ago.

Sheets and Sever's photos, taken from an aircraft equipped with sensors that can "see" the glow of heat energy given off by the ground, are part of a revolution in archaeology that has brought a new thrill of discovery to the old trowel-and-shovel discipline. Using sensors mounted on space shuttles, satellites, airplanes and balloons, dragged by jeep or even ox cart or held in the hand, archaeologists are getting a fresh look at the ancient world, with startling results.



SYGMA

Hidden treasures. *Satellite photos reveal ancient caravan trails (faint lines at lower right) that dip under sand dunes and point to the lost city of Ubar.*

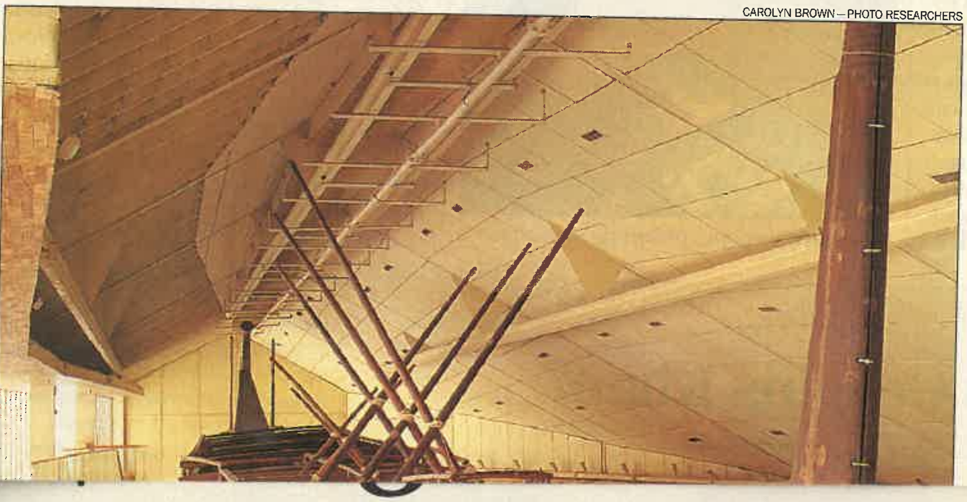
Next spring, NASA will fly a space shuttle equipped with imaging radar to search for the remains of the famed "Silk Route," the ancient overland trading route used by Marco Polo and others to travel between Europe and the Far East. Last year, a team of archaeologists used satellite images to help lead them to Ubar, the "Atlantis of the sands," a long-lost, 5,000-year-old trading center in the Middle East. High-tech archaeology has also helped pinpoint a new set of walls around the ancient city of Troy, uncover 1,000-year-old roads in the American Southwest and reveal the ghostly remains of a long-extinct river as big as the Nile beneath the parched sands of the modern Sahara. In one instance, remote sensing has enabled archaeologists to search for the tomb of the great Mongolian warrior Genghis Khan—without lifting a spade of dirt (box, Page 72).

Because their "vision" extends

beyond the range of visible light, ese new technologies reveal clues from the ancient past that cannot be seen with the archaeologist's naked eye. From above, for instance, the dense tropical forest of Costa Rica may look like a featureless sea of green. But photos taken with a sensor that detects invisible infrared light reveal the buried, ancient footpath anyway. Disturbed soil typically retains more moisture than does the surrounding terrain, and this changes the dirt's temperature so that it glows with of Landsat satellite, scheduled to be launched this month, takes pictures with details as small as 45 feet across—twice the resolution of its predecessors—easily revealing an ancient fort or agricultural field. France's SPOT satellite can produce photographs with details down to 30 feet across, but the new Landsat will sample a broader part of the electromagnetic spectrum.

Telltale camel tracks. The new view from space was the key to finding the ancient city of Ubar. Archaeologists examined photographs of the Arabian Peninsula that had been taken by Land- their stops along the trading route.

A satellite's bird's-eye perch gives archaeologists an opportunity to discover very large patterns and features in the landscape that are all but imperceptible from the ground. Last spring, space geologist Farouk El-Baz, director of Boston University's Center for Remote Sensing, was examining a photograph of Arabia taken from space when he noticed a subtle change in the patterns made by dunes in the sands across the huge expanse of uninhabited desert. A leading expert in interpreting remote sensing photographs, El-Baz realized that he was see-


CAROLYN BROWN—PHOTO RESEARCHERS

CLAUDE E. PETRONE—NATIONAL GEOGRAPHIC SOCIETY

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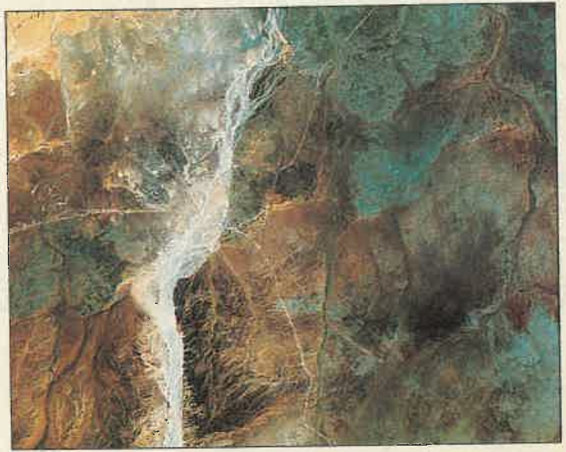
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Because their "vision" extends

small to play such an epic role in ancient times. But when an international team of archaeologists recently re-explored the site using remote sensing, they found a buried, thick clay wall surrounding the city more than 1,000 feet from the previously known ruins. The team also found evidence of buried structures within the confines of the wall, testifying to the existence of an ancient, bustling metropolis.

These structures were discovered because soil and rock are magnetized by Earth's magnetic field as they form. Disturbing the earth by burying a metal tool, wall or other structure slightly alters this magnetic orientation, and these anomalies can be detected by sensitive magnetometers. Other remote sensing devices look for slight changes in the soil's electric conductivity, which suggests a buried structure. Or they thump the ground, listening for hollow-sounding echoes, which suggest a buried cistern or tomb.

CLAUDE E. PETRONE—NATIONAL GEOGRAPHIC SOCIETY

New wave. *Probing pyramids with radar*

The high-tech nature of these new sensors has led to their slow adoption by mainstream archaeologists. Most expeditions are sparsely funded, and these new machines can cost tens of thousands of dollars.

Yet in the long run, remote sensing may well save money by allowing archaeologists to map out an entire area and then excavate particular spots that look promising, rather than the more common—and far more time consuming—practice of randomly digging a series of trenches. Remote sensing also will help save priceless clues to the past. Archaeologists have always had to live with the unhappy fact that excavation can destroy as much as it reveals. Now, they have tools that can minimize disturbances to the record left by the ancients, preserving it for later generations with even better ways to map civilization's rise. ■

BY WILLIAM F. ALLMAN

A MONGOLIAN QUEST

Where sleeps Genghis Khan?

According to Mongolian legend, the finder of the tomb of Mongolia's greatest warrior, Genghis Khan, will be an old man with a beard reaching to his navel, riding a blue bull. A joint Japanese-Mongolian team of scientists who have been searching for the Harsh Ruler's tomb for four years indeed ride a "blue bull"—an azure-painted, four-wheel-drive Mitsubishi van—but none has a beard of the right length. And none carries the archaeologist's stock tools, a pick and shovel.

THE GRANGER COLLECTION

The main Mogul. *Genghis Khan*

To win permission for their search, the scientists, recruited from Japan's top universities and engineering firms by the Tokyo-based *Yomiuri Shimbum* newspaper, had to promise the Mongolian government that they would not actually dig anywhere; theirs may be the first archaeological expedition to rely solely on remote sensing technology. Although the team has not yet identified Genghis's tomb, its sensing equipment has confirmed the location of the lost city thought to be the site of his palace. The scientists believe Genghis's tomb lies nearby.

In the last 20 years of his life, the 13th-century nomadic chieftain conquered half the then known world, creating an empire stretching from Korea west to the Caspian Sea and from Siberia south to the Himalayas. Yet, popular impressions aside, Genghis and his Mongol tribe "were not isolated nomads who got some crazy idea one day that they wanted to rule the world," says Mongolia expert Christopher Atwood of Indiana University. Rather, Genghis may merely have sought to control a booming fur trade between what is now Uzbekistan and Siberia. Archaeology could provide proof.

Along with their high-tech arsenal of satellite pictures and airborne sensors, the scientists' primary workhorse is a Mitsubishi Ralli Art van equipped with ground-penetrating radar, a magnetometer—which senses fluctuations in Earth's magnetic field—and a device that uses data from satellites to pinpoint its precise location anywhere on Earth. Using the van's remote sensing capabilities, the scientists can construct a computer image of features in the ground, including hollows and objects as small as 4 inches across, to a depth of more than 6 feet.

The van's greatest find is the buried palace in which Genghis Khan's son and successor, Ogedei, was inaugurated in 1229. The team has drawn up a map of all the large tombs discovered by remote sensing in the same area. Genghis's resting place likely lies apart from the others in an area called in legend Ikh Khorig (the great taboo).

Face time. For the Mongols, who are emerging from 70 years of domination by the Soviet Union, Genghis Khan has become a national icon. Lenin Avenue is now Genghis Khan Street, politicians hang Genghis's portrait in their offices and his image adorns the handsome new 5,000 tugrik bank note.

Yet even if the team does locate Genghis's grave, many Mongols are opposed to the idea of disturbing it; indeed, the Mongolian government as yet has no plans to excavate the newly found palace city. The team warns, however, that without a professional excavation, the site may fall prey to treasure hunters, and vital clues to the mysterious, world-conquering nomad's life and times may be lost forever.

BY SUSAN V. LAWRENCE IN
DELGERKHAAN, MONGOLIA

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Missouri Archaeology Month
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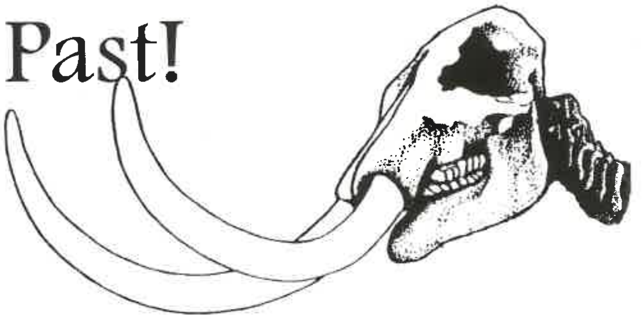

Shown on the front of this poster is the skull of a mastodon superimposed over an artist's concept of a living mastodon. Adjacent is a Clovis point of the type used to kill and process mastodons. The back of the poster includes information on some of the current and past projects in the state which have been aimed at this earliest period of human existence in Missouri. Archaeological sites in Missouri are contributing to the study of the earliest Americans and their interaction with ice age animals. The Kimmswick Bone Bed in Jefferson County, Missouri has the distinction of being the first place in the Americas where mastodon bones were found in association with Clovis points. You can contribute to this fascinating study by reporting any finds of Paleo Indian tools or prehistoric animal remains to the Missouri Archaeological Society or an archaeologist.

During the month of September, the Missouri Archaeological Society has organized over 70 public talks, exhibits, and presentations throughout the state on the significance of Missouri's heritage through archaeology. For a list of these events or more information on Missouri Archaeology Month, contact Alan Banks, 4068 Avery Lane, Bridgeton, Missouri 63044, (314)291-1165, e-mail: abanks7@aol.com For information about the Missouri Archaeological Society or the chapter closest to you, write to: MAS, P.O. Box 958, Columbia, Missouri 65205, Phone # 1-800-472-3223, or website http://www.missouri.edu/~moarch/

Missouri Archaeology Month is partially funded by a federal grant from the Missouri Department of Natural Resources' Historic Preservation Program and the National Park Service, U.S. Department of the Interior. Grant awards do not imply an endorsement of the contents by the grantor.

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Missouri Archaeology Month was made possible by:
Those individuals who set aside time to plan and present programs and exhibits, the MAS chapter coordinators and others who helped promote events, Melody Galen at the MAS office and those in Columbia who helped with mailing, Karen Grace and Judith Deel who are Grant Monitors, Nancy Faerber who is Grant Manager, Tim Baumann who assisted with poster production, Deloris Rose who was the graphic artist for the poster, Ken Cole, Julie Morrow, Michael O'Brien, Jack Ray, and Raymond Wood who provided informational text and figures for the back of the poster, the staff of the Mastodon State Historic Site who provided resources and ideas, Jeffrey Saunders of the Illinois State Museum who shared his expertise on Ice Age animals, Roy Hathcock who provided the Clovis point on front of the poster, Carol Stephenson who mailed posters to Missouri Legislators, Pete Peterson who handled publicity, Carol Diaz-Granados who promotes Archaeology Month endlessly, Alan Banks who served as Archaeology Month Coordinator, and all those who helped in any other way.

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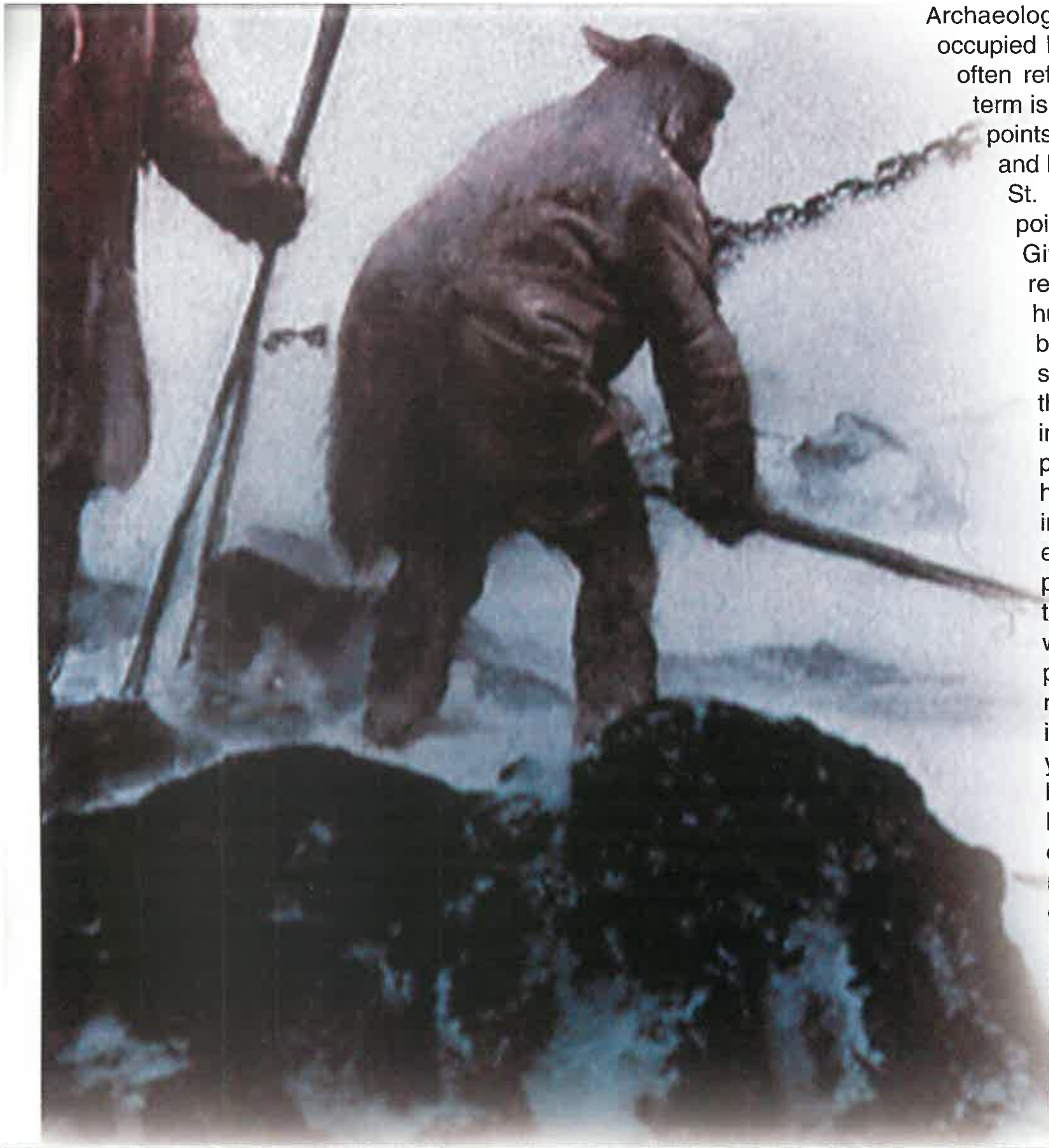
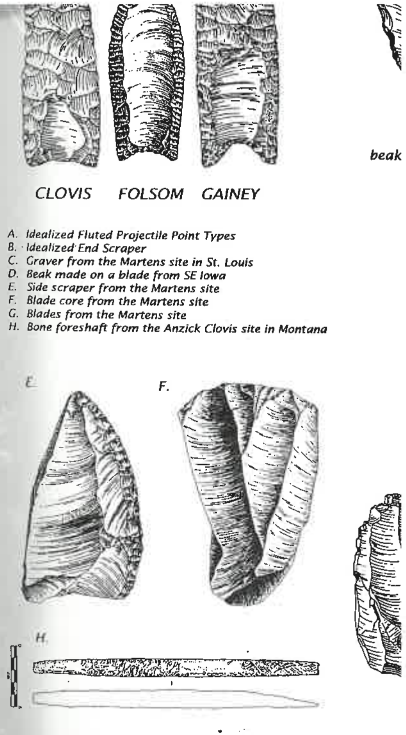


Archaeological evidence, scant as it is, indicates that people occupied Missouri as early as 12,500 years ago. Archaeologists often refer to these early people as "big-game hunters." This term is derived from the contexts in which early stone projectile points and other tools have been found-mammoth, mastodon, and bison butchering sites. One such site is located south of St. Louis near the town of Kimmswick. Here, early stone points were found alongside the remains of mastodon. Given the association between human tools and the remains of large, extinct animals, the term "big-game hunters" was a natural one to apply to these early people, but it isn't necessarily very accurate. Evidence from some sites in the American Southwest strongly suggests that carcass scavenging was an important strategy, and increasing evidence also suggests that the processing of plant foods was a recurring activity. Still, archaeologists have tended to emphasize the beautifully made stone implements left behind by these early people. The earliest recognized form, usually considered to be a projectile point, is distinctive in design: The base was thinned on both faces by removal of overlapping flakes, which created a "fluting" effect. These are called "Clovis" points. They have been found associated with mammoth remains in the West and Southwest and with mastodon in Missouri and Washington. Sometime around 12,000 years ago, these large animals were gone. Were they hunted into extinction by technologically sophisticated hunters, or did the climate at the end of the last ice age change the animals' habitats to such a degree that they no longer could be supported? Or was it a combination of both? The jury is still out on this question, but irrespective of why the large animals vanished, human populations apparently did not suffer as a consequence. Whatever portion of the human diet was composed of big-game animals, was taken over by other sources of food such as bison and deer. For more information, visit:

http://www.cr.nps.gov/seac/paleoind.htm



A. Idealized Fluted Projectile Point Types
B. Idealized End Scraper
C. Graver from the Martens site in St. Louis
D. Beak made on a blade from SE Iowa
E. Side scraper from the Martens site
F. Blade core from the Martens site
G. Blades from the Martens site
H. Bone foreshaft from the Anzick Clovis site in Montana

Paleoindian Tools

People during the Paleoindian period variety of distinctive tools from stone points, like the Clovis, Folsom, and G to process animal hides and work woo engraving bone, ivory, wood, stones, shaped to be used for cutting and Highly perishable artifacts made of org rare finds at Paleoindian sites. Tools butchering, as well as eyed-needles f materials.

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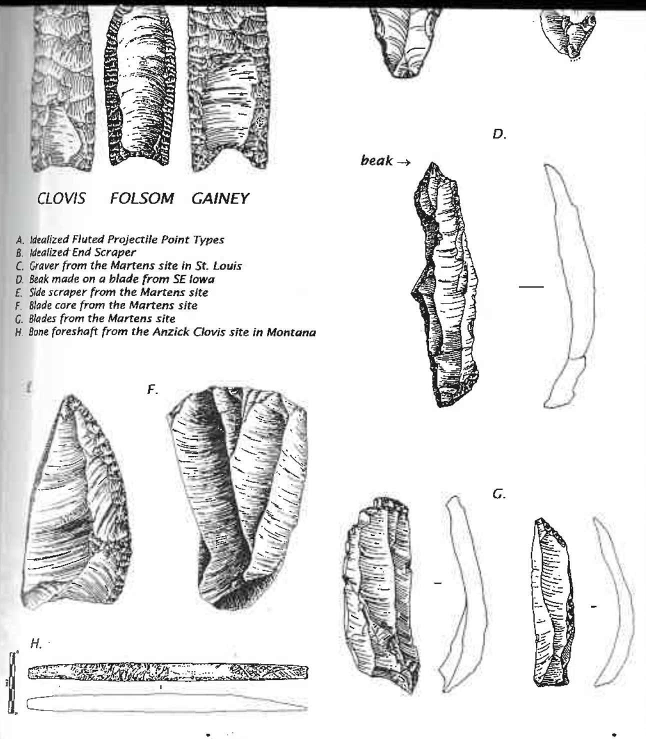

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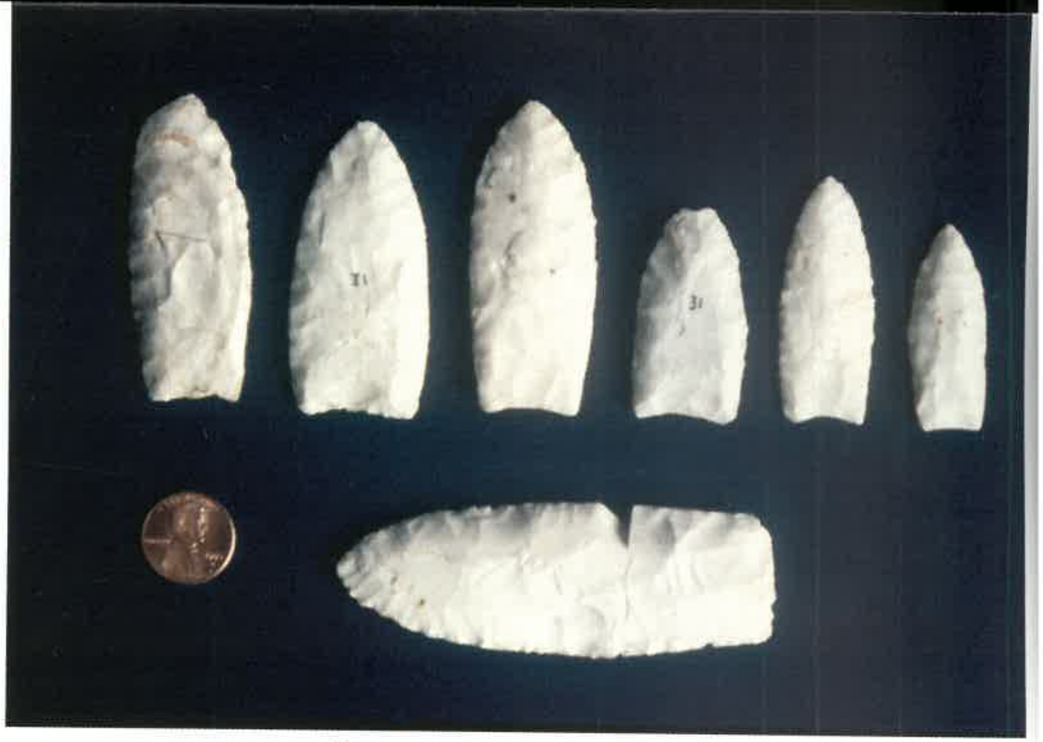
H. Bone foreshaft from the Anzick Clovis site in Montana

Paleoindian Tools

People during the Paleoindian period were highly mobile hunter-gatherers producing a variety of distinctive tools from stone. Some of these tools include the fluted spear points, like the Clovis, Folsom, and Gainey point types, end scrapers which were used to process animal hides and work wood. Gravers and burins were used for scoring and engraving bone, ivory, wood, stones, and possibly for tattooing. Simple blades were shaped to be used for cutting and scraping or as "blanks" for making other tools. Highly perishable artifacts made of organic materials such as bone, antler and ivory are rare finds at Paleoindian sites. Tools used for hide-working, flint-working, skinning and butchering, as well as eyed-needles for sewing clothing were made from these organic materials.

http://www.anthro.fsu.edu/special/paleo/saa98.html



Excavation of a Clovis Camp at the Martens Site

Excavations in 1997 at the Martens Site in Chesterfield, Missouri have documented one of the most intensively occupied Clovis habitation sites known in the Midwest. The site dates to approximately 11,000 years ago. The range of tool types and the amount of workshop debris suggested that the activities conducted there included meat and hide processing, bone and wood working and chipped stone tool manufacture and maintenance. Visit this website to learn more information:

http://www.missouri.edu/~moarch/

Louis. A slide presentation will describe the history of the stoneware pottery industry in Arrow Rock, highlighting the 2001 excavations at the Caldwell Pottery site. At the Arrow Rock State Historic Site Visitor Center. For more information contact Michael Dickey, (660) 837-3330.

Barnhart: Month of September, Library Hours
Display of artifacts relating to Missouri archaeology, featuring finds from Jefferson County. The display is presented by the Three Rivers Chapter, Missouri Archaeological Society. At the Windsor Branch, Jefferson County Library, 7479 Metropolitan Blvd, Barnhart. For information contact Barb Hubick, (636) 948-3644.

Barnhart: Saturday, 8th, 1:00-5:00 p.m.
Film and artifact identification, presented by Barb Hubick, member of Three Rivers Chapter, Missouri Archaeological Society. The film, "On the Trail of the First Americans and Missouri's Native American Heritage" will be shown at 1, 2, 3, and 4 p.m. Visitors are encouraged to bring artifacts for identification. At the meeting room of the Windsor Branch, Jefferson County Library, 7479 Metropolitan Blvd, Barnhart. For information contact Barb Hubick (636) 948-3644.

Branson: Month of September, Call to arrange program.
"First Americans and Cultural Changes Through Time," presented by Pete Peterson, Vice President of the Missouri Archaeological Society. The program is offered to schools, service clubs and libraries in the Branson area. For more information contact Pete Peterson (417) 334-7143. hwpete76@aol.com.

Cadet/Old Mines: Sunday, 30th, 1:00 p.m.
"The Archaeology of Missouri," presented by Jim Duncan, historian and past director of the Missouri State Museum. This program will include a slide presentation on Missouri archaeology from the earliest known sites to the latest. An artifact identification session will follow. At St. Michael's House, on Hwy CC, just east of Hwy 21 (across from Washington State Park). For more information contact Fran Pashia, (573) 438-2368.

Clinton: Saturday, 22nd, 1:00 p.m.
"Archaeology at Boone's Lick State Historic Site," presented by Jeff Yelton Ph. D., Central Missouri State University. This slide program will discuss the results of research on an early 19th century salt production facility. There will be an artifact identification session beginning at 1:00 and the program will start at 3:00. At the Henry County Historical Museum, 203 W. Franklin. For information contact Jeff Yelton (660) 429-5747, yelton@cmsu1.cmsu.edu.

Columbia: Month of September
Missouri archaeology exhibit, displays and exhibits describing Missouri's prehistory and history, including many interesting artifacts. At the Museum of Anthropology, University of Missouri-Columbia, 100 Swallow Hall, 9th Street near University Avenue. This is at the Museum of Anthropology - not the Archaeology Museum, which is nearby. For more information call (573) 882-3764.

Columbia: Saturday, 22nd, 11:00 a.m. to 4:00 p.m.
Artifact Identification Day. Artifact collectors are encouraged to bring their artifacts for identification and share their knowledge. Display tables will be available and professors and students will provide identification. Dr. Richard Edging will be available to explain a poster presentation, "Site Complexes: Understanding Organizational Principles of Late Woodland Settlement in the Northern Ozarks," which he and Steven R. Ahler prepared. At the Museum Support Center, Rock Quarry Road at Hinkson Creek. For more information contact LuElla Parks, (573) 882-8364.

Columbia: Wednesday, 26th, 7:30 p.m.
"An Overview of the Archaic Period," presented by Michael O'Brien Ph. D., Professor of Anthropology at the University of Missouri-Columbia. This is the regular meeting of the Boonslick Chapter of the Missouri Archaeological Society. At the Anthropology Museum Support Center, Rock Quarry Road at Hinkson Creek, just off Stadium Boulevard. For information contact LuElla Parks, (573) 882-8364.

Defiance: Thursday, 13th, 6:00-7:00 p.m.
"Archaeology of the Boone Home," by Joe Harl, Director of the Archaeological Research Center of St. Louis. The program will cover both the prehistoric and historic archaeology of the site. At the Daniel Boone "Peace Chapel," 1868 Highway F, Defiance. For more information contact Raymond Scupin, Ph. D. (314) 949-4730.

Missouri Archaeology Month

September 2001

Schedule of Events

Sponsored by:

The Missouri Archaeological Society, the Missouri Department of Natural Resources' Historic Preservation Program, and the Missouri Association of Professional Archaeologists

Arrow Rock: Saturday, 1st, 2:00 p.m.
"Made in Clay: 19th Century Pottery Production in Arrow Rock, Missouri," presented by Tim Baumann, an archaeologist at the University of Missouri-St.

Defiance: Thursday, 20th, 4:00 p.m.
"Digging up Missouri's Past Through Court Documents," presented by Joseph Cernik Ph. D., Professor of Public Management and International Business and Phil Hamilton Ph. D., Associate Professor of History, both of Lindenwood University. The workshop and barbecue for American History and Government high school teachers and debate club advisors will be 4:00-5:00 p.m. Between 5:00 and 5:45 there will be a debate on the topic, "Slave Trials in Missouri," presented by the Rufus Easton Debating Society of Lindenwood University. At Boonesfield Village, Daniel Boone Home, 1868 Highway F. For more information contact Joseph Cernik, (636) 949-4810, jcernik@lindenwood.edu.

Eminence: Month of September
Shannon County artifact exhibit, a small display of artifacts found in Shannon County. At the Shannon County Museum on Main Street (Highway 19) across from the courthouse. For more information contact Alan Banks, (314) 291-1165.

Fayette: Saturday, 15th, 10:00 a.m. to noon
"Indians and Archaeology of Missouri" presented by Dan Elliott Ph. D., past President of MAS. The archaeology timeline will be discussed, and there will be a display of local artifacts and a flint knapping demonstration. The public is invited to bring artifacts for identification. At the Howard County Court House, lawn on the south side. In case of rain, go to the Stephens Museum on the CMC campus. For more information contact Dan Elliott (660) 248-6370. delliott@cmc.edu.

Fayette: Monday, 24th, 10:00-10:50 a.m.
"Indians and Artifacts of Missouri" presented by Dan Elliott Ph. D., past President of MAS. Missouri artifacts will be used to explain Missouri's Indian history. At the Daly Elementary School Library, Fayette. Audience limited to students, teachers, and parents. For more information contact Dan Elliott (660) 248-6370.

High Ridge: Saturday and Sunday, 6-7 October
The Three Rivers Chapter of the Missouri Archaeological Society will have a booth at the 11th Annual DeMaree Fair. There will be collection exhibits and demonstrations and information on site reporting. The Fair is on farm land at 6848 Highway PP. For information contact Bill Svejkosky, (636) 797-4883.

Imperial: Monday, 10th, 7:00 p.m.
"Recent Finds Show and Tell," presented by the members of the Three Rivers Chapter of the MAS. This will be the first fall season regular monthly meeting of the Three Rivers Chapter and members will display artifacts found during the summer and share archaeological information. At Mastodon State Historic Site Museum, 1050 Museum Drive. For more information contact Bill Svejkosky, President, Three Rivers Chapter-MAS (636) 797-4883.

Imperial: Saturday, 22nd, 9 a.m.-4 p.m.; and Sunday, 23rd, noon-4:30 p.m.
Archaeology Days, presented by Mastodon State Historic Site. On the 22nd craftspeople will demonstrate skills of prehistoric Native Americans, including flint knapping, fire-making, and fabrication of cordage, bone, and shell objects. Local artifact collections will be displayed, and avocational and professional archaeologists will identify artifacts brought in by visitors. Visitors may also participate in spear throwing, corn grinding and rock painting activities. Free admission to the museum on both days. At Mastodon State Historic Site, 1050 Museum Drive. For more information contact Kurt Senn (636) 464-2976.

Ironton: Saturday and Sunday, 22nd and 23rd
2001 Battle of Pilot Knob, state-sponsored reenactment of 1864 battle on the original site. At Fort Davidson State Historic Site near Ironton. For more information call (573) 546-3454.

Kansas City: Call to arrange a program
"Indians in Clay, Platte, and Jackson Counties, Missouri," or "What is Archaeology?" presented by Edwin Trainor, Vice President of the Missouri Archaeological Society. Available at various schools and libraries in the Kansas City area. For more information contact Ed Trainor, (816) 455-7264.

Kansas City: Tuesday, October 2nd, 7:30 p.m.
"Results of Archaeological Investigations Near the Missouri State Line," presented by Mary Conrad, Kansas City Archaeological Society (KCAS). The program will describe the results of June, 2001 surveys and test excavations of sites near the Kansas-Missouri line near Atchison, Kansas. At the Arthur Mag Center, behind 425 Volker, Kansas City, MO. For information contact Mary Conrad, (913) 287-4405.

Lincoln: Sunday, 23rd, 1:00-4:00 p.m.
"Missouri Lithic Resources, Heat Treatment of Chert, and Principles of Chert (Flint) Knapping," presented by Dr. Thomas T. Hoyne, Missouri Archaeological Society Trustee, and Robin Kimbar, State President of the Missouri Mozarkite Society. There will be items on exhibit beginning at 1:00 and the presentation will start at 2:00. At the Rigbyville Complex building, 2nd floor, about 5 miles south of Lincoln on west side of Highway 65. For more information contact Dr. Hoyne, (573) 377-2203.

Miami: Saturday, 15th, 3:00 p.m.
"The Historic Missouri and Osage Indians in Saline County," presented by Jeffery Yelton Ph. D., Professor at Central Missouri State University. This slide program will describe the Native Americans who lived at the Great Bend of the Missouri River in Saline County. At the Van Meter State Park Visitor Center. For more information contact Connie Winfrey, (660) 886-7537.

Malden: Wednesdays and Saturdays, 1:30-4:30 p.m.
Exhibit of the Dennis Collection of Egyptian Antiquities. This collection is a gift of James Dennis, an amateur archaeologist and Egyptologist who worked with scientific expeditions in the early 1900s. Included are scarabs, alabaster jars, necklaces, and statuettes, dating back to 2,000 B.C. In addition the museum's fine representation of local Mississippian artifacts is on display. At the Malden Historical Museum, 201 North Beckwith. For more information contact Elizabeth Hoskins, (573) 276-5008.

Malden: Saturday, 15th, 10:00 a.m. - 3:00 p.m.
"Late Mississippian in the Central Mississippi Valley," a symposium featuring six speakers and a display of diagnostic artifacts. At the Bootheel Youth Museum, 700A North Douglas. For more information contact Alan Banks (314) 291-1165 abanks7@aol.com

Malden: Saturday, 15th, 10:00 a.m.-4:00 p.m.
Archaeology Day, presented by the museum staff of the Bootheel Youth Museum. Age-appropriate activities for children in the form of hands-on discovery stations. At the Bootheel Youth Museum, 700A N. Douglas. For more information contact Patsy Reublin, (573) 276-3600, bymstaff@sheltonbbs.com, web page: www.bootheelyouthmuseum.org/.

Montgomery City: Saturday, 22nd, 10 a.m. to 2 p.m.
Archaeology Day, presented by the Graham Cave State Park staff. Park staff will lead interpretive walks to Graham Cave and the natural area at 10:00 and 1:00 leaving from the trailhead parking area. There will be an opportunity for a hands on experience with "archaeology in a box" and to participate in other interpretive activities. Graham Cave State Park is two miles west on Highway TT from exit 170 (Danville exit) off Interstate 70. For more information call (573) 564-3476.

New Madrid: Daily 9:00 a.m. to 5:00 p.m., Sundays noon to 5:00 p.m.
Special exhibit, "Mississippian Artifacts from the Lilbourn Site". The exhibit features rare effigy pots and a chipped stone ceremonial mace. The museum also has impressive permanent archaeological and historical exhibits. Featured are items from the fur trade and Civil War and 1811-12 Earthquake exhibits. At the New Madrid Historical Museum, #1 Main Street. There is a nominal admission charge. For more information contact Dot Halstead, (573) 748-5944.

Poplar Bluff: Wednesday, 12th, Noon
"Meet Me at the Fair," presented by Carol Diaz-Granados Ph. D., Archaeologist. The program will discuss the conception, construction, attractions, and exhibits at the 1904 St. Louis World's Fair. At the Public Library, 318 N. Main St. For more information call (573) 686-8639.

Revere: Saturday, 8th, 12 – 4 p.m.
"Athens Archaeology Day," presented by Roger Boyd, Site Administrator at Battle of Athens State Historic Site. Area artifact collections will be on display and demonstrations of flint knapping and atlatl spear throwing will take place throughout the afternoon. At the shelter house at Battle of Athens State Historic Site, RR 1. For more information contact Roger Boyd (660) 877-3871.

Springfield: Month of September, 8 a.m. to 8 p.m.
"Prehistoric Archaeology in Southwest Missouri," an interpretive display showing time periods and point typology, stone tools, common southwest Missouri chert samples, etc. The exhibit will also show the involvement of the

Mysteries
f the Cave Painters

By JOHN MASTERS

SAT. EVE. POST 1-2-60

A famous author recounts the fascinating story of the world's earliest known art treasures, the subterranean paintings of prehistoric man.

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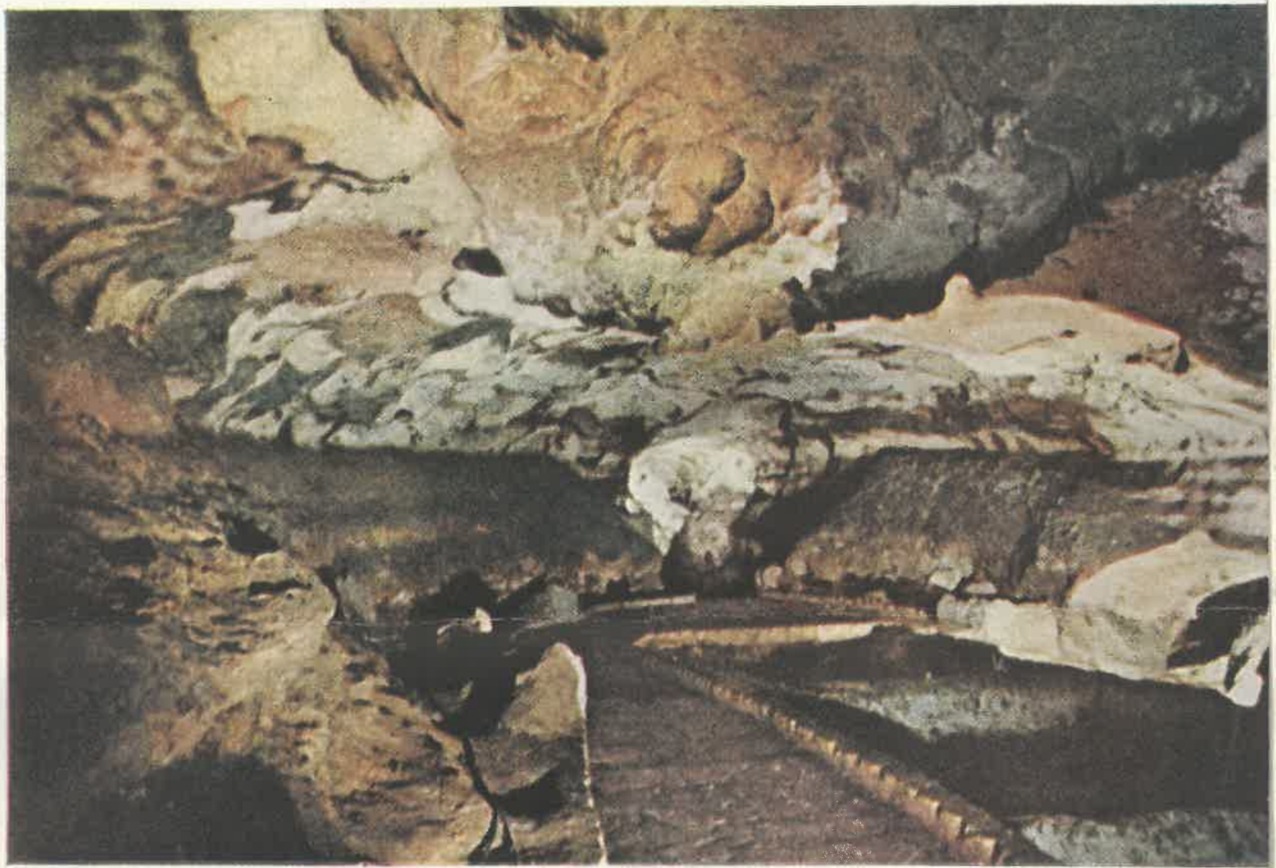
(Continued on Page 94)



The Hall of the Bulls. Some of the Lascaux work is easily accessible on the wall of this large hall (unicorn is at upper left), while the rest is hidden away in small adjoining caves.

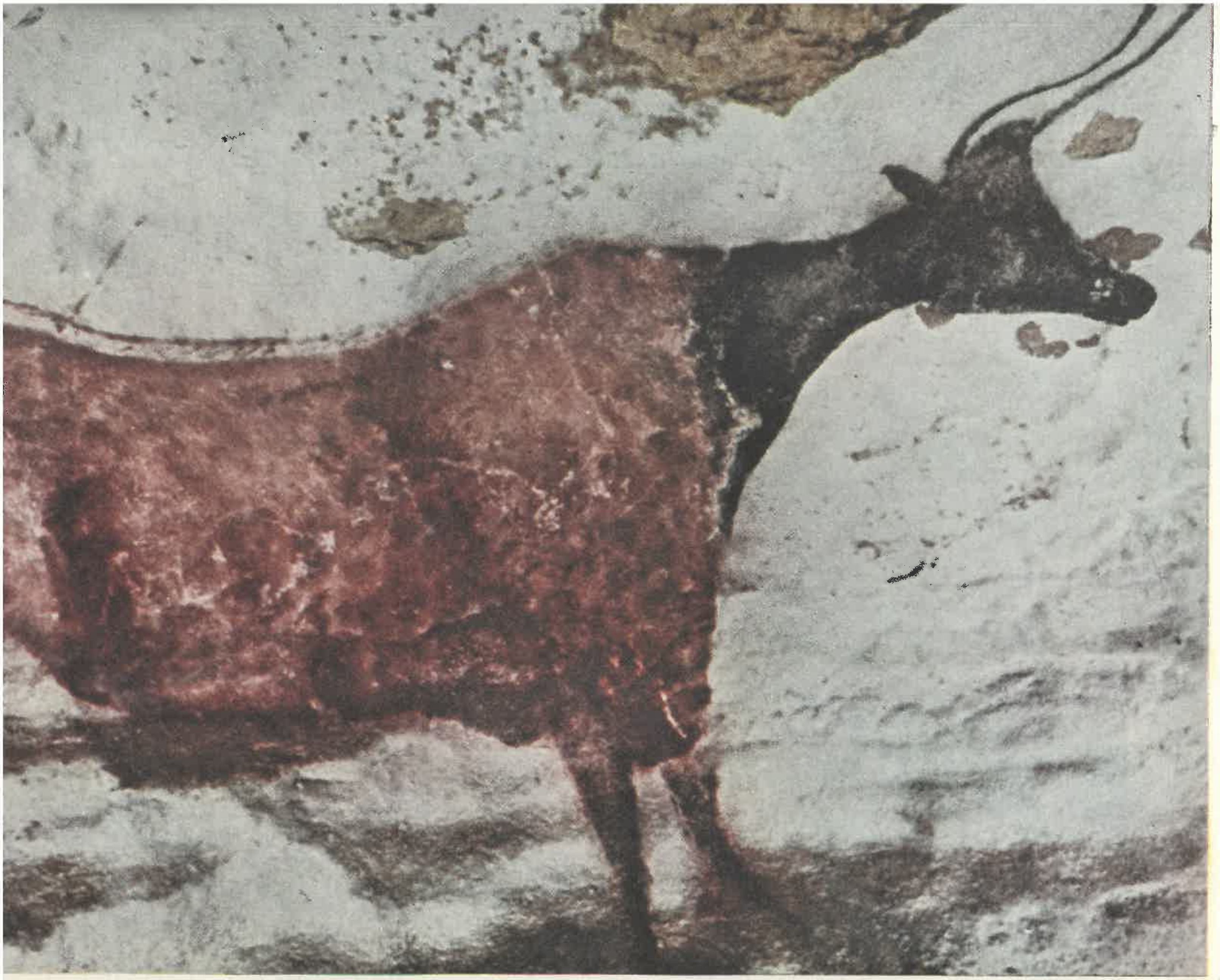
Both Karen and Doug were a few feet from Will Roth's gun, held in his now-steady hand, completely at his mercy.

By NANCY RUTLEDGE

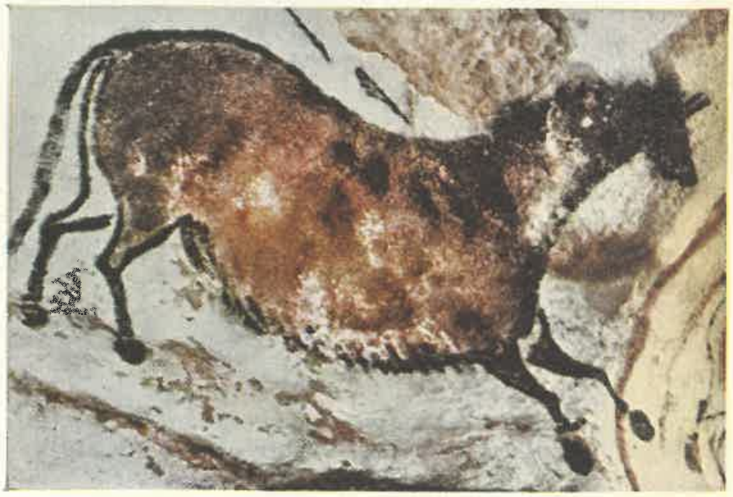
ROPIC IOLIDAY

"Two hundred fifty thousand dollars!" Karen said. "No one could pay that much!"

Karen Corey was the prisoner of Will Roth, a confidence man, and his half brother, Mick, in a remote cottage on one of the Virgin



his large figure of a cow, at Lascaux, France, may have been painted 30,000 o. The cave wasn't discovered until 1940 when Marcel Ravidat, a native of nearby Montignac, and a group of his companions stumbled upon it.



A pregnant horse fleeing what is believed to be a shower of arrows. Such paintings may represent man's earliest attempts to communicate with God, says the author.

The familiar hush fell over the crowd, and the camera moved in for a close-up of his face.

ne Television Idol

By PATRICK CRUMHORN

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"At Fort Knox," I agreed. "Go on."

"The same O'Toole who brought fame and fortune to Madam Sherman Hunk, the gifted French artist from Des Moines, by having her gild a lily?"

"I am the one," I murmured humbly.

"The same O'Toole who carried colds to Newcastle and so helped the aspirin manufacturers of Great Britain, and whose book, *The Post-Nasal Drip and I*, caused consternation in the medical profession throughout the world?"

"I am he," I answered. "I am flattered that you know of my promotions, but what has that got to do with your wanting to sing, and what does your wanting to sing have to do with me?"

"I want to get married," said Cadaver Craig.

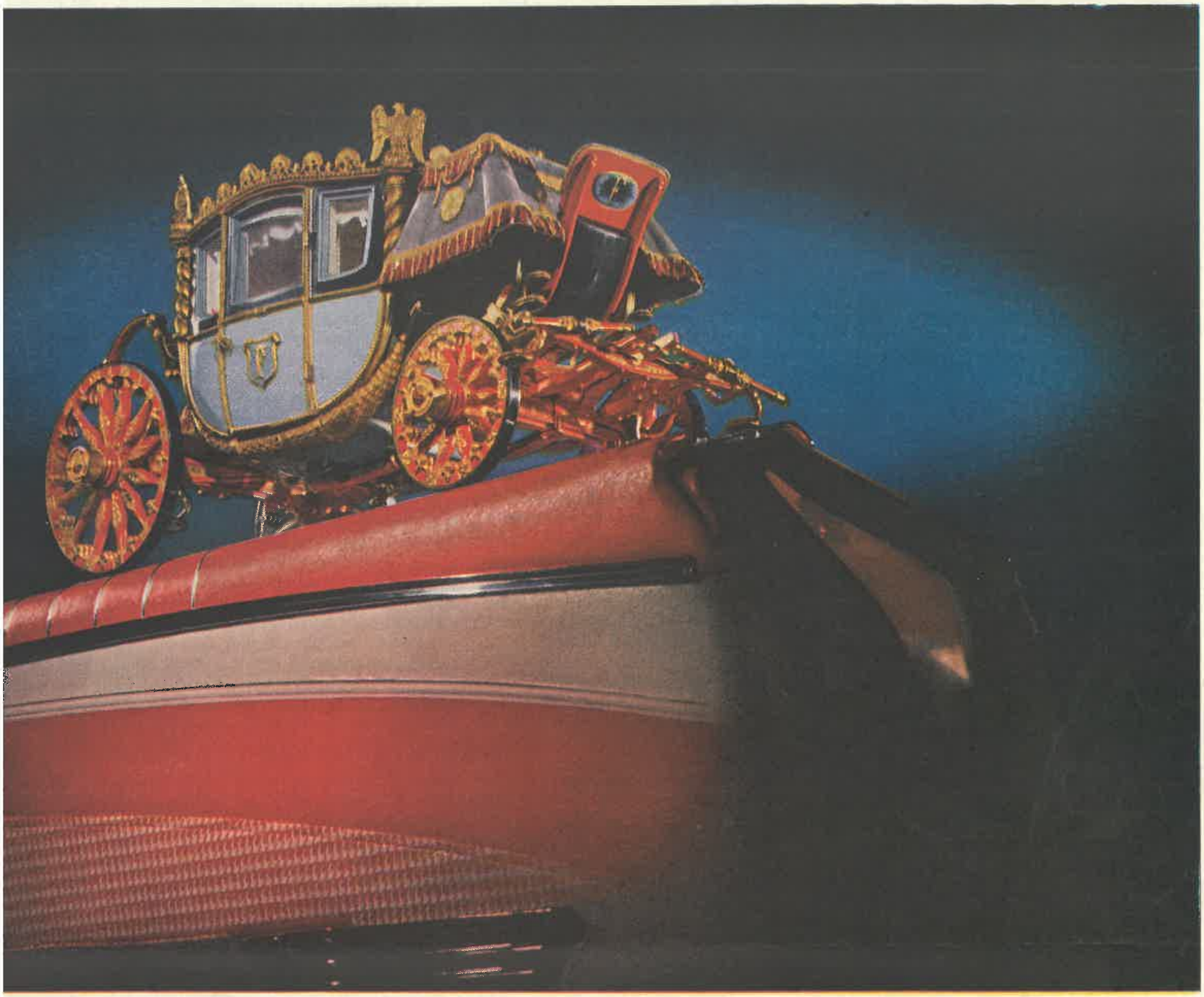
"You have my permission," I said and, selecting the most succulent looking piece of shish kebab, I returned to the task I was engaged in before this mountain of color had interrupted.

"Mr. O'Toole," the mountain of color was speaking again, "I don't need permission; I

thousand miles from Miami Beach. His ears resembled the wings of a PBY, the Navy patrol bomber of World War II, and his face was as long and as woebegone as that of a man who has just missed the last streetcar at midnight and who would now have to wait until dawn for the next.

"Promote you?" I looked him over. "Promote you? That might be possible if your talents were in another line besides music. If you know so much about me, you must have found out that I have no ear for music. To me the noise made by the most elegant symphony orchestra is no better than the noise made by the ferryboat as it crosses the Mississippi in a fog. Learn to paint, to roller skate, or to roll cigarettes with two fingers, and I'll make you known in all the worst places—I'll give you a gold star on your report card. But promote a singer? Never!"

"Mr. O'Toole," Cadaver said pleadingly, "I have all the ear for music anyone could want. As a matter of fact, my ears are big enough to



pen and shut case

BUILT-IN QUALITY OF BODY BY FISHER

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like a new car and when you get your next one, be sure you get all the built-in quality extras of Body by Fisher: Magic-Mirror Finish • Sound Barrier Build Vista-Panoramic Windshield • Safety Plate Glass All Around • Vault-Solid Doors • Contour-Molded Carpets and Mats.

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Cave Painters

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work was being done by gentlemen of leisure, assisted by scholars under their patronage—country squires in England, a king in Denmark, lawyers and bankers in France, the remarkable Schliemann who discovered Troy. All over the world, but particularly in western Europe, men were digging and probing and sifting. The foundations of scientific method were being laid, and the searchers were not now so keen on the individual "find"—a Rosetta stone, a king's tomb, a prehistoric necklace—as in the classification of strata. Some of the caves they found, especially in southwestern France, had been occupied for thousands of years, and the successive generations of inhabitants had left layer upon layer of debris as a record of their lives. The scientists dug carefully into this debris, leaving a vertical back wall on which the layering was visible to the naked eye. Carefully they classified what they found in each layer. They found that man's technical skills—the shaping of flints, for instance—went back a very long way. They found that the same caves had been inhabited by men who looked like cave men and by others who looked much the same as we do. The bones of rhinoceros and mammoth traced for them the advance and recession of the ice ages. They found traces of ritual burial and said, "Here, at last, is something which shows the beginnings of man as a civilized animal—but he has a long way to travel."

It was an enthralling and wonderful period, for these earnest seekers of the mid-nineteenth century were inventing and perfecting a new art. They were doing something, like painting or sculpture, which had no practical purpose. They were, in fact, exercising one of the basic qualities of humanity as we have defined it. It is all the more surprising that they recoiled with such shock, almost outrage, when they came across the cave art of the Stone Age. We can understand their attitude better if we appreciate the Victorian era's sense of finality. The world was thus and so, and one could make a mechanical model of it. The steam engine had been invented, electricity discovered, and man had all the tools he needed for a total uncovering of the universe. It would take time, of course, but it would be a logical, mechanical progression—as there had been from ape to cave man to Michelangelo. We, who have been confronted with the shadowy vastness of Einstein's special theory of relativity, with the quantum theory, with a universe that can only be explained in terms of mathematical symbols, and those dependent on a nonexistent quantity, the square root of minus 1, are as sure of nothing as the Victorians were of everything.

Altamira was genuine, then, but it was inexplicable, like a waterfall that flowed upward. The experts had their theories, but they did not take the general public into their confidence. The public, as a matter of fact, had hardly heard of Altamira, and was not very interested. Another and greater shock was needed.

It came on September 12, 1940, when four youths set out from the village of Montignac, in the Black Périgord district of southwestern France, for a walk on the wooded hill which dominates the little town and the River Vézère from the south. Two were natives of Montignac, and two were evacuees from German-occupied Paris. One of the locals, Marcel Ravidat, took his small dog, Robot, along. Most of the hill was owned by the *comte* de la Rouchefoucauld-Montbel, and over the centuries nearly every part of it had been given a name. In the area known as Lascaux, the dog, hunting for rabbits, disappeared down a small hole. The young men, determined not to lose their pet, followed him down with some difficulty, for the hole was narrow and soon turned into a steep slope. They slid down it and found the whimpering dog. The faint light shining down the hole by which they had entered showed them that they were in a large hall.

They were excited. The valleys of the Vézère and the Dordogne had long been the scene of important archaeological research. Villages in the district had given their names to whole epochs of man, whose traces had been found nearby—Cro-Magnon, Les Eyzies, Le Moustier, La Madeleine, Périgueux.

This had to be investigated further. The cave might contain bones, a skull—"Lascaux Man," and they would have discovered him! They scrambled out through the narrow hole, took an oath of secrecy and returned next day with a lamp.

Like the girl Maria de Sautuola sixty-one years before, when they raised the lamp in the great hall they saw the visions of their own imaginations spring to life upon the walls. There were stags with magnificently antlered heads, horses, bison, human figures and again bulls, this time so colossal that the eye could hardly take them in at a single glance—one of them was more than sixteen feet long. The young men, with private regret, realized that this was too important to keep secret. On their return to Montignac they told the village schoolteacher, who set a guard on the cave mouth and wired at once to the greatest living expert in the country, and the world—the *Abbé* Breuil.

This time there could be no doubt about the authenticity of the paintings, for some of them were partly covered by a layer of calcite, which must have taken thousands of years to form. The rest of the paintings were done on top of earlier calcite deposits. The paintings were technically as good as those of Altamira, if not better; there were more of them, and in better preservation; the cave was in inquisitive, artistic France; and some sixty years had passed, bringing the idea of tourism, a widening of education and easier means of travel.

The roof fell in—not the roof of the great cave of Lascaux, but the roof of the archaeologists' private world. Altamira and Font-de-Gaume and the rest were hardly known outside the circle of experts. Lascaux became as famous as the Louvre, and the only reason why it did not receive as many visitors was that the Historical Monuments Commission quickly took steps to preserve the climatic conditions of the cave by installing triple air-lock doors and limiting the number of visitors allowed inside each day.

The questions that had been bruited ever since the discovery of Altamira could no longer be evaded. Lascaux, besides its wealth of art, presented the twentieth century with mysteries. Here the prehistoric artists had invented animals—for nowhere in reality has any trace been found of an extraordinary beast, on one wall, that might have been a unicorn except that it had two horns, long and straight and close together. Also there were devices set among the animals—grilles, and squares, and hieroglyphs, some blocked in with color masses that gave the whole a strong resemblance to cubist art. And man was there, lying apparently dead or dying in front of a bison, the bison transfixed by a long spear and its entrails hanging out; and by the man's right hand was a device of a white bird on a long stick.

The Vézère and the Dordogne in this area flow through a rolling, rocky landscape covered with chestnut, oak and pine trees. They have worn their channels deep, and frequently they pass under tall cliffs, curved in and out with the marks of flood eras that took place 1,000,000 years ago. Everywhere, beside the main rivers, beside the small streams that flow into them, there are shallow caves and overhangs; in hundreds of them traces of prehistoric man have been found. He lived under these overhangs—on the sheltered south side during the hot interglacial periods, on the north when the cold winds marched down across Europe. Here and there a limestone wall has had a figure scratched into it; bones have been found carved into the shape of steatopygous

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tility among them, and so toward more meat for the hunters. The white bird on a stick beside the dying man—can it have been his soul that the artist was showing? Then the running cow, the deer swimming the river, their antlered heads at exactly the correct angle—could the artists have understood that if God brought death, He was also responsible for life? Could they believe that this mysterious power to communicate was also His gift, to be used for the wonder of it? If so, Altamira and Lascaux were more than chapels; they were the very labor rooms of humanity.

Marcel Ravidat closed the last of the airtight doors carefully behind us as we came out, my wife, myself, then Ravidat. He is the guide to the cave now; his dog, Robot, is long since dead. It is nineteen years since he and Jacques Marsal and the two from Paris slid down that narrow hole where now the steps and the triple doors are; but all the time he showed us around, his manner had been full of wonder—as though it had happened that morning. And the wonder was not at what had befallen him but at the works of man there on the walls of that secret place. Marcel Ravidat had long since realized the true miracle of Lascaux, which is not in the genius of its art, but in the nature of man.

We were standing, silent, at the edge of the wood, beside the sandy track among the chestnut trees. The Vézère wound away to the west through the Black Périgord, the land of truffles, *foie gras*, good wine, and walnut-oil dressing. I thought, *My ancestors became "man" here, in these hills, a thousand generations ago.*

The woods seemed to grow denser and, in the valley, the villages faded and disappeared. The river remained, and so did the contours of the land. A trampling among the dead leaves did not make me turn my head; it was a bison, but it was far away, and I was unarmed. The men coming up the slope carried animal bladders, full of oil, over their bare shoulders. Their hair was long, and they wore no clothes at all, for it was a warm day. There were six or seven of them. They also had earthenware pots and lumps of color in their hands. They stopped, looked around cautiously and listened. Then two of them who carried long spears moved aside and sat under a tree, on guard. The others, one by one, slid down the narrow hole into the earth. The last man stayed a moment, half in and half out of the hole, staring full at me. I was not looking at cave man or Cro-Magnon man or prehistoric man, but at Man, the discoverer and molder of what we have become and will become, the eyes of a man groping to find a link with infinity through a mysterious power to show color, shape and movement. This was all he had now, but he knew already that one day, if he worked and thought, he would understand.

Marcel Ravidat said softly, "I am so lucky. Every time I feel despair, I go into the cave. I wish that everyone in the world could do the same. Even to see Lascaux once. . . ." He did not finish the sentence, but I could do it for him. We are citizens of no mean city.

Then we went down the hill.

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(Continued from Page 27)

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of a multi-engined airplane. Wheels on top of each of the two control columns turn the ship. Fore and aft movement of the yoke manipulates the diving planes. In front of each helmsman a panel of instruments indicates depth, heading, rate of dive and rudder angle. To complete the aircraft analogy, each helmsman's seat has a safety belt to hold him in place during the more violent maneuvers.

When I took my trick at the wheel, I felt right at home—as though I were back in the cockpit of an S2F. I strapped myself in and began a gentle turn to port. The controls were more sensitive than I had anticipated. The ship heeled over. Unconsciously I pressed on the deck where the rudder pedals should have been. No rudder pedals. I could feel the momentum of the ship building up more rapidly than I could handle it.

In a short time vertigo, the aviator's special kind of panic, began to creep up on me. I scanned the instrument panel in vain, looking for my old friends from the S2F cockpit. They were there, but unrecognizable in their guise as submarine instruments. Vertigo had taken hold of my senses now, and for a few seconds I couldn't tell whether I was upside down, still turning or on an even keel.

"Rudder amidships," said the diving officer over my shoulder.

I relaxed my grip on the wheel. The ship stopped turning, and my vertigo disappeared. "Where am I going?" I asked.

"Your course is north," said the diving officer.

I had drifted off course many degrees by this time. I gingerly returned the ship to its proper heading, then turned the controls over to someone else. I retired to the rear of the control room to light up a cigarette and think things over.

In case of war the sub-killing *Skipjack*

Wars I and II have proved. Germany started World War II with fifty-seven submarines. Today Russia could go to war with at least seven times that many. Not long ago intelligence from the Soviet Union reported the interesting fact that Russia had suddenly suspended its massive conventional-submarine construction program. As the chief of naval operations, Adm. Arleigh Burke, has testified, this meant only one thing to the Navy—the Russians were shifting over to nuclear-powered submarines.

The Navy, of course, has elaborate conventional measures for dealing with the Russian submarine threat, including aircraft carriers, secret sonar devices and patrol planes. "But the antisubmarine weapon I fear the most," says the *Skipjack's* boss, Cmdr. Bill Behrens, "is an enemy nuclear sub. I think most sub skippers would say the same thing." Articulate and slightly graying, Behrens has been a submariner ever since he was graduated from the Naval Academy in 1943. His experience ranges from patrols against the Japanese in World War II to director of the Navy's first Nuclear Power School in New London.

"A nuclear killer sub like the *Skipjack* can maintain at all times the best sonar-listening depth because it never has to snorkel," Commander Behrens says. "I can pick up another sub at the longest possible range. In other words, I can hear him before he hears me." Backing up the *Skipjack's* hunting prowess are six torpedo tubes in her nose and special attack sonar that enables the *Skipjack* to strike at any target, surfaced or submerged, without ever raising her periscope. The only shortcoming of *Skipjack*, submariners say, is that we don't have enough subs like her.

No small problem in the underseas

along with one another and carry out complex technical jobs despite being shut up many fathoms below the surface of the ocean for weeks or even months.

When I first came aboard the *Skipjack* I was given a "pocket dosimeter," a pencil-like instrument that measures the total amount of radiation accumulated during a given period of time. "There's little problem about stray radiation," the ship's doctor, Lt. Clint (Dan) McGrew said. "But we give one of these to every visitor so you can see for yourself."

A qualified submariner, twenty-eight-year-old Doctor McGrew holds a master's degree from the University of Rochester in radiation biology in addition to his M.D. As head of the medical department on the *Skipjack*, he is responsible for monitoring radiation levels aboard ship. "People on a sub receive less radiation than people ashore," he said. "Sea water shields cosmic radiation. Thus you can get more background radiation taking a sun bath than we ever get aboard the *Skipjack*. So many safeguards were built into the nuclear-sub designs that radiation is no problem."

Each member of the *Skipjack's* crew wears a film badge at all times aboard ship, even while asleep. Once a month Doctor McGrew and his staff of medical corpsmen develop the X-raylike film from the badges and record any radiation in a permanent record for each man. "No one aboard the *Skipjack* has received more than the allowed weekly dosage since the ship was commissioned," says Doctor McGrew. "This includes members of the engineering and medical departments who periodically work in the reactor compartment. Most of our crew have not picked up any at all."

In my twelve hours aboard the *Skipjack*

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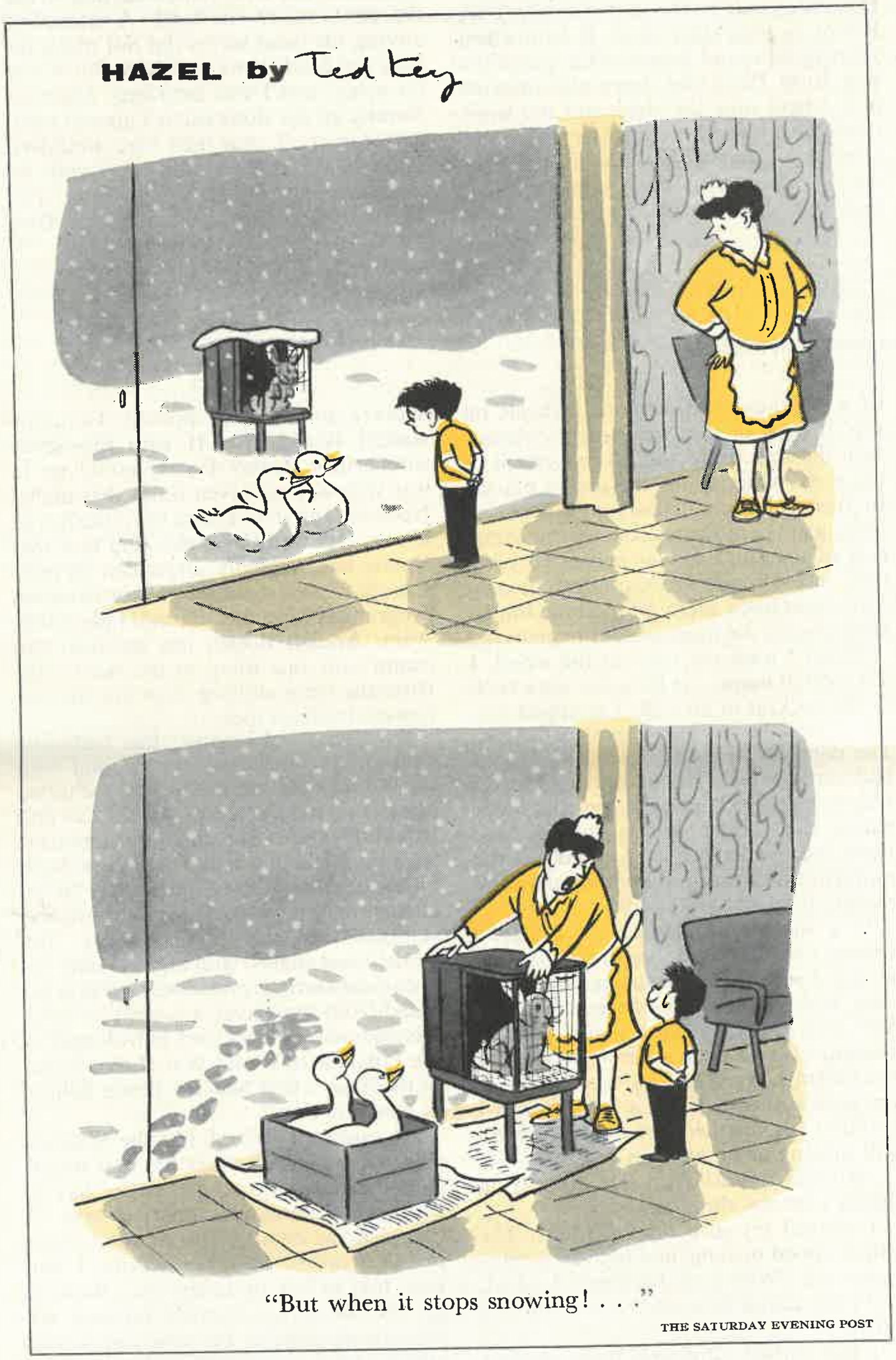
stowage and eliminates the time-consuming and nerve-racking countdown needed to fire off liquid-fueled rockets such as the Atlas. Like torpedoes aimed for the surface, the missiles will be shot from their tubes with a charge of compressed air. As the missile pops up above the surface, its rocket engines will fire off, and a sophisticated, self-contained guidance system will direct it to its target.

Not since the advent of the aircraft carrier has a new naval weapon system been so widely ballyhooed or stirred up so much controversy. Air Force generals, for example, heavily committed to their own solid-propellant Minuteman ICBM, have advanced arguments against Polaris which closely resemble their old harangues against the aircraft carrier. They argue that Polaris is too expensive—each sub costs $100,000,000, and each missile $1,200,000 at present—and say that the

skeptics even say that the Polaris missile itself is no good.



"But when it stops snowing! . . ."

THE SATURDAY EVENING POST

One fact is indisputable: The submarines which will launch the missile are being built at breakneck speed. Electric Boat Division now works three shifts a day, seven days a week to get the *George Washington* and the *Patrick Henry* out on their deterrent patrols by fall of 1960. The pace is reminiscent of World War II days, say the old-timers in New London and Groton. In one part of the shipyard one crew started laying the keel of a third missile sub before a construction gang finished enlarging the ways enough to accommodate the new ship.

From all indications, progress on the missile itself is satisfactory, despite recent highly publicized failures. Compared with Air Force Atlas ICBM flight tests, the Polaris—as new in its own way as the Atlas was at that time—has made a good

Cape Canaveral, a hydraulic tilting pad that simulates a ship's motion so realistically that it can cause seasickness to someone standing on top of it. Two weeks later a successful shot was fired from a vertical launching tube aboard the *U.S.S. Observation Island*, a cargo ship modified to test Polaris launching equipment under actual sea conditions. The transition from surface to subsurface is not expected to be difficult. Dummy Polaris missiles have already been successfully ejected from an underwater launching tube at San Clemente Island, California.

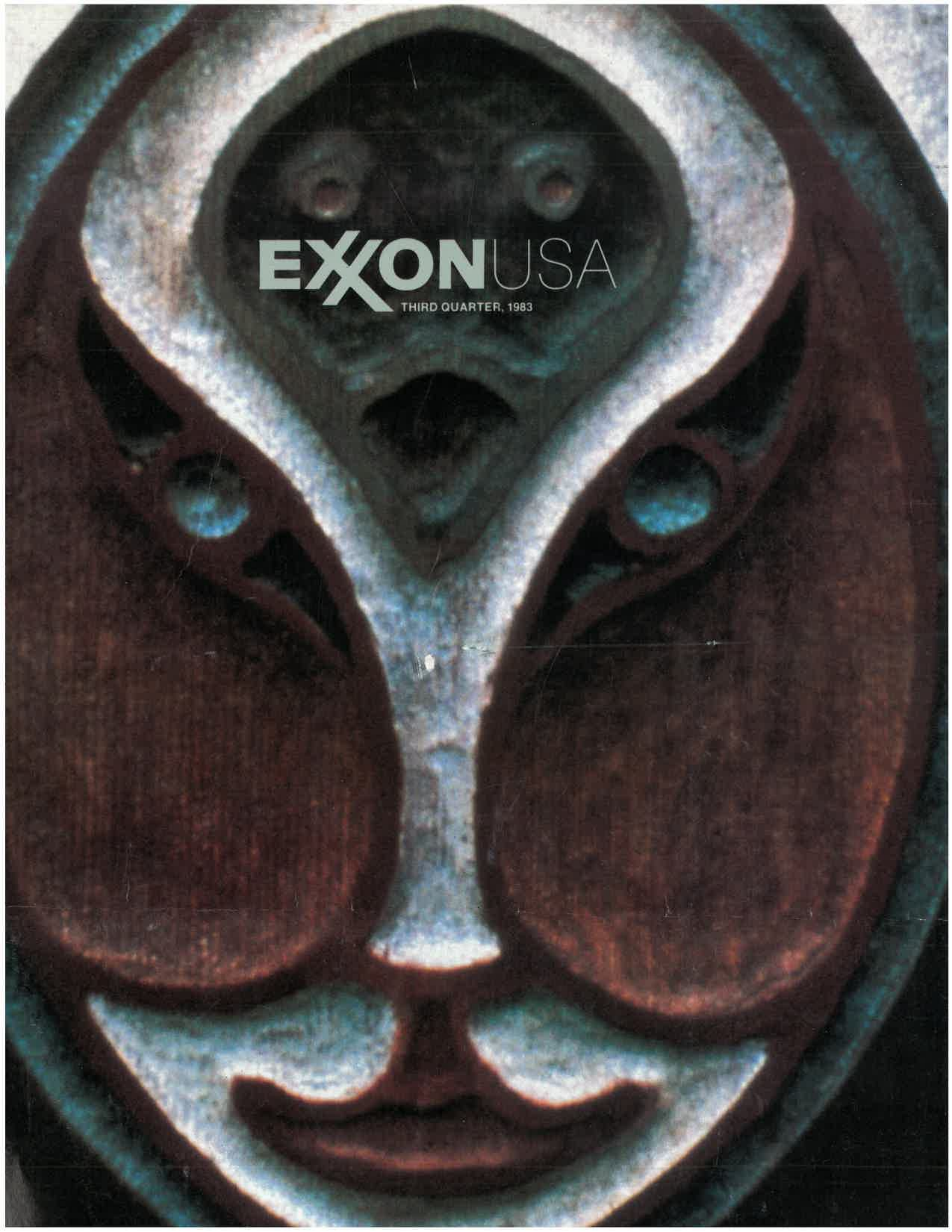
Some critics of Polaris maintain that its range has drastically been downgraded to 750 nautical miles to meet the tight schedules of the crash program. "I wish I could find out who started this story," says Rear Adm. William F. Raborn, the Polaris program's hard-driving head man. "I'd nominate him for oblivion, because there's no essence of truth in it. The range objective for the 1960-model missile is still in excess of twelve hundred miles."

The Navy has not yet announced the range results of any Polaris test shots, but informed sources report that a recent test vehicle, fired on December seventh, traveled over 900 miles down the Cape Canaveral range. A 1200-mile missile would make almost all of Russia vulnerable except for a small area in central Russia. Improved versions of Polaris now under development will have 1500- and, ultimately, 2000-nautical-mile ranges. No area in Russia will then be safe from undersea atomic bombardment.

But can this missile ever be as accurate as a land-based missile which proceeds from one known geographical point to another? The Navy is hard at work on the solution to this problem too. The *U.S.S. Compass Island*, a sister ship to the *Observation Island*, has logged 90,000 miles since 1956 checking an automatic inertial-navigating system accurate enough to position a sub for an effective missile launching. Using the inertial system alone, the *Compass Island* navigates within a standard tolerance of four tenths of a nautical mile—or 810 yards—of its desired latitude and longitude. When the kill radius of a nuclear warhead is measured in miles, the accuracy achieved by the *Compass Island* seems quite sufficient to do the job.

A final criticism of the Polaris program is that communications with submerged submarines are not reliable enough for a war in which the first few minutes can determine the outcome. The completion of a 1000-kilowatt radio station in Cutler, Maine, will soon give the Navy the final link in a reliable communications system that spans the world. Twenty times stronger than the most powerful commercial AM station, this new installation will contain very-low-frequency transmitters, which have been used successfully for a number of years to keep in touch with our submarine forces, and which will undoubtedly be able to give our Polaris subs the word if the time ever comes to launch their deadly cargo.

Three years ago the Polaris program was a dream. Any day now the *George*



EXXON USA

THIRD QUARTER, 1983

Closing up after a 16-hour day, Fenison lowers the folding doors on his service bays. He credits customer service and careful attention to money management for his success.

time for his wife and three children and for the family's church. For 18 years he has served as choir director of the Florida Avenue Baptist Church. He also serves as chairman of the board of deacons and has taught the adult Sunday School class for over a dozen years.

"If you can't find me at the station, I'm either at home or the church," he tells those who want to contact him.

In keeping with his personal commitments, Fenison is also one of approximately 3,000 Exxon dealers in the U.S. who have subscribed to Exxon's Commitment to Excellence Program, a comprehensive strategy designed to improve efficiency and competitiveness in today's tough market. Among the program's key elements are expanded customer services, superior training of employees, sharper service and better appearance for the station, efficient management and administration, and strong community development. Top-rated dealers receive recognition and prizes, such as vacation trips. But the main thrust is to keep Exxon deal

Fenison feels his station has been committed to excellence since it opened. "As an independent dealer, I don't know of any company that's better to deal with than Exxon," he reasons. "My first consideration is quality, and Exxon products are tops." Other pluses, he believes, are the company's willingness to stand behind its products, company help in saving money on purchases, and marketing aids useful in today's competitive marketplace. "I have a full-service station in an area where self-service is popular," Fenison points out. "When you're emphasizing service over price, you need all the help you can get."

Of equal importance to Fenison's success is his system of keeping track of every detail of the station's high-volume operation. Although well over a million dollars in revenue passes through his station in a year's time, and his transactions number into the tens of thousands, Fenison keeps his margin of error to no more than a low 2 percent.

It takes Fenison between one and two hours a day to record that day's sales, services, and expenses. Every item is accounted for in his Daily Business Record Book, an indispensable tool for Exxon dealers. In addition, he spends most of a day at the end of each month running an inventory of the thousands of items in stock, right down to the tire stems and hose clamps. An Exxon sales representative helps with that process. At month's close, one entire day is devoted to reconciling all purchases, payouts, and other financial transactions for the month.

"That's the only way I know to find out if you are making a profit, breaking even, or losing money," Fenison says.

If you are, indeed, making a profit, Fenison believes, then you are very likely giving super person-to-person service. Take, for example, the case of the dump truck driver.

Near the end of a sweltering day, a

tles out to greet and serve the customer. While the truck's tanks fill, Basina cleans its windshield, looks under its hood, and checks tire pressures.

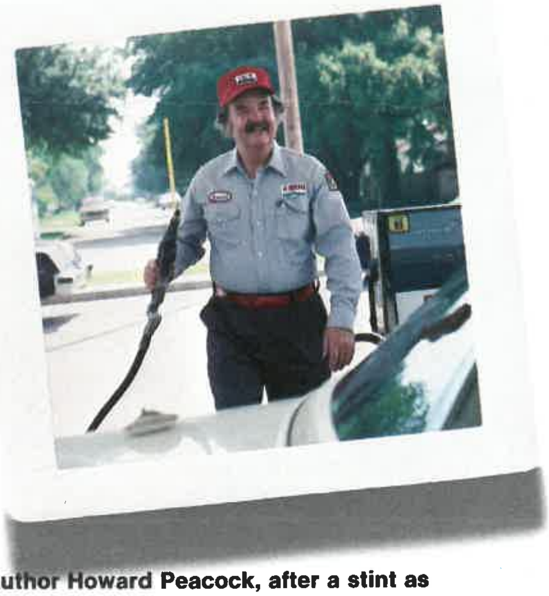
"One more thing," gruffs the dishevelled, sweat-drenched driver. "I'd like a cold drink from your machine." He names a brand of soda pop and gives Basina a quarter. Although he has never been asked to fetch drinks before, Basina doesn't hesitate. Before the driver can finish wiping grime from his forehead, the cold drink is in his hand. He downs half of it in one swallow.

"That's full service for sure," he grins. "You've got yourself a new customer. You can bet on it."

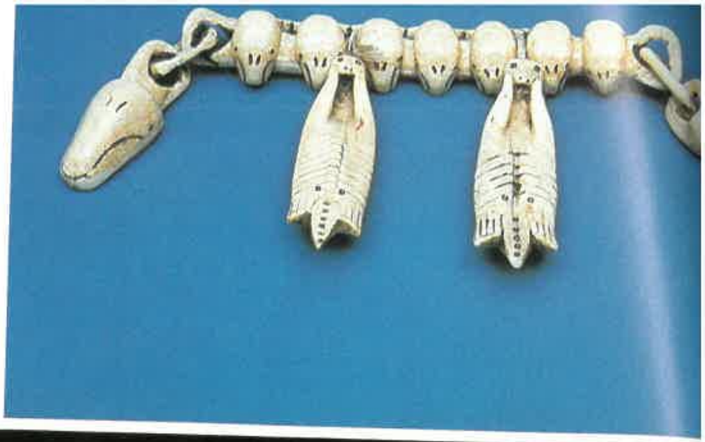
HOWARD PEACOCK

ABOUT THE AUTHOR

Free-lance writer and photographer Howard Peacock works out of Woodville, Texas, and is a regular contributor to EXXON USA. His first television script, a tribute to artist E. M. (Buck) Schiwetz, recently won a national award.



Author Howard Peacock, after a stint as a driveway attendant, came away with a

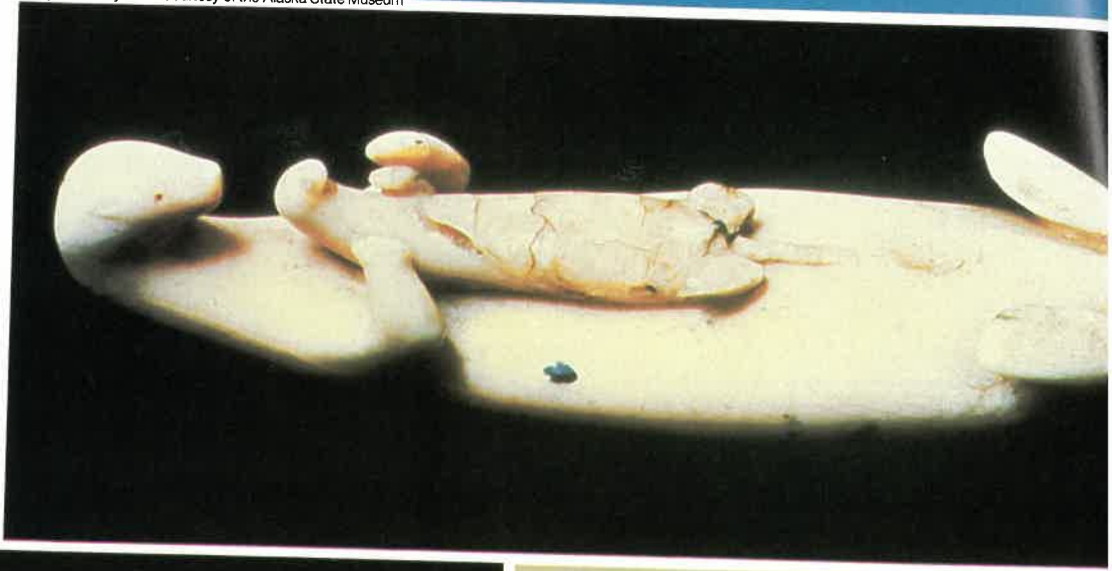


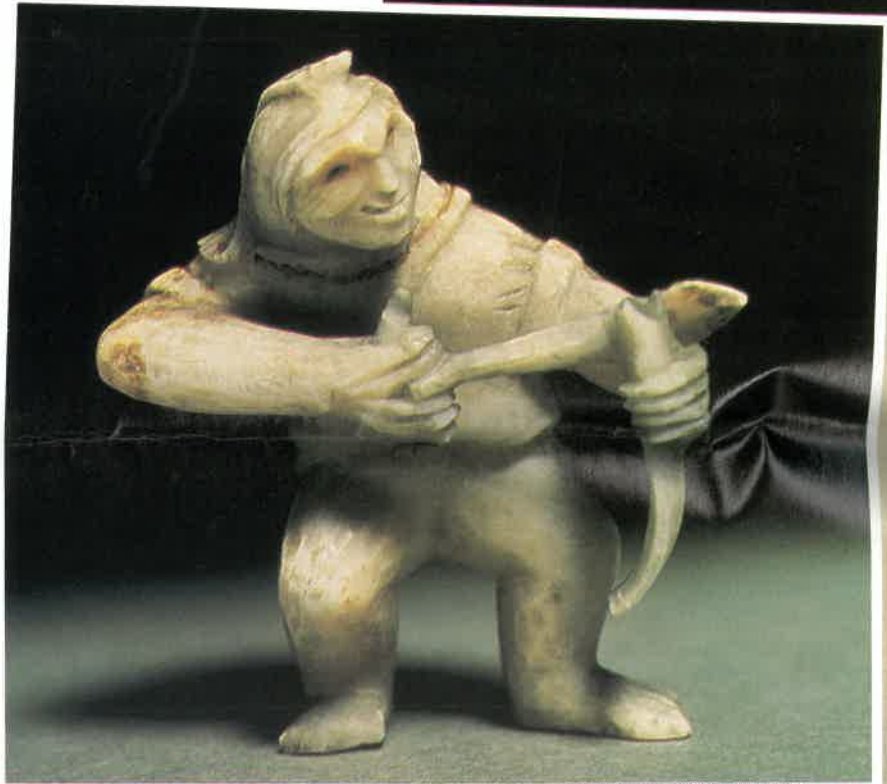
Barry J. McWayne — Courtesy of the Alaska State Museum

ABOVE:
An early 19th century ivory carving collected at Nootka Sound and said to be of eastern Aleutian workmanship depicts a sea beast with two sea otters as pendants. It is in the Ulster Museum in Belfast, Northern Ireland.

AT RIGHT:
A stylized sea otter with her pup comes from the eastern Aleutians. The figurine is in the Museum of Anthropology and Ethnology of the Academy of Sciences in Leningrad, USSR.

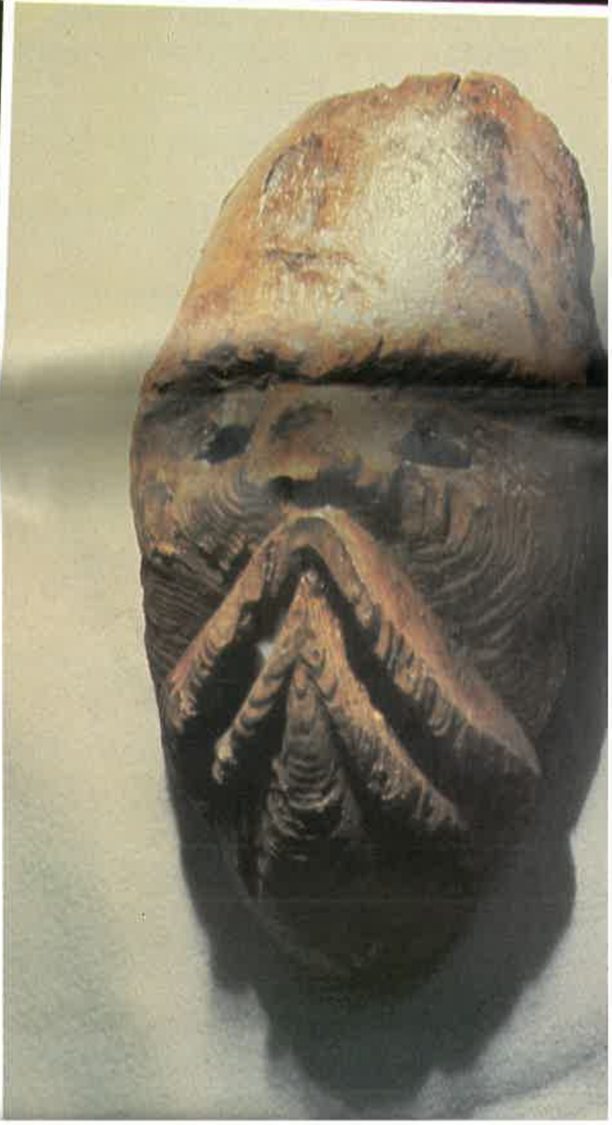
BELOW:
Artists of Atka carved small but dynamic human figures in ivory. Collected before 1853 by Holmberg, this inch tall archer is housed in the National Museum of Denmark.





Paul Mork

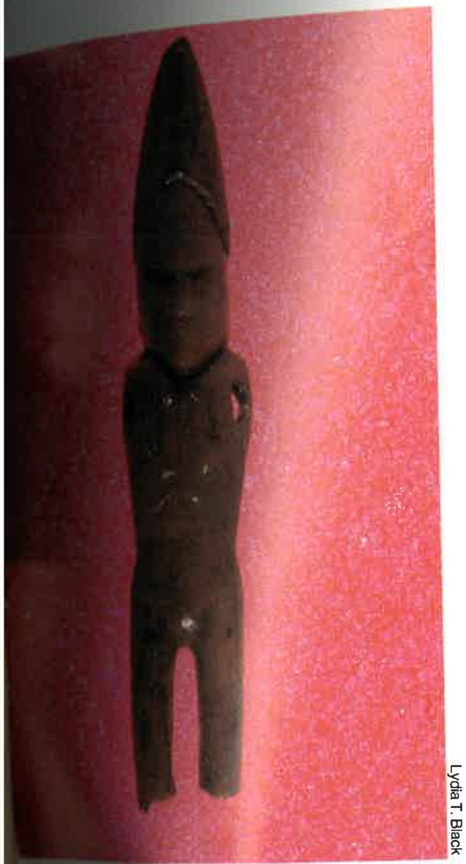
AT RIGHT:
A burial mask, dated between 110 and 120 A.D., was found in the "Mask" cave on Kagamil Island. Part of the T. P. Bank II collection, it will be on display at the new museum of Aleut art soon to open on Unalaska.



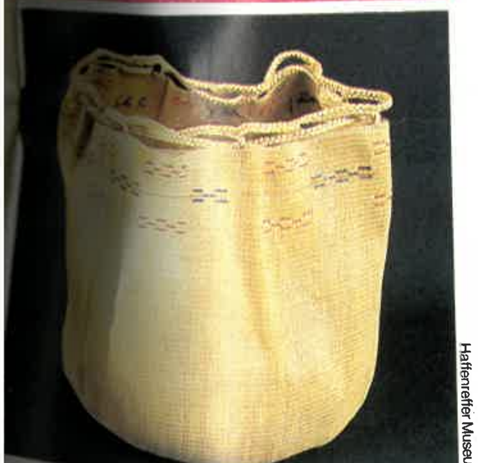
Lydia T. Black

Aleutian Art: a cord of many strands

Little known outside their island home, the Aleut people share a rich artistic heritage inspiring to artists of today



Lydia T. Black



Haffenreffer Museum

TOP:
The Lady of Amaknak, wearing her ritual hat, represents ancient Unangan sculpture at its best. Part of the Bank colleciton, it is being returned to Unalaska.

BOTTOM:
Finely woven utility baskets made Aleut women famous. This

FROM ALASKA'S NECK, the Aleutians curve away to the west for a thousand miles, a necklace of 200 islands reaching almost to Siberia. North of the island chain rolls the restless Bering Sea; on its southern flank, the Pacific Ocean begins; the Aleutians divide them.

Dots of land with abrupt names . . . Attu, Kiska, Atka, Umnak, Adak . . . the Aleutians are remote, forbidding, mysterious. The cradle of storms, they lie shrouded in perpetual mist. In the flash of the rare summer sun, their treeless shores gleam emerald-green against grey seas; their snowy peaks emerge diamond-like from roiling winter fogs. The Illusions, they have been called.

People are few in the Aleutians. Aside from the reluctant heroes standing guard at U.S. Navy and Coast Guard bases, there remain but a thousand or so of the Native inhabitants in several small villages on the larger islands. In their own language, they call themselves Unangan, which translates, perhaps, as, "place of those above." But when the Russians came in the 18th century, the Unangan took the name of Aleut, by which they are known today.

A hardy people, the Aleut. Extracting a difficult living from a perilous sea, they have historically enjoyed few resources beyond their native ingenuity. In an earlier day, they used driftwood, animal bone and sinew, stone, and grass as raw materials for homes, boats, clothing, weapons, and tools. Yet, with just these, the Unangan found time and motivation to produce magnificent art. Men carved sculptures in walrus ivory, bone, and wood. They painted splendid designs on their implements and wooden hunting helmets. Women brought their utilitarian craft of basketweaving to such a degree of perfection that museums the world over are proud to display an Aleutian basket. From the skins and guts of marine mammals and imported caribou

skill and artistic imagination of those ancient seamstresses.

Early visitors from Europe were quick to recognize the quality of Unangan work. They collected it with such thoroughness that no examples of traditional Unangan art remain today in the islands. It exists elsewhere in museums and private collections. One of these collections was recently returned to Alaska, thanks to an Exxon grant.

From study of collected works, an understanding of Unangan artistic tradition is beginning to emerge. The Unangan seldom made art for art's sake or purely for fun or as decoration alone. Their art was utilitarian. But no implement or garment or container was made without an aesthetic dimension. A boat cleat would be transformed into a sculpture; a waterproof garment of whale gut would be adorned with designs; a hunting helmet would be brilliantly ornamented.

Furthermore, Unangan art was a cord of many strands. Several distinct artistic traditions or styles flourished. Artisans of the eastern Aleutians sculpted ivory with a remarkable elegance of line and economy of surface decoration. They favored human over animal subjects, depicting people in a stylized, abstract manner. Their representations of sea otters, a symbolic animal, were also highly stylized.

In contrast, the Atkan, or Central Aleutian, sculptors of the historic period preferred realism. Their work renders people and animals in a natural manner with great skill and vigor.

In the Near Islands, the westernmost part of the Aleutian chain, artists employed a totally different style. Prehistoric craftsmen covered the surfaces of objects with incised or raised designs that were heavily pigmented. They also preferred animal to human motifs. The one existing prehistoric figurine from Attu is sents a striking contrast to the elongated heads and faces of prehistoric human sculpture from the eastern Aleutians.

The fourth distinctive region is to be found in the Four Mountains Islands, a group ranging from Amukta Island to Umnak Island. Few sculptures have been recovered here. Those on hand are sea mammal images in bone or ivory, with surfaces decorated by incised point-like dots. Representation of people consisted of wooden, armless torsos. All came from caves of Kagamil Island and were associated with mummy burials.

These regional differences in styles carry over into other art forms, as well. For example, inhabitants of Kagamil carved masks that relate to those of the Northwest Alaska Eskimo masks. From Atka come two masks that emphasize the spherical elements of the face. One has a detachable helmet that secures to the face mask with pegs. The other features a protruding tongue and is the only one of its kind in all the Aleutians. The best known and largest collection of masks comes form the Shumagin Island group. They were found in the 1870s and are thought to have been used in rituals associated with whaling. One type probably signifies ritual transformation of men into killer whales. This was a necessary symbolic act to enable a human to take the greatest of the marine creatures. The other was probably worn by neophytes, being smaller, lighter, and more clearly human.

From Umnak to the Alaska Peninsula, masks were associated with burial. They were carved of bone, or, sometimes, of ivory. Small in size, their eyes are unseeing. They were not attached to the corpse, but signify the person in death.

Oddly, the inhabitants of the Near Islands didn't carve masks of any kind. At least, none has been found there to date.

After the arrival of Europeans in the 18th century, Aleutian art continued to flourish. While carvers continued to craft weapons and hunting helmets, they also began creating artwork for sale. In the eastern Aleutians, the stylized sea otter was popular, along with stylized male and female figurines. Sometimes the male figures were incorporated into hunting scenes. Male figures were used to decorate the front of hunting helmets; later, bird figurines, realistically rendered, replaced them.

In rendering the female in sculpture, Aleut carvers accented the body — the head was small in proportion. Typically, the woman was shown in a squatting position. She was clothed in skin garments with hair pieces and ornaments on ears, nose, and chin. Female figurines seem to have been important ritual objects associated with pregnancy, childbirth, and fertility.

Atkan sculptures of the historic period are humanistic. Animals were also carved, sometimes as part of a scene from a myth. For example, a figurine showing two baby sea otters facing in opposite directions illustrates a myth in which an incestuous brother and sister were turned into sea otters by the deity, after which the brother swam north and the sister swam south. Dancers, hunters, men, women, Russians, Americans, all can be found illustrated by the Atkan carvers.

Woodcarving from prehistoric times is not known in the Aleutians, probably because of the scarcity and rapid deterioration of the available medium. After the arrival of the Russians, who imported wooden building materials, Aleut woodcarving was adapted to new uses. Examples from the 1820s survive in a chapel in Unalaska and in icon frames in private homes.

The Aleuts loved color. Wood ornamentation of altar screens, hunting helmets, and even bird figurines were gaily and imaginatively painted in polychrome. Color was rubbed into incised geometric designs, even on harpoon foreshafts. Colorful designs were painted on drag floats, decoys, bows, hunting clubs, arrows, and spear shafts. Aleuts decorated their boats, called baidarkas, with designs in red. But nowhere did this love of color appear as in the decoration of hunting helmets.

These bentwood headgear were popular from the mainland all the way out to the Andreanof Islands. The Attuans, it seems, did not wear them. There were three kinds, each worn according to the work and rank of the wearer. Shape, style, and design varied according to locality. No two were alike.

A low-ranking person might wear an open-crowned visor with a short bill — that day's version of the "gimme cap." Men of more stature would wear a long-billed, open-crowned visor, especially when hunting or traveling. The rim of the crown would be fringed with sea lion whiskers or tufts of feathers. The visor would be brightly painted with horizontal bands of contrasting colors over a base coat. Sometimes spiral or geometric patterns, sometimes flowers, rosettes, and medallions, would be added. Reds and blues seem to have been the favorite colors

east of Umnak; to the west, yellows a
greens predominated. At first glance t
designs appear to be symmetrical, b
Aleut artists deliberately introduc
asymmetry with subtle changes a
variations.

Headgear worn by men of high
rank and by chiefs during ceremon
occasions was larger and more elabor
still. These ceremonial hats would f
ture a closed crown, perhaps surmoun

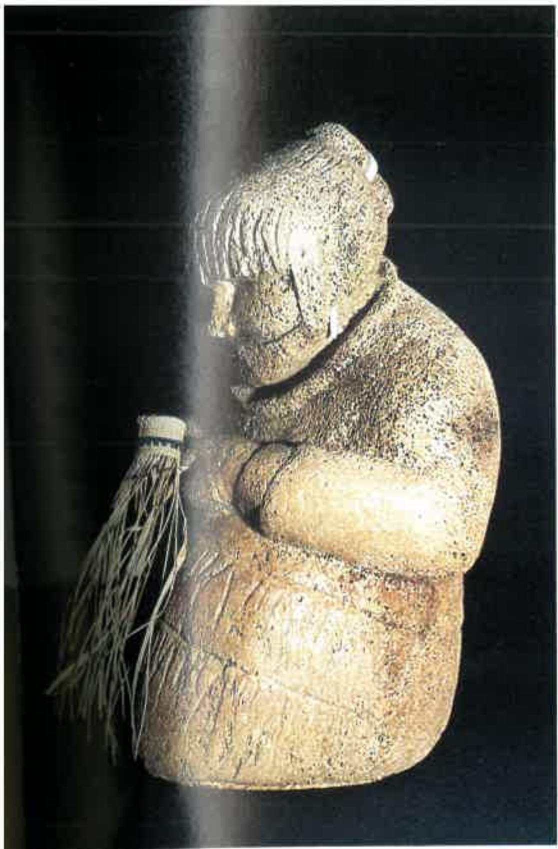
©Mary Randlett 1979

Stylized human faces evoking the vanished Okvi
culture of the Bering Sea often appear in the wor
of John Hoover, as in his "Annioga Spirit Mask,"
detail of which appears on the cover.

with bone or ivory plaques fringed wit
sea lion whiskers or feathers. Elabora
designs might depict whales and seals
hunters and animals.

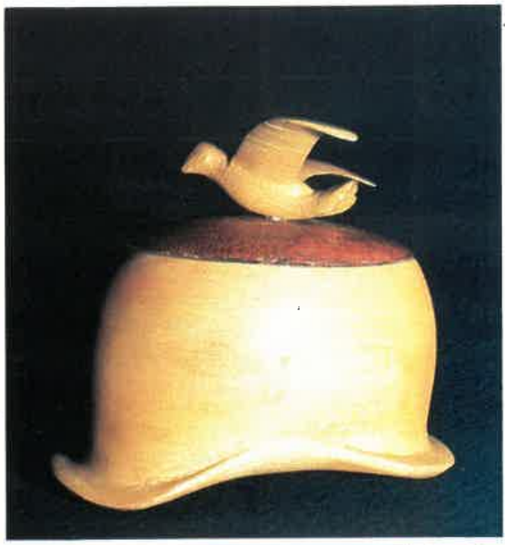
A model showing a hunting party tra
eling in a baidarka has the chief in t
stern in control of the tiller; the assista
chief sits in the bow; both wear ta
closed-crowned helmets with long viso
The oarsmen wear smaller, ope
crowned visors.

While men did most of the carving a
painting among the Aleuts, women h
access to paints as well. They used p
ments to ornament the skin side of



Ray Hudson

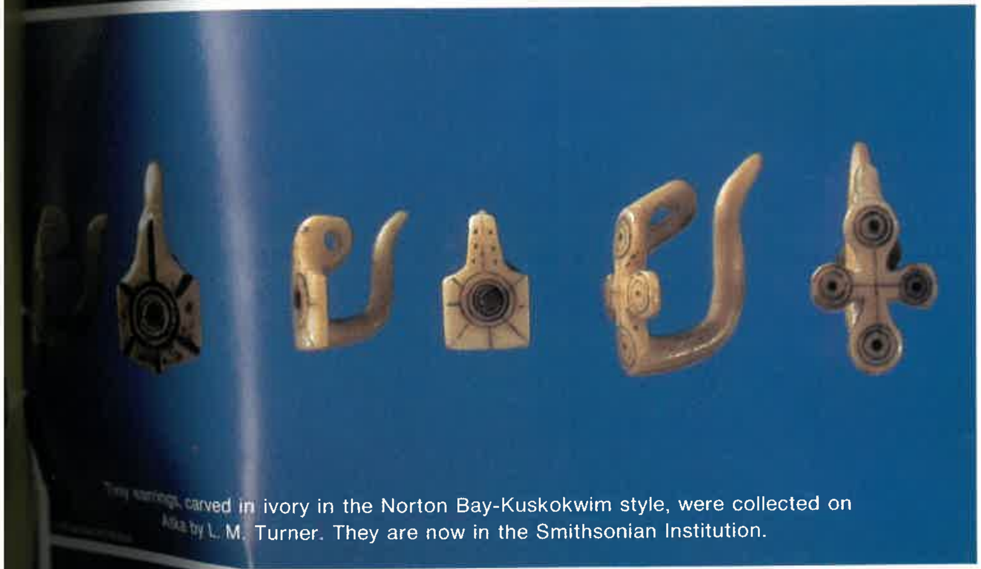
AT LEFT:
"The Basketweaver," by Gertrude Svarny, of Unalaska, was created of whalebone with walrus ivory accents and wild rye grass.



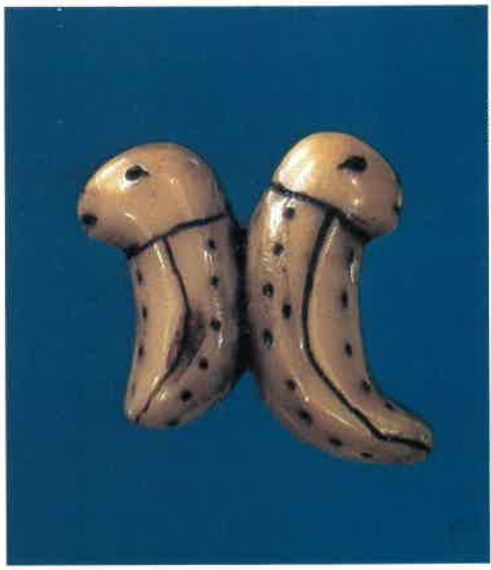
Ray Hudson

AT LEFT:
One of Philemon Tutiakoff's carvings in yellow cedar and mahogany consists of a miniature lidded box crowned by a sea bird in flight.

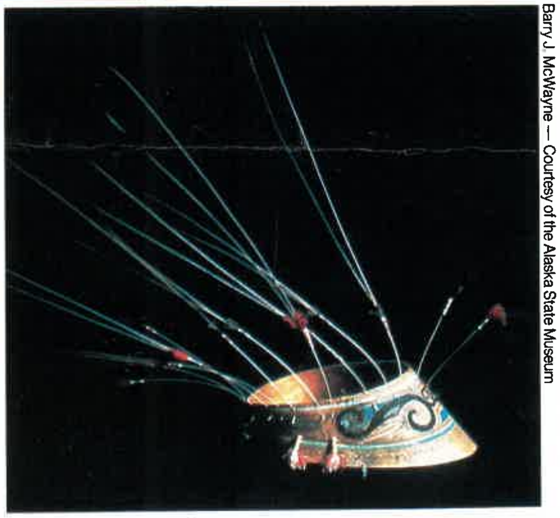
BELOW:
Brother and sister sea otters from Atka, collected by Lucien M. Turner in the 1870s, were inspired by an Aleutian myth. The figurine is in the Smithsonian Institution.



Tiny earrings, carved in ivory in the Norton Bay-Kuskokwim style, were collected on Atka by L. M. Turner. They are now in the Smithsonian Institution.



Smithsonian Institution



Barry J. McWayne — Courtesy of the Alaska State Museum

ABOVE:
Every hunter wore a visor over his kamleika (rain shirt) hood. This one is decorated in polychrome with beads and sea lion whiskers. It is on display at the Berlin Museum fur Voelkerkunde.

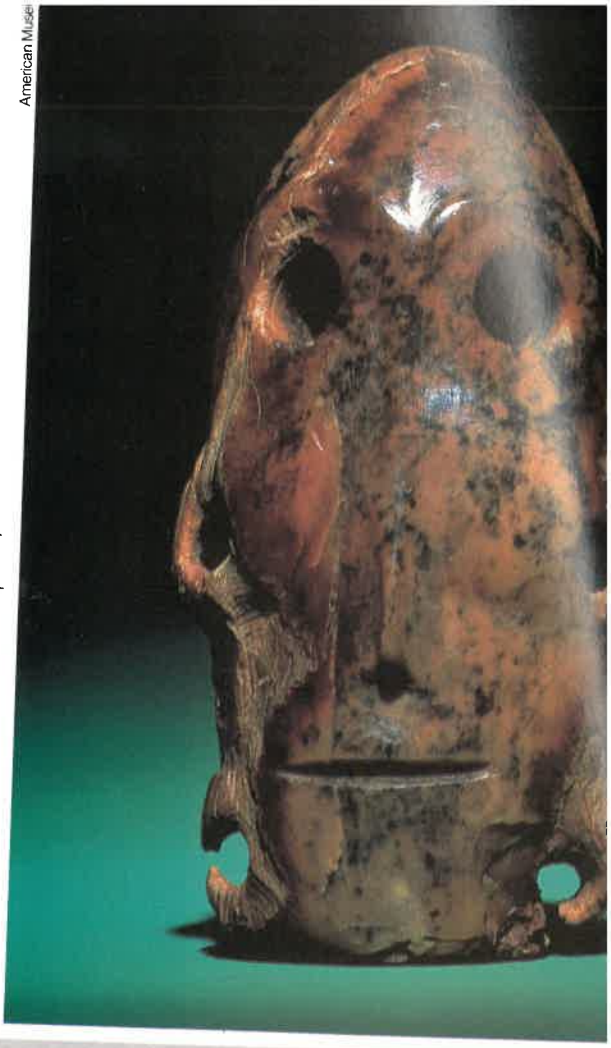
AT LEFT:

garments worn by women and of the bird-skin garments worn by men. To decorate waterproof kamleikas, they would add accents of blue, green, orange, and yellow to the conventional designs in red, black, and white. In addition, the women would dye sea lion membrane in bright colors and applique designs cut from it to the kamleika. They might also add a heavy overlay of embroidery of caribou hair in white or gold and in a later period multi-colored worsted wool or even later, silk.

The same elaborate needlework went into the decoration of ritual hats made of seal skins. These were worn on important social occasions and took a variety of fanciful shapes. After the arrival of the Russians, women modeled ritual hats for their menfolk after the caps worn by Russian sailors. They were appliqued with embroidery and fringed with brightly dyed skin. Women also made highly decorated tool kits for men and "housewives" for themselves. These pocketlike containers in which women kept small tools often had their entire surfaces covered with elaborate embroidery.

All of these artforms, with the exception of the bentwood headgear, were little known to the western world. But there is one outstanding exception: Aleut basketry. Nowhere in the North was the art of basketweaving brought to such perfection. All Aleut women excelled at basketmaking, but the finest baskets of all came from Attu. These are recognizable by their exceptionally fine texture, the finish of the edges, and the distinctive knob by which the basket lid was lifted. Using wild beach rye grass, weavers twined baskets so fine that they might be mistaken for linen. Elegant decorative motifs were added in contrasting colors. Early weavers used overlays of colored grasses; in later times, they worked out designs in wool, silk, and cotton thread. Feathers, too, were an important design element in basketry. Quite rightly, Aleut baskets are world-famous.

Yet, the Aleut artists were never closed to innovation. They were ready to adopt ideas, forms, and materials from their neighbors. Their art did not disappear with the arrival of the Russians, as has been claimed. The Aleuts simply made new concepts their own and gave them an unmistakable Aleutian character. New materials, too, were readily accepted, as were new design ideas. For example, the Aleut master weaver, the late Anfesia Shapsnikoff, originally of Atka, studied samples of wallpaper brought from the

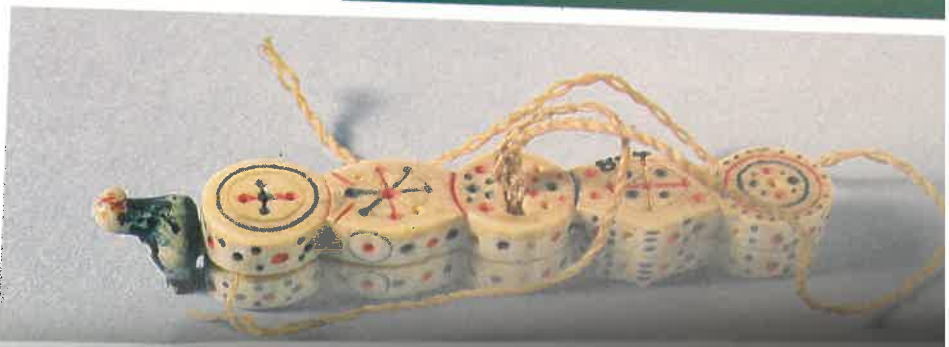


American Muse

AT RIGHT:
This prehistoric sculpture from Amaknak Island representing a human face in ivory suggests the elegance of which Unangan carvers were capable. It is in the American Museum of Natural History's Cahn collection.

BELOW:
An ivory tool to braid cords of sinew is incised and pigmented and features a puffin at the top. Collected in 1867 by George Davidson, it is in the Lowie Museum of Anthropology of the University of California at Berkeley.

BOTTOM:
Philemon Tutiakoff, for many years a carver in Unalaska, creates small abstract images of driftwood. This pendant is owned by the author's daughter.

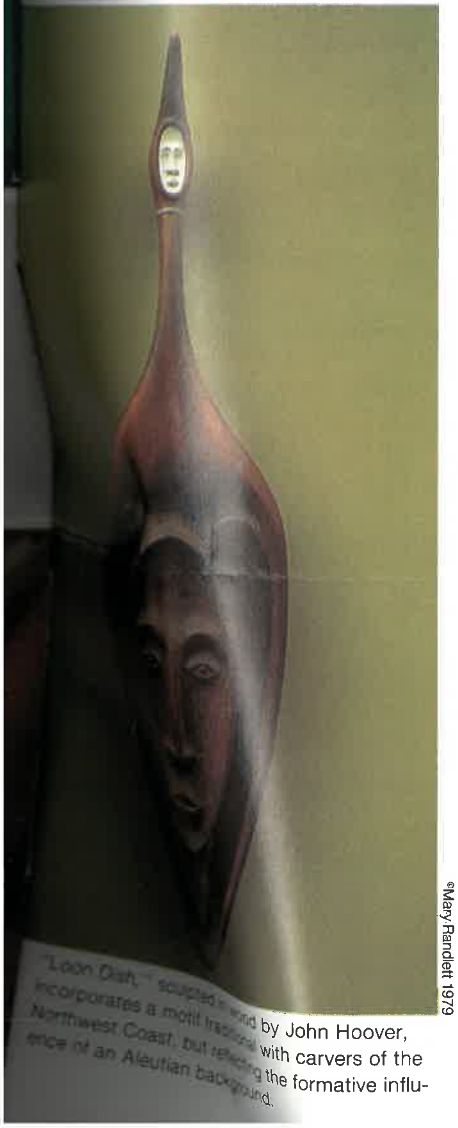


Lowie Museum of Anthropology

Providence College Audio-Visual Center

Pletnikoff, of Unalaska, created these earrings for the author. They symbolize bells.

T. E. Lux



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"Loon Dish," sculpted in wood by John Hoover, incorporates a motif traditional with carvers of the Northwest Coast, but reflecting the formative influence of an Aleutian background.

United States and Europe and borrowed designs from it for incorporation into her superb basketry.

Aleut art survives today, although in contemporary forms and media.

Perhaps the best known individual is John Hoover, whose work is widely collected by museums. Beginning as a painter, Hoover turned to sculpture later in his career. He lives and works in Seattle, but maintains his ties with the Aleut community, where he goes to visit and teach carving to Aleut youngsters. Hoover's highly abstract works reflect his personal Odyssey and professional life as molded by western education and the formative influence of Euro-American artistic traditions. Yet, he is an Aleut artist. While such motifs as the loon, the raven, or the salmon woman suggest the Northwest Coast, his stylized human faces hauntingly evoke the vanished Okvik culture of the Bering Sea, and their frequent appearance in his carvings is said to be a puzzle even to him. His palette is that of the Aleut artists of old, in which red, black, and blue predominate, and accents of yellow, green, and orange appear, just as they did on the hunting helmets and appliqued embroidery.

Another well-known Aleut artist is Fred Anderson, who, like Hoover, earns his living as a fisherman. He lives in Anchorage. Studying ancient Aleut art, Anderson has sought to rebuild his ties to his heritage. The art and symbolic meanings of masks first captured his imagination; more recently, his interest has turned to the bentwood headgear and the complex designs carried out by their makers. As a carver and sculptor, Anderson expresses the Native tradition with contemporary vision.

This interest is shared by an older woodcarver, Anatoly Lekanof, Jr., of St. George Island. Lekanof works in wood, often creating miniatures such as snuffboxes or spoons, each decorated in relief with sea-animal shapes that follow the Aleut tradition closely.

Philemon Tutiakoff of Unalaska carves exclusively in wood, with driftwood preferred. His work is small-scale, finely detailed, and ranges from such objects as letter knives and bud vases to trinket boxes and elegant sea-mammal sculptures. The figures may be natural or totally abstract; often, an abstract figure suggests different animal shapes when viewed from various angles.

Remarkable is the work of Gertrude dren, she turned to sculpting but recently. She works, like Tutiakoff, with the materials offered by the sea. But her favorite is whalebone. She has carved striking masks in this material as well as sculptures in the round.

Sergie Sovoroff, of Umnak, Vasili Tcheripanov, of Akutan, and several other elders in the outlying villages continue to carve miniature models of traditional Aleut objects.

Younger Aleuts, introduced to modern media through schools, have begun to produce work with contemporary materials, but with an Aleut thematic content. Best known is the work of Michael Dirks, of Atka, who employs the medium of the woodcut.

Clearly, Aleut art and Aleut culture are alive and well. To be sure, modern Aleut artists create work that is different from that of past ages. But it is no less a statement of Aleutian life and times. To house it, there will soon be an Aleutian museum. A historic building, the Bishop's House, in Unalaska, is being carefully restored. The center is expected to house the work of contemporary Aleutian artists. But of equal importance, it will become the home for an important collection of Aleutian art and artifacts. The University of Michigan, at Ann Arbor, and the city of Grand Rapids, have returned to the Aleuts an archaeological collection assembled under the direction of the late T. P. Bank II. A grant of $10,000 from Exxon Company, U.S.A. covered the cost of crating the collection, shipping it to Alaska, and storing it at the University of Alaska in Fairbanks until the museum building is ready for it.

For the first time, young Aleut artists will be able to study the work of both their forebears and their brothers and sisters. The artistic cord will remain unbroken, as those who add to it today contribute their own strands to the rich tradition of Aleutian art.

LYDIA T. BLACK

ABOUT THE AUTHOR

Russian-born Lydia T. Black received her Ph. D. in anthropology from the University of Massachusetts and now holds the post of associate professor of anthropology at Providence College in Rhode Island. She is an authority on the Aleut peoples and their art. Dr. Black's book, "Aleut Art," may be purchased from the publisher, the Aleutian/Pribilof Islands

Your questions answered on:

Service station operations

Recently, consumers in eight cities met with Exxon managers to exchange information. Exxon executives explained the company's marketing practices and policies. Consumers responded with their views and questions. Afterward, those who attended said they found the exchange informative and helpful. "Why don't you share these answers with others?" they asked. So, Exxon decided to do just that. In this issue, EXXON USA reports questions and answers on the subject of service station operations. In later issues, EXXON USA will report on other areas of interest to consumers.

The Editor

How are Exxon service stations operated and supplied with products?

The two most commonplace are these: Some dealers have supply agreements with Exxon providing for regular delivery of products to their stations directly from Exxon's facilities. Other dealers buy products from distributors (also known as "jobbers" or "resellers"), who purchase supplies from Exxon at the wholesale level, then resell them to the dealers.

How many stations does Exxon operate with its own personnel? How many stations are operated by dealers?

Of the nearly 20,000 stations selling Exxon products at the end of 1982, about 570 — less than 3 percent — were managed and staffed by Exxon employees. These are called "company-operated stores." The remaining outlets were operated by dealers; 7,272 were supplied directly by Exxon, and 12,014 by distributors.

How much control does Exxon have over individual service stations?

With the exception of company-operated stores, very little. Service station dealers are independent merchants operating their own businesses, even though the properties they operate may be owned by Exxon. They are free to buy and sell products made by Exxon and others and to furnish whatever services they choose, subject only to their contractual obligations and federal and state laws and regulations affecting the marketing of petroleum products. Dealers are free to hire their own employees, set their own prices, and determine their own operating practices. Exxon's role with dealers is principally that of a motor fuel supplier (possibly one of several suppliers of products and merchandise) and a business counselor. If Exxon owns the station and leases it to the dealer, it also has the rights of a landlord.

Does Exxon monitor all stations selling Exxon gasoline for courtesy and cleanliness?

Exxon and successful Exxon dealers know that courtesy and cleanliness are essential to attracting customers and giving them a reason to come back. Exxon's field sales representatives continually counsel dealers on these and other areas of their business in an effort to help them improve the efficiency and profitability of their operations. Exxon recently launched a nationwide program to help and encourage dealers to upgrade their operations and enhance the Exxon image in the branded retail business. The program, called "Commitment to Excellence," stresses the basics of good business, basics which are fundamental to success in today's highly competitive marketplace.

Is Exxon able to exert any discipline over service station dealers? What about cheating, petty thievery, etc.?

No arbitrary, unilateral authority exists for Exxon to "discipline" dealers; however, if a dealer's performance has been unsatisfactory, Exxon may exercise its right not to renew a dealer contract at the expiration of its term. Specific grounds for termination or nonrenewal of a lease by any supplier are set out in the Petroleum Marketing Practices Act, a federal law enacted in 1978. Examples of these grounds are: fraud or criminal miscon-

NATURAL HIST 8/80

The Piltdown Conspiracy

A famous priest apparently was involved in the most spectacular scientific fraud of this century

by Stephen Jay Gould

Introduction and Background

Of Conspiracies

In his great aria "La calunnia," Don Basilio, the music master of Rossini's *Barber of Seville*, graphically describes how evil whispers grow, with appropriate watering, into truly grand and injurious calumnies. For the less conniving among us, the same lesson may be read with opposite intent: in adversity, try to contain. The desire to pin evil deeds upon a single soul acting alone reflects this strategy; conspiracy theories have a terrible tendency to ramify like Basilio's whispers until the runaway solution to "whodunit" becomes "everybodydunit." But conspiracies do occur. Even the pros and pols now doubt that Lee Harvey Oswald acted alone; and everybody did do it on the Orient Express.

The Piltdown case, surely the most famous and spectacular fraud of twentieth-century science, has experienced this tension ever since its exposé in 1953. The semiofficial, contained version holds that Charles Dawson, the lawyer and amateur archeologist who "found" the first specimens, devised and executed the entire plot himself. Since J.S. Weiner's elegant case virtually precludes Dawson's innocence (*The Piltdown Forgery*, Oxford University Press, 1955), conspiracies become the only reasonable refuge for challengers. And proposals for coconspirators abound, ranging from the great anatomist Grafton Elliot Smith to W.J. Sollas, professor of geology at Oxford. I regard these claims as farfetched and devoid of reasonable evidence. But I do believe that a conspiracy existed at Piltdown and that, for once, the most interesting hypothesis is actually true. I believe that a man who later became one of the world's most famous theologians, a cult figure for many years after his death in 1955, knew what Dawson was doing and probably helped in no small way—the French Jesuit priest and paleontologist Pierre Teilhard de Chardin.

Teilhard and Piltdown

Teilhard, born in Auvergne (central France) in 1881, belonged to an old, conservative, and prosperous family. Entering the Society of Jesus in 1902, he studied on the English island of Jersey from 1902 to 1905 and then spent three years as a teacher of physics and chemistry at a Jesuit school in Cairo. In 1908, he returned to finish his theological training at the Jesuit seminary of Ore Place in Hastings, providentially located right next to Piltdown on England's southeast coast. Here he stayed for four years, and here he was ordained a priest in 1912. As a theological student, Teilhard was talented enough, but lackadaisical. His passion at Hastings was, as it always had been, natural history. He scoured the countryside for butterflies, birds, and fossils. And, in 1909, he met Charles Dawson at the focus of their common interests—in a stone quarry, hunting for fossils. The two men became good friends and colleagues in pursuit of their interest. Teilhard described Dawson to his parents as "my correspondent in geology."

Dawson claimed that he had recovered the first fragment of Piltdown's skull in 1908, after workmen at a gravel pit told him of a "coconut" (the entire skull) they had unearthed and smashed at the site. Dawson kept poking about, collecting a few more skull pieces and some fragments of other fossil mammals. He did not bring his specimens to Arthur Smith Woodward, keeper of paleontology at the British Museum, until the middle of 1912. Thus, for three years before any professional ever heard of the Piltdown material, Dawson and Teilhard were companions in natural history in the environs of Piltdown.

Smith Woodward was not a secretive man, but he knew the value of what Dawson had brought and the envy it might inspire. He clamped a tight lid upon Dawson's information prior to its publication. He wanted none of Dawson's lay friends at the site, and only one naturalist accompanied Dawson and Smith Woodward in their first joint excavations at Piltdown—Teilhard de Chardin, whom Dawson had described as "quite safe." More specimens came to light during 1912, including the famous jaw with its two molar teeth, artificially filed to simulate human patterns of wear. In December, Smith Woodward published and the controversy began.

The skull fragments, although remarkably thick, could not be distinguished from those of modern humans. The jaw, on the other hand, except for the wear of its teeth, loudly said "chimpanzee" to many experts (in fact, it once belonged to an orangutan). No one smelled fraud, but many professionals felt that parts of two

tematically through time-lapse photography and other kinds of film research, note taking, and hours of observation. Just how city outdoor spaces work or fail to work is described in his book *The Social Life of Small Urban Spaces*, from which this article has been adapted. Mr. Whyte, a former editor of *Fortune* magazine, is the author of *The Organization Man* and *The Last Landscape.*

vey in Reston, Virginia. Research on the cause of earthquakes has taken him on field trips to New Zealand, southern California, Nevada, and Kenya. Projected research projects involve investigating the relation of earthquakes to the deep structure of the earth's crust.

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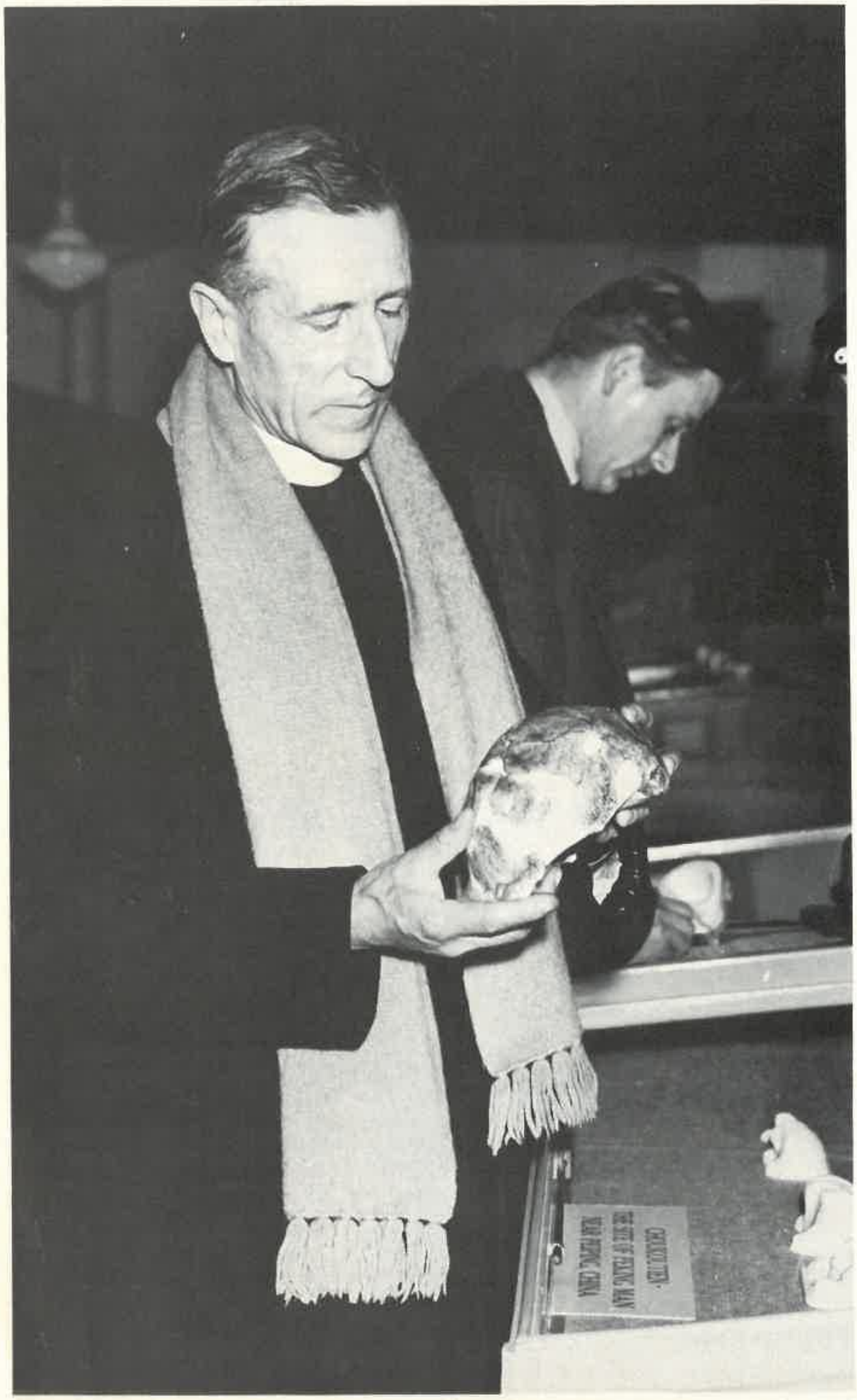
creatures had been mixed together at the Piltdown site. Smith Woodward stoutly defended the integrity of his creature, arguing, with flawed logic, that the crucial role of brain power in our mastery of the earth today implies a precocious role for large brains in evolutionary history as well. A fully vaulted skull still attached to an apish jaw vindicated such a brain-centered view of human evolution.

Teilhard left England late in 1912 to begin his graduate studies with Marcellin Boule, the greatest physical anthropologist of France. But in August 1913, he was back in England for a retreat at Ore Place. He also spent several days prospecting with Dawson and on August 30 made a major discovery himself—a canine tooth of the lower jaw, apish in appearance but worn in a human fashion. Smith Woodward continued his series of publications on the new material, but critics persisted in their belief that Piltdown man represented two animals improperly united.

The impasse broke in Smith Woodward's favor in 1915. Dawson had been prospecting at another site, two miles from Piltdown, for several years. He probably took Teilhard there in 1913; we know that he searched the area several times with Smith Woodward in 1914. Then, in January 1915, he wrote to Smith Woodward. The second site, later called Piltdown 2, had yielded its reward: "I believe we are in luck again. I have got a fragment of the left side [it was actually the right] of a frontal bone with a portion of the orbit and root of nose." In July of the same year, he announced the discovery of a lower molar; again, apish in appearance but worn in a human fashion. The bones of a human and an ape might wash into the same gravel pit once, but the second, identical association of vaulted skull and apish jaw surely proved the integrity of a single bearer, despite the apparent anatomical incongruity. H.F. Osborn, America's leading paleontologist and critic of the first Piltdown find, announced a conversion in his usual grandiloquent fashion. Even Teilhard's teacher Marcellin Boule, leader of the doubters, grumbled that the new finds had tipped the balance, albeit slightly, in Smith Woodward's favor. Dawson did not live to enjoy his triumph, for he died in 1916. Smith Woodward stoutly supported Piltdown for the rest of his long life, devoting his last book (*The Earliest Englishman*, 1948) to its defense. He died, mercifully, before his bubble burst.

Meanwhile, Teilhard pursued his calling with mounting fame, frustration, and exhilaration. He served with distinction as a stretcher bearer in World War I and then became professor of geology at the Institut Catholique of Paris. But his unorthodox (although always pious) thinking soon led him into irrevocable conflict with ecclesiastical authority. Ordered to abandon his teaching post and to leave France, Teilhard departed for China in 1926. There he remained for most of his life, pursuing distinguished research in geology and paleontology and writing the philosophical treatises on cosmic history and the reconciliation of science with religion that later made him so famous. (They all remained unpublished, by ecclesiastical fiat, until his death.) Teilhard died in 1955, but his passing only marked



Teilhard de Chardin with skull of Peking man.

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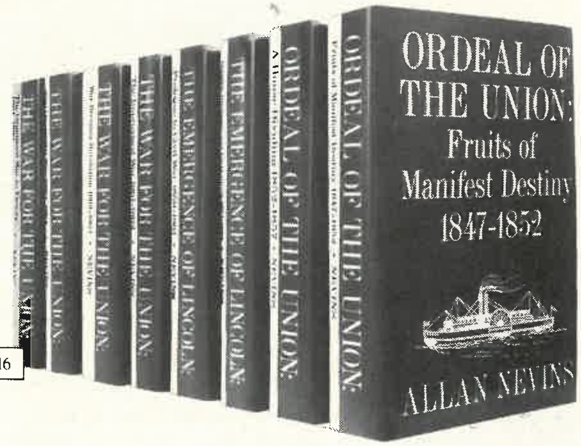

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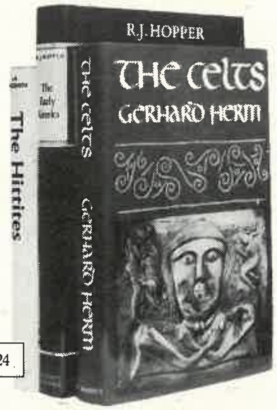

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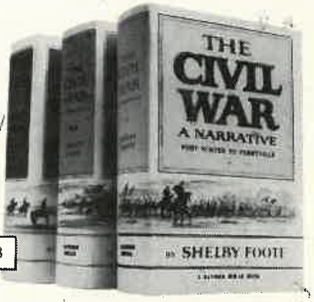

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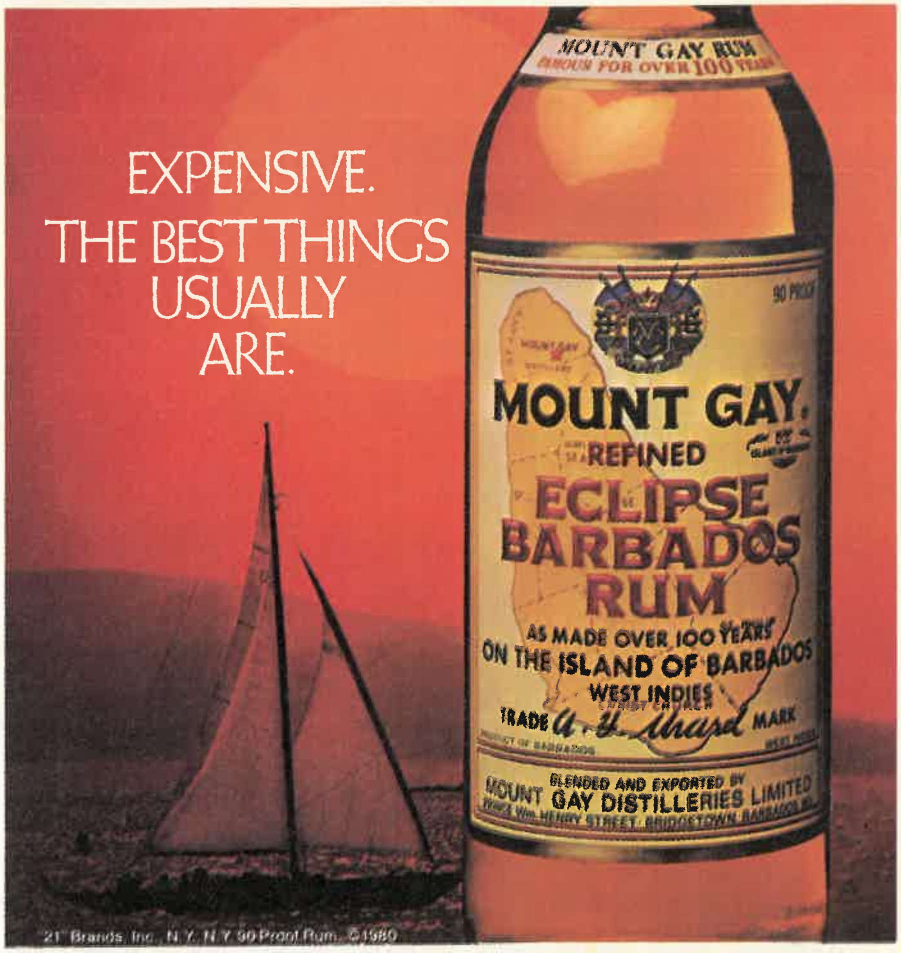
inning of his meteoric rise to His treatises, long suppressed, published and quickly translated all major languages. *The Phenom- n of Man* became a best seller roughout the world. Harvard's Wid- ner Library now houses an entire tier of books devoted to Teilhard's writing and thinking. Two journals that were established to discuss his ideas still flourish.

Of the original trio—Dawson, Teilhard, and Smith Woodward—only Teilhard was still living when Kenneth Oakley, J.S. Weiner, and W.E. le Gros Clark proved that the Piltdown bones had been chemically stained to mimic great age, the teeth artificially filed to simulate human wear, the associated mammal remains all brought in from elsewhere, and the flint "implements" recently carved. The critics had been right all along, more right than they had dared to imagine. The skull bones did belong to a modern human, the jaw to an orangutan. As the shock of revelation gave way to the fascination of whodunit, suspicion quickly passed from two members of the trio. Smith Woodward had been too dedicated and too gullible; moreover, he knew nothing of the site before Dawson brought him the original bones in 1912. (I have no doubt whatsoever of Smith Woodward's total innocence.) Teilhard was too famous and too present for any but the most discreet probing. He was dismissed as a naïve, young student who, forty years before, had been duped and used by the crafty Dawson. Dawson acting alone became the official theory; professional science was embarrassed, but absolved.

Doubts

I was just the right age for primal fascination—twelve years old—and a budding paleontologist when news of the fraud appeared on page one of the *New York Times* one morning at breakfast. My interest has never abated, and I have, over the years, asked many senior paleontologists about Piltdown. I have also remarked, both with amusement and wonder, that very few believed the official tale of Dawson acting alone. I noted, in particular, that several of the men I most admire suspected Teilhard, not so much on the basis of hard evidence (for their suspicions rested on what I regard as a weak point among the arguments), but from an intuitive feeling about this man whom they knew well,



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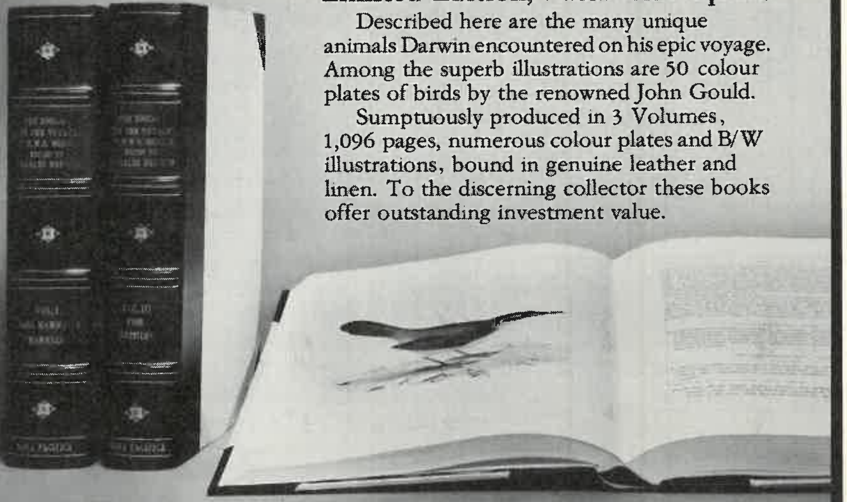

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Pierre Teilhard de Chardin and Lucien Cuénot examine fossils from the Far East.

loved, and respected, but who seemed to hide passion, mystery, and good humor behind a garb of piety. A.S. Romer and Bryan Patterson, two of America's leading vertebrate paleontologists and my former colleagues at Harvard, often voiced their suspicions to me. Louis Leakey voiced them in print, without naming the name, but with no ambiguity for anyone in the know (see his autobiography, *By the Evidence*).

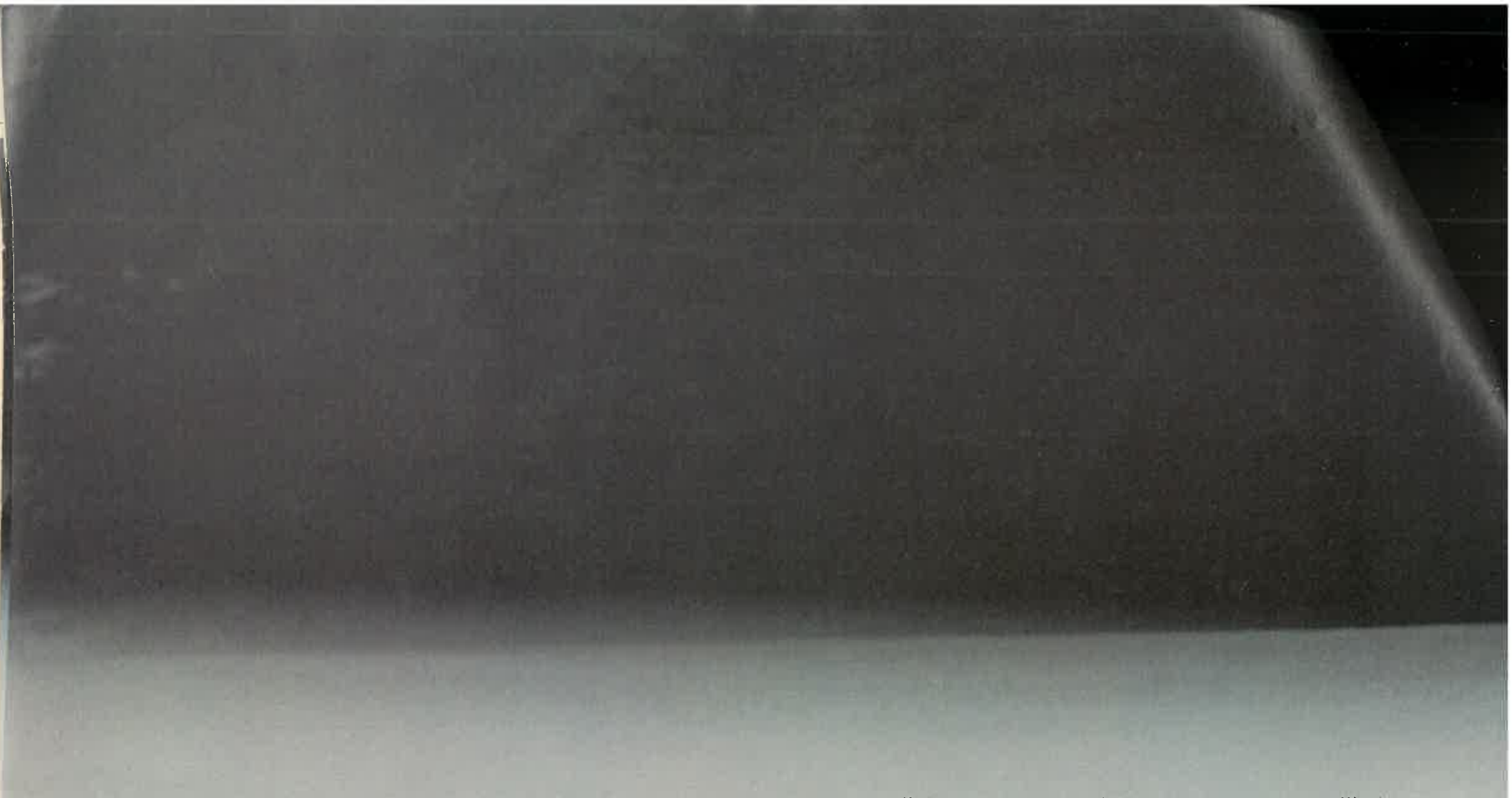
I finally decided to get off my butt and probe a bit after I wrote a column on Piltdown for other reasons (*Natural History*, March 1979). I read all the official documents and concluded that nothing excluded Teilhard, although nothing beyond his presence at Piltdown from the start particularly implicated him either. I intended to drop the subject or to pass it along to someone with a greater zeal for investigative reporting. But at a conference in France last September, I happened to meet two of Teilhard's closest colleagues, the leading paleontologist J. Piveteau and the great zoologist P.P. Grassé. They greeted my suspicions with a blustering "*incroyable*." Then Père François Russo, Teilhard's friend and fellow Jesuit, heard of my inquiries and promised to send me a document that would prove Teilhard's innocence—a copy of the letter that Teilhard had written to Kenneth Oakley on November 28, 1953. I received this letter in printed French translation (Teilhard wrote it in English) in October 1979 and realized immediately that it contained an inconsistency (a slip on Teilhard's part) most easily resolved by the hypothesis of Teilhard's complicity. When I visited Oakley at Oxford in April 1980, he showed me the original letter along with several others that Teilhard had written to him. We studied the documents and discussed Piltdown for the better part of a day, and I left convinced that Romer, Patterson, and Leakey had been right. Oakley, who had noted the inconsistency but interpreted it differently, agreed with me and stated as we parted: "I think it's right that Teilhard was in it." (Let me here express my deep appreciation for Dr. Oakley's hospitality, his openness, and his simple, seemingly inexhaustible kindness and helpfulness. I always feel so exhilarated when I discover—and it is not so rare as many people imagine—that a great thinker is also an exemplary human being.) Since then, I have sharpened the basic arguments and read through Teilhard's published work, finding a pattern that seems hard to reconcile with his innocence. My case is, to be sure, circumstantial (as is the case against Dawson or anyone else), but I believe that the burden of proof must now rest with those who would hold Father Teilhard blameless.

The Case Against Teilhard

The Letters to Kenneth Oakley

The main virtue of truth, quite apart from its ethical value (which I hold to be considerable), is that it represents an infallible guide for keeping your story straight. The problem with prevarication is that, when the going gets complex or the recollection misty, it becomes very difficult to remember all the details of your invented scheme. Richard Nixon finally succumbed on a minor matter, and Sir Walter Scott spoke truly when he wrote the famous couplet: "Oh, what a tangled web we weave,/When first we practice to deceive!"

Teilhard made just such a significant slip on a minor point in his letter to Oakley. Teilhard offered no spon-



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taneous recollections about Piltdown and responded only to Oakley's direct inquiries for help in establishing the forger's identity. He begins by congratulating Oakley "most sincerely on your solution of the Piltdown problem. Anatomically speaking, *'Eoanthropus'* [Smith Woodward's name for the Piltdown animal] was a kind of monster. . . . Therefore I am fundamentally pleased by your conclusions, in spite of the fact that, sentimentally speaking, it spoils one of my brightest and earliest paleontological memories."

Teilhard then stonewalls on the question of fraud. He refuses to believe it at all, declaring that Smith Woodward and Dawson (and, by implication, himself) were not the kind of men who could conceivably do such a thing. Is it not possible, he asks, that some collector discarded the ape bones on a gravel pit that legitimately contained a human skull, the product of a recent interment. Could not the iron staining have been natural, since the local water "can stain (with iron) at a remarkable speed." But Teilhard's notion can explain neither the artificial filing of the teeth to simulate human wear nor the crucial discovery of a second combination of ape and human at the Piltdown 2 site. In fact, Teilhard admits: "The idea sounds fantastic. But, in my opinion, no more fantastic than to make Dawson the perpetrator of a hoax."

Teilhard then goes on to discuss Piltdown 2 and, in trying to exonerate Dawson, makes his fatal error. He writes:

> He Dawson just brought me to the site of Locality 2 and explained me [*sic*] that he had found the isolated molar and the small pieces of skull in the heaps of rubble and pebbles raked at the surface of the field.

But this cannot be. Teilhard did visit the second site with Dawson in 1913, but they did not find anything. Dawson "discovered" the skull bones at Piltdown 2 in January 1915, and the tooth not until July 1915. And now, the key point: Teilhard was mustered into the French army in December 1914 and was shipped immediately to the front, where he remained until the war ended. He could not have seen the remains of Piltdown 2 with Dawson, unless they had manufactured them together before he left (Dawson died in 1916).

Oakley caught the inconsistency im-

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mediately when he received Teilhard's letter in 1953, but he read it differently and for good reason. At that time, Oakley and his colleagues were just beginning their explorations into whodunit. They rightly suspected Dawson and had written to Teilhard to gather evidence. Oakley read Teilhard's statement when he was simply trying to establish the basic fact of Dawson's guilt. In that context, he assumed that Dawson had shown the specimens to Teilhard in 1913, but had withheld them from Smith Woodward until 1915—more evidence for Dawson's complicity.

Oakley wrote back immediately, and Teilhard, realizing that he had tripped, began to temporize. In his second letter of January 29, 1954, he tried to recoup:

> Concerning the point of "history" you ask me, my "souvenirs" are a little vague. Yet, by elimination (and since Dawson died *during* the First World War, if I am correct) my visit with Dawson to the *second* site (where the two small fragments of skull and the isolated molar were supposedly found in the rubble) must have been in late July 1913 [it was probably in early August].

Obviously troubled, he then penned the following postscript.

> When I visited the site no. 2 (in 1913?) the two small fragments of skull and tooth had already been found, I believe. But your very question makes me doubtful! Yes, I think definitely they *had* been already found: and that is the reason why Dawson pointed to me the little heaps of raked pebbles as the place of the "discovery."

In a final letter to Mable Kenward, daughter of the owner of Barkham Manor, site of the first Piltdown find, Teilhard drew back even further: "Dawson showed me the field where the second skull (fragments) were found. But, as I wrote to Oakley, I cannot remember whether it was after or before the find" (March 2, 1954).

I can devise only four interpretations for Teilhard's slip.

1. I thought initially, when I had only read the first letter, that one might interpret Teilhard's statement thus: Dawson took me to the site in 1913 and later stated in wartime correspondence that he had found the fragments in the rubble. But Teilhard's second letter states explicitly that Dawson, in the flesh, had pointed to the spot at Piltdown 2 where he had found the specimens.

2. Oakley's original hypothesis: Dawson showed the specimens to an innocent Teilhard in 1913, but withheld them from Smith Woodward until 1915. But Dawson would not blow his cover in such a crude way. For Dawson took Smith Woodward to the second site on several prospecting trips in 1914, always finding nothing. Now Teilhard and Smith Woodward were also fairly close. Dawson had introduced them in 1909 by sending to London some important mammal specimens (having nothing to do with Piltdown) that Teilhard had collected. Smith Woodward was delighted with Teilhard's work and praised him lav-

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ishly in a publication. He accepted Teilhard as the only other member of their initial collecting trips at Piltdown. Moreover, Teilhard was a house guest of the Smith Woodwards when he visited London in September 1913, following his discovery of the canine. If Dawson had shown Teilhard the Piltdown 2 finds in 1913, then led Smith Woodward extensively astray during several field trips in 1914, and if an innocent Teilhard had told Smith Woodward about the specimens (and I can't imagine why he would have held back), then Dawson would have been exposed.

3. Teilhard never did hear about the Piltdown 2 specimens from Dawson, but simply forgot forty years later that he had never actually viewed the fossils he had read about later. This is the only alternative (to Teilhard's complicity) that I view as at all plausible. Were the letters not filled with other damaging points, and the case against Teilhard not supported on other grounds, I would take this possibility more seriously.

4. Teilhard and Dawson planned the Piltdown 2 discovery before Teilhard left England. Forty years later, Teilhard misconstrued the exact chronology, forgot that he could not have seen the specimens when they were officially "found," and slipped in writing to Oakley.

Teilhard's letters to Oakley contain other curious statements, each insignificant (or subject to other interpretations) by itself, but forming in their ensemble a subtle attempt to direct suspicion away from himself.

1. In his letter of November 28, 1953, Teilhard states that he first met Dawson in 1911. In fact, they met in May 1909, for Teilhard describes the encounter in a vivid letter to his parents. Moreover, this meeting was an important event in Teilhard's career, for Dawson befriended the young priest and personally forged his path to professional notice and respect by sending some important specimens he had collected to Smith Woodward. When Smith Woodward described this material before the Geological Society of London in 1911, Dawson, in the discussion following Smith Woodward's talk, paid tribute to the "patient and skilled assistance" given to him by Teilhard since 1909. I don't regard this, in itself, as a particularly damning point. A first meeting in 1911 would still be early enough for complicity (Dawson "found" his first piece of the Piltdown skull in 1911, although he states that a workman had given him a fragment "several years before"), and I would never hold a mistake of two years against a man who tried to remember the event forty years later. Still, the later (and incorrect) date, right upon the heels of Dawson's first "find," certainly averts suspicion from Teilhard.

2. Oakley wrote again in February 1954, probing further into Dawson's first contact with the Piltdown material, wondering in particular what had happened in 1908. Teilhard simply replied (March 1, 1954): "In 1908 I did not know Dawson." True enough, but they met just a few months later, and Teilhard might have mentioned it. A small point, to be sure.

3. In the same letter, Teilhard tries further to avert suspicion by writing of his years at Hastings: "You know, at that time, I was a young student in theology—not allowed to leave much his cell of Ore Place (Hastings)." But this description of a young, pious, and restricted man stands in stark contrast with the picture that Teilhard painted of himself at the time in a remarkable series of letters to his parents (*Lettres de Hastings et de Paris 1908–1912*, Paris: Aubier, 1965). These letters speak little of theology, but they are filled with charming and detailed accounts of Teilhard's frequent wanderings all over southern England. Eleven letters refer to excursions with Dawson, and no other naturalist is mentioned so frequently. If he spent much time at Ore Place, he didn't choose to write about it. On August 13, 1910, for example, he exclaims: "I have travelled up and down the coast, to the left and right of Hastings; thanks to the cheap trains [*les cheap-trains* as he writes in French] so common at this time of year, it is easy to go far with minimal expense."

Perhaps I am now too blinded by my own attraction to the hypothesis of Teilhard's complicity. Perhaps all these points are minor and unrelated, testifying only to the faulty memory of an aging man. But they do form an undeniable pattern. Still, I would not now come forward with my case were it not for a second argument, more circumstantial to be sure, but somehow more compelling in its persistent pattern of forty years—the rec-

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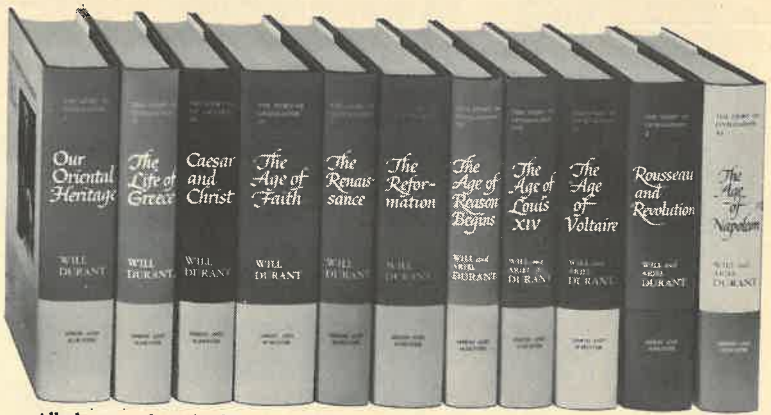

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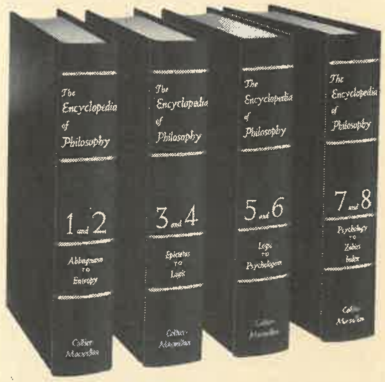

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ord of Teilhard's letters and publications.

Piltdown in Teilhard's writing

I remember a jokebook I had as a kid. The index listed "mule, sex life," but the indicated page was blank (ridiculous, in any case, for mules do not abstain just because the odd arrangement of their hybrid chromosomes debars them from bearing offspring). Teilhard's published record on Piltdown is almost equally blank. In 1920, he wrote one short article in French for a popular journal on *Le cas de l'homme de Piltdown.* After this, virtually all is silence. Piltdown never again received as much as a full sentence in all his published work (except once in a footnote). Teilhard mentioned Piltdown only when he could scarcely avoid it—in comprehensive review articles that discuss all outstanding human fossils. I can find fewer than half a dozen references in the twenty-three volumes of his complete works. In each case, Piltdown appears either as an item listed without comment in a footnote or as a point (also without comment) on a drawing of the human evolutionary tree or as a partial phrase within a sentence about Neanderthal man.*

Consider just how exceedingly curious this is. In his first letter to Oakley, Teilhard described his work at Piltdown as "one of my brightest and earliest paleontological memories." Why, then, such silence? Was Teilhard simply too diffident or saintly to toot his own trumpet? Scarcely, since no theme receives more voluminous attention, in scores of later articles, than his role in unearthing the legitimate Peking man in China.

As I began my investigation into this extraordinary silence, and trying to be as charitable as I could, I constructed two possible exonerating reasons for Teilhard's failure to discuss the major event of his paleontological youth. Kenneth Oakley then told me of the 1920 article, the only analysis of Piltdown that Teilhard ever published. I found a copy in the ten-volume edition of Teilhard's *oeuvre scientifique*, and realized that its content invalidated the only exculpatory arguments I could construct.

The first argument: Marcellin Boule, Teilhard's revered teacher, was a leading critic of Piltdown. He regarded it as a mixture of two creatures (not as a fraud), although he softened his opposition after he learned of the subsequent discovery at Piltdown 2. Perhaps Boule upbraided his young student for gullibility, and Teilhard, embarrassed to the quick, never spoke of the infernal creature, or of his role in discovering it, again.

The 1920 article invalidates such a conjecture, for in this work, Teilhard comes down squarely on the right side. He mentions that his English companions, convinced by finding the jaw so close to the skull fragments, never doubted the integrity of their fossil. Teilhard then notes, with keen insight, that experts who had not seen the specimens *in situ* would be swayed primarily by the formal anatomy of the bones themselves, and that these bones loudly proclaimed: human skull, ape's jaw. Which emphasis, then, shall prevail, geology or anatomy? Although he had witnessed the geology, Teilhard opted for anatomy:

> In order to admit such a combination of forms [a human skull and an ape's jaw in the same creature], it is necessary that we be forced to such a conclusion. Now this is not the case here. . . . The reasonable attitude is to grant primacy to the intrinsic morphological probability over the extrinsic probability of geological conditions. . . . We must suppose that the Piltdown skull and jaw belong to two different subjects.

Teilhard called it once, and he called it right. He had no reason to be embarrassed.

The second argument: Perhaps Teilhard had reveled in his role at Piltdown, cherished the memory, but simply found that the man he had helped to unearth could offer no support for, or even contact with, the concerns of his later career. On a broad level, this argument is implausible, if only because Teilhard wrote several general reviews about human fossils; however controversial or dubious, Piltdown should have been discussed. Even the leading doubters never failed to air their suspicions. Boule wrote chapters about Piltdown. Teilhard listed it without comment a few times and only when he had no choice.

In a more specific area, Teilhard's silence about Piltdown becomes inexplicable to the point of perversity (unless guilt and knowledge of fraud engendered it)—for Piltdown provided the best available support that fossils could provide for the most important argument of Teilhard's cosmic and mystical views about evolution, the dominant theme of his career and the source of his later fame. Teilhard never availed himself of his own best weapon, partly provided by his own hand.

The conclusion that skull and jaw belonged to different creatures did not destroy the scientific value of Piltdown, provided that both animals legitimately lay in the strata that supposedly entombed them. For these

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*Teilhard's complete works are spread over two editions—a thirteen-volume edited compendium of his general articles (Paris: Editions de Seuil), and a more extensive ten-volume facsimile reprint of his professional publications (Olten: Walter-Verlag). To my annoyance, I discovered that the Paris edition has expurgated all Piltdown references without so stating and without even inserting ellipses. In trying to spiff up Teilhard's record, they have made him appear even more culpable by accentuating the impression of guilty silence. I therefore consulted likely originals whenever I could find them. One expurgation is particularly infuriating in its downright misrepresentation. A posthumous volume of essays, *Le Coeur de la matière* ("The heart of matter," Seuil, 1976), reprints Teilhard's application for the chair of paleontology at the Collège de France in 1948 (ecclesiastical authority did not permit him to accept). In this autobiographical essay, Teilhard discusses his role in human paleontology: "My first stroke of good luck in this area of ancient human paleontology came in 1923 when I was able to establish, with Emile Licent, the existence, hitherto contested, of paleolithic man in Northern China." If Teilhard had thus truly suppressed Piltdown in presenting himself for review, what but complicity could we infer? By sheer good fortune, I found a copy of this unpublished, mimeographed document in the reprint collection of my late colleague A.S. Romer. It reads: "My first stroke of good luck in this area of ancient human paleontology was to be included, when still young, in the excavation of *Eoanthropus dawsoni* in England. The second was, in 1923, to be able to establish, with Emile Licent. . . ." I doubt that half a dozen copies of the unpublished original exist in America, and I might easily have been led from the published and doctored version to an even stronger indication of Teilhard's complicity based on his silence. (It has, of course, occurred to me that the pattern of silence I detect in Teilhard's writing might represent more his editor's posthumous expurgation than Teilhard's own preference. Yet the completely honest ten-volume facsimile edition contains more than enough material to establish the pattern, and I have checked enough original versions of potentially expurgated texts to be confident that references to Piltdown are fleeting and exceedingly sparse throughout Teilhard's writing.)

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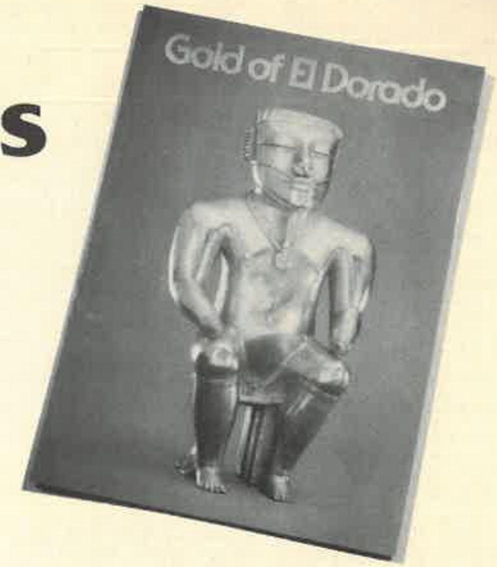

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(Make checks payable to American Museum of Natural History) were older than any housing erthal man, Europe's major to anthropological fame. Nean- hal, although now generally con- ered as a race of our species, was low-vaulted, beetle-browed fellow of decidedly "primitive" cast. Piltdown, despite the thickness of its skull bones, looked more modern in its globular vault. The assignment of the jaw to a fossil ape further enhanced the skull's advanced status. Humans of modern aspect must have lived in England even before Neanderthal man evolved on the continent. Neanderthal, therefore, cannot be an ancestral form; it must represent a side branch of the human tree. Human evolution is not a ladder but a series of lineages evolving along separate paths.

In the 1920 article, Teilhard presented the Piltdown skull, divorced from its jaw, in just that light—as proof that hominids evolved as a bundle of lineages moving in similar directions. He wrote:

> Above all, it is henceforth proved that even at this time [of Piltdown] a race of men existed, already included in our present human line, and very different from those that would become Neanderthal.... Thanks to the discovery of Mr. Dawson, the human race appears to us even more distinctly, in these ancient times, as formed of strongly differentiated bundles, already quite far from their point of divergence. For anyone who has an idea of paleontological realities, this light, tenuous as it appears, illuminates great depths.

To what profundity, then, did Teilhard refer Piltdown as evidence? Teilhard believed that evolution moved in an intrinsic direction representing the increasing domination of spirit over matter. Under the thrall of matter, lineages would diverge to become more unlike, but all would move upward in the same general direction. With man, evolution reached its crux. Spirit had begun its domination over matter, adding a new layer of thought—the noosphere—above the older biosphere. Divergence would be stemmed; indeed, convergence had already begun in the process of human socialization. Convergence will continue as spirit prevails. When the last vestiges of matter have been discarded, spirit will involute upon itself at a single point called Omega and identified with God—the mystical evolutionary apocalypse that secured Teilhard's fame.

But convergence is a thing of the future. Scientists seeking evidence for such a scheme must look to the past for twin signs of divergence accompanied by similar upward direction—in other words, for *multiple, parallel lineages* within larger groups.

I have read all of Teilhard's papers from the early 1920s. No theme receives more emphasis than the search for multiple, parallel lineages. In an article on fossil tarsiers, written in 1921, he argues that three separate primate lineages extend back to the dawn of the age of mammals, each evolving in the same direction of larger brains and smaller faces. In a review published in 1922 of Marcellin Boule's *Les Hommes fossiles*, Teilhard writes: "Evolution is no more to be represented in a few simple strokes for us than for other living things; but it resolves itself into innumerable lines which diverge at such length that they appear parallel." In a general essay on evolution, printed in 1921, he speaks continually of oriented evolution in multiple, parallel lines within mammals.

But where was Piltdown in this extended paean of praise for multiple, parallel lineages? Piltdown provided proof, the only available proof, of multiple, parallel lineages within human evolution itself—for its skull belonged to an advanced human older than primitive Neanderthal. Piltdown was the most sublime argument that Teilhard possessed, and he never breathed it again after the 1920 article.

These two arguments have been abstract. A third feature of the 1920 article is stunning in its directness. For I believe that Teilhard fleetingly tried to tell his colleagues, too subtly perhaps, that Piltdown was a phony. In discussing whether the Piltdown remains represent one or two animals, Teilhard laments that the direct and infallible test cannot be applied. One skull fragment contained a perfect glenoid fossa, the point of articulation for the upper jaw upon the lower. Yet the corresponding point of the lower jaw, the condyle, was missing on a specimen otherwise beautifully preserved at its posterior end. Teilhard writes: "Since the glenoid fossa exists in perfect state on the temporal bone, we could simply have tried to articulate the pieces, *if the mandible had preserved its condyle:* we could have learned, without possible doubt, if the two fit together." I read this statement in a drowsy state one morning at two o'clock, but the next line—set off by Teilhard as a paragraph in itself terminated by an exclamation point—destroyed any immediate thought of sleep: "As if on purpose [*comme par exprès*], the condyle is missing!"

"Comme par exprès." I couldn't get those words out of my mind for two days. Yes, it could be a literary line, a permissible metaphor for emphasis. But I think that Teilhard was trying to tell us something he didn't dare reveal directly.

Other Arguments

1. Teilhard's embarrassment at Oakley's disclosure. Kenneth Oakley told me that, although he had not implicated Teilhard in his thoughts, one aspect of Teilhard's reaction had always puzzled him. All other scientists, including those who had cause for the most profound embarrassment (like the aged Sir Arthur Keith, who had used Piltdown for forty years as the bedrock of his thought), expressed keen interest amidst their chagrin. They all congratulated Oakley spontaneously and thanked him for resolving an issue that had always been puzzling, even though the solution hurt so deeply. Teilhard said nothing. His congratulations arrived only when they could not be avoided–in the preface to a letter responding to Oakley's direct inquiries. When Teilhard visited London, Oakley tried to discuss Piltdown, but Teilhard always changed the subject. He took Teilhard to a special exhibit at the British Museum illustrating how the hoax had been uncovered. Teilhard glumly walked through as fast as he could, eyes averted, saying nothing. (A.S. Romer told me several years ago that he also tried to conduct Teilhard through the same exhibit, and with the same strange reaction.) Finally, Teilhard's secretary took Oakley aside and explained that Piltdown ws a sensitive subject with Father Teilhard.

But why? If he had been gulled by Dawson at the site, he had certainly recouped his pride. Smith Woodward had devoted his life to Dawson's concoction. Teilhard had written about it but once, called it as correctly as he could, and then shut up. Why be so embarrassed? Unless, of course, the embarrassment arose from guilt about another aspect of his silence—his inability to come clean while he watched men he loved and respected make fools of themselves, partly on his account. Marcellin Boule, his beloved master, for example, correctly called Smith

Woodward's *Eoanthropus* "an artificial and composite being" in the first edition of *Les Hommes fossiles* (1921). The skull, he said, could belong to *"un bourgeois de Londres"*; the jaw belonged to an ape. But he pondered the significance of Piltdown 2 and changed his mind in the second edition of 1923: "In the light of these new facts, I cannot be as sure as I was before. I recognize that the balance has now tipped a bit in the direction of Smith Woodward's hypothesis—and I am happy for this scientist whose knowledge and character I esteem equally." How did Teilhard feel as he watched his beloved master, Boule, falling into the abyss—when he contained tools for extraction that he could not use.

2. The elephant and the hippo. Bits and pieces of other fossil mammals were salted into the Piltdown gravels in order to set a geologic matrix for the human finds. All but two of these items could have been collected in England. But the hippo teeth, belonging to a distinctive dwarfed species, probably came from the Mediterranean island of Malta. The elephant tooth almost surely came from a distinctive spot at Ichkeul, Tunisia, for it is highly radioactive as a result of seepage from surrounding sediments rich in uranium oxide. This elephant species has been found in several other areas, but nowhere else in such highly radioactive sediments. Moreover, the Ichkeul site was only discovered by professionals in 1947; the doctored specimen at Piltdown could not have come from a cataloged museum collection.

Teilhard taught physics and chemistry at a Jesuit school in Cairo from 1905 to 1908, just before coming to Piltdown. His volume of *Letters from Egypt* again records little about theology and teaching, but much about travel, natural history, and collecting. He did not call at Tunisia or Malta on his passage down, but I can find no record of his passage back, and the two areas are right on his route from Cairo to France. In any case, Teilhard's letters from Cairo abound in tales of swapping and exchange with other natural historians of several North African nations. He was plugged into an amateur network of information and barter and might have received the teeth from a colleague.

This argument formed the base of evidence among my senior colleagues who suspected Teilhard—A.S. Romer, Bryan Patterson, and Louis Leakey (Leakey also mentioned Teilhard's knowledge of chemistry and the clever staining of the Piltdown bones). According to hearsay, le Gros Clark himself, a member of the trio that exposed the hoax, also suspected Teilhard on this basis. I regard this argument as suggestive, but not compelling. Dawson too was plugged into a network of amateur exchange.

3. Teilhard's good luck at Piltdown. Although records are frustratingly vague, I believe that all the Piltdown pieces were found by the original trio—Dawson, Smith Woodward, and Teilhard. (In the official version, a workman may have given Dawson the first piece in 1908.) Dawson, of course, unearthed most of the material himself. Smith Woodward, so far as I can tell, found only one cranial fragment. Teilhard, who spent less time at Piltdown than his two colleagues, was blessed. He found a fragment of the elephant tooth, a worked flint, and the famous canine.

People who have never collected in the field probably do not realize how difficult and chancy the operation is when fossils are sparse. There is no magic to it, just hard work. A tooth in a gravel pit is about as conspicuous as the proverbial needle in a haystack. The hoaxer worked hard on his Piltdown material. He filed the canine and painted it to simulate age. Apes' teeth are not easy to come by. If I had but one precious item, I would not stick it into a large gravel heap and then hope that some innocent companion would find it. It would probably be lost forever, not triumphantly recovered. I doubt that I would ever find it again myself, after someone else had mucked about extensively in the pile.

Teilhard described his discovery in the first letter to Oakley: "When I found the canine, it was so inconspicuous amidst the gravels which had been spread on the ground for sifting that it seems to me quite unlikely that the tooth could have been planted. I can even remember Sir Arthur congratulating me on the sharpness of my eyesight." Smith Woodward's recollection (from his last book of 1948) is more graphic:

> We were excavating a rather deep and hot trench in which Father Teilhard, in black clothing, was especially energetic; and, as we thought he seemed exhausted, we suggested that he leave us to do the hard labor for a while he had comparative rest in searc the rain-washed spread gravel. Very so he exclaimed that he had picked up th missing canine tooth, but we wefe incredulous, and told him we had already seen several bits of ironstone, which looked like teeth, on the spot where he stood. He insisted, however, that he was not deceived, so we both left our digging to go and verify his discovery. There could be no doubt about it, and we all spent the rest of that day until dusk crawling over the gravel in the vain quest for more.

I also have some doubt about Teilhard's flint, for it is the only Piltdown item indubitably found *in situ*. All the other specimens either came from gravel heaps that had been dug up and spread upon the ground or cannot be surely traced. Now *in situ* can signify one of two things (and the records do not permit a distinction). It may mean that the gravel bed lay exposed in a ditch, cliff, or road cut—in which case, anyone might have stuck the flint in. But it may mean that Teilhard dug into the layer from undisturbed, overlying ground—in which case, he could only have planted the flint himself.

Again, I regard this argument only as suggestive, not as definitive. It is the weakest point of all, hence its place at the botton of my list. Perhaps Teilhard was simply a particularly keen observer.

Conclusions

What shall we make of all this? I can only imagine three conclusions. First, perhaps Piltdown has simply deluded another gullible victim, this time myself. Maybe I have just encountered an incredible string of coincidences. Could all the slips in the letters have been innocent errors of an aging man; the *comme par exprès* merely a literary device; the failure to use his best argument a simple oversight; his conspicuous silence beyond a few fleeting and unavoidable mentions only an aspect of a complex personality that no one has fathomed; his profound embarrassment just another facet of the same personality; the elephant and hippo Dawson's property . . . ? I just can't believe it. Coincidences recede into improbability as more and more independent items coagulate to form a pattern. The mark of any good theory is that it makes coordinated sense of a string of observations otherwise independent and nexplicable. Let us then assume that Teilhard knew Piltdown was a hoax, at least from 1920.

We are left with two possibilities. Was Teilhard innocent in the field at Piltdown? Did he tumble to the hoax later (perhaps when he deciphered the inconsistencies in Piltdown 2)? Did he then maintain silence out of loyalty to Dawson who had befriended him or because he didn't wish to stir a hornet's nest when he was not completely sure? But why, then, did he try so hard to exonerate Dawson in the letters to Oakley? For Dawson had used him and played on his youthful innocence as cruelly as he had deceived Smith Woodward. And why did he write a series of slips and half-truths to Oakley that embody, as their only pattern, an attempt to extract himself alone? And why such intense embarrassment and such conspicuous silence if he had guessed right but had been too unsure to say so?

Alan Ternes, editor of *Natural History*, made the interesting suggestion that Teilhard, as a priest, might have heard of the hoax through a confession by Dawson that he could not subsequently reveal. I have not been able to ascertain whether Dawson was Catholic; I do not think that he was. But I am told that priests may regard statements of contrition by other baptized Christians as privileged information. This is the most sensible version I have heard of the hypothesis that Teilhard knew about the fraud but did not participate in it. It would explain his silence, his embarrassment, even the "*comme par exprès.*" But, in this case, why would Teilhard have tried to construct such an elaborate and farfetched theory of Dawson's innocence in his first letter to Oakley. Confession may have required silence, but surely not sheltering by falsehood. Any why the slips and half-truths for his own exoneration in the subsequent letters?

This leaves a third explanation—that Teilhard was an active coconspirator with Dawson at Piltdown. Only in this way can I make sense of the pattern in Teilhard's letters to Oakley, the 1920 article, the subsequent silence, the intense embarrassment.

This conclusion raises two final issues. First, to cycle back to my introduction, conspiracies have a tendency to spread. Once we admit Teilhard into the plot, should we not wonder about others as well? In fact, several knowledgeable people have strong suspicions about some young subordinates in the British Museum. I have confined my work to Teilhard's role; I think that others may have participated.

Second, what about motive? However overwhelming, the evidence cannot satisfy us without a reasonable explanation for why Teilhard might have done such a thing. Here I see no great problem, although we must recast Piltdown (at least from Teilhard's standpoint) as a joke that went too far, not as a malicious attempt to defraud.

Teilhard was not the dour ascetic or transported mystic that his publications sometimes suggest. He was a passionate man—a genuine hero in war, a true adventurer in the field, a man who loved life and people, who strove to experience the world in all its pleasures and pains. I assume that Piltdown was merely a delicious joke for him—at first. At Hastings, he was an amateur natural historian, with no expectation of a profesional career in paleontology. He probably shared the attitude toward professionals so common among his colleagues—there but for the vagaries of life go I. Why do they have the fame, the reputation, and the cash? Why do they sit at their desks and reap rewards while we, with deeper knowledge born of raw experience, amuse ourselves? Why not play a joke to see how far a gullible professional could be taken? And what a wonderful joke for a Frenchman, for England at the time boasted no human fossils at all, while France, with Neanderthal and Cro-Magnon, stood proudly as the queen of anthropology. What an irresistible idea—to salt English soil with this preposterous combination of a human skull and an ape's jaw and see what the pros could make of it.

But the joke quickly went sour. Smith Woodward tumbled too fast and too far. Teilhard was posted to Paris to become, after all, a *professional* paleontologist. The war broke out, and Teilhard had to leave just as the last act to quell skepticism, Piltdown 2, approached the stage. Then Dawson died in 1916, the war dragged on to 1918, and professional English paleontology fell further and further into the quagmire of acceptance. What could Teilhard say by the war's end? Dawson could not corroborate his story. The jobs and careers of other conspirators may have been on the line. Any admission on Teilhard's part would surely have wrecked irrevocably the professional career he had desired so greatly, dared so little to hope for, and at whose threshold he now stood with so much promise. What could he say beyond *comme par exprès.*

Shall we then blame Teilhard or shall we forgive him? We cannot simply laugh and forget. Piltdown absorbed the professional attention of many fine scientists. It led millions of people astray for forty years. It cast a false light upon the basic processes of human evolution. Careers are too short and time too precious to view so much waste with equanimity.

But who among us would or could have come clean in Teilhard's position? Unfortunately, intent does not always correlate with effect in our complicated world—yet I believe that we must judge a man primarily by intent. If Teilhard had acted for malice or in hope of reward, I would have no sympathy. But I cannot view his participation as more than an intended joke that unexpectedly turned to a galling bitterness almost beyond belief. I think that Teilhard suffered for Piltdown throughout his life. I believe that he must have cried inwardly as he watched Smith Woodward and even Boule himself make fools of themselves—the very men who had befriended and taught him. Could the anguish of Piltdown have been on his mind, when he made the following pledge from the trenches during World War I.

> I have come, these days, to realize one very elementary fact: that the best way to win some sort of recognition for my ideas would be for me myself to attain, in the truest possible sense of the word, to a "sanctity" that will be manifest to others—not only because of the particular force God would then give to whatever good is in my aspirations and influence—but also because nothing can give me more authority over men than for them to see me as someone who speaks to them from close to God. With God's help, I must live my "vision" fully, logically, and without deviation. There is nothing more infectious than the example of a life governed by conviction and principle. And now I feel sufficiently drawn to and sufficiently equipped for, such a life.

Teilhard paid his debt and lived a full life; may we all do so well.

Stephen Jay Gould teaches biology, geology, and the history of science at Harvard University.

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