anthro notes

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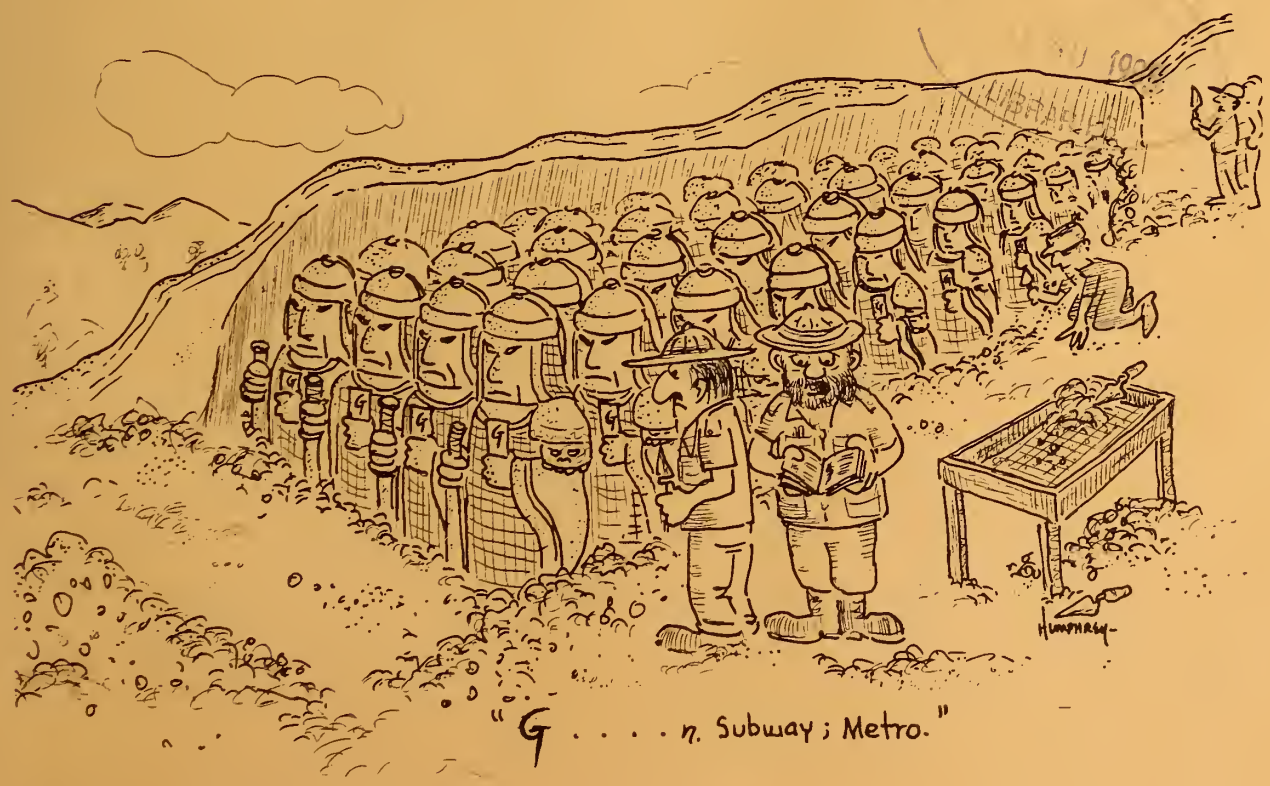
EXPLORING ARCHEOLOGY SITES IN CHINA

Green and wet rice paddies froze in my mind. Nor could I forget the enigmatic smiles of dignified terracotta warriors, the stares and snorts of water buffalo, the daring sword tricks of Chinese acrobats, the roar of a 400 pound pig in a wooden cart in the middle of Wuhan, graceful ballet dancers, disco dancing with strobe lights, and a television ad selling a computer sitting on the Great Wall.

I was in China from July 14 to August 5 along with 36 high school students and two other teacher-leaders: Steve McCarter, an anthropology and social studies teacher at Lower Merion High School in Ardmore Pennsylvania, and David Orr, Chief of the Division of Archaeology, Mid-Atlantic Region, National Park Service. We and the students participated in the 1988 American-Chinese Youth Science Exchange, a pilot program hosted by the China Association for Science and Technology (CAST). The administration and operation of the program was handled by the High School Ambassador program division of People to People International. Nine science areas including archeology formed delegations. As part of the archeology delegation, we travelled to Hong Kong, Beijing, Xian, Wuhan, Changsha, and Guangzhou and explored over a dozen archeological sites and half a dozen museums. In the process, we discovered much about the glories and concerns of



Chinese archaeology and about this 4,000 year old civilization.

Zhoukoudian

Our first stop was the town of Zhoukoudian (Choukoutien), an hour's drive southwest of Beijing where the famous Peking Man site at Dragon Bone Hill is located. At the bottom of Locality I cave, 500,000 years ago, Homo erectus is supposed to have killed, cooked his food, slept, and prospered. Other generations found the cave hospitable, in spite of the resident hyenas and sabre toothed cats, until about 50,000 years ago when the roof of the cave fell in. By that time the floor level had risen about 80 feet (30 meters of human activity).

In his visit to Zhoukoudian three years ago, Lewis Binford questioned the evidence for large game hunting and the use of fire in his videotape "K'ao-Ku, Paleolithic Sites in Contemporary China" and in "Zoukoudian: A Closer Look" (with Nancy M. Stone, Current Anthropology 27, December 1986). Dr. You Yu-zhu, from the Institute of Vertebrate Paleontology and Paleoanthropology at the Academia Sinica, and two graduate students had met with Binford and remain skeptical about his conclusions. Another graduate student, specializing in taphonomy and zooarcheology, is doing research on Zhoukoudian materials to answer some of Binford's queries. While we were there, we saw the scrapers, points, hand-axes, reconstructed skull caps, and shovel-shaped incisors belonging to more than forty individuals--males and females, young and old. The last excavation was in 1979.

Dr. You explained that archeology is not as well-funded by the government as he would wish. The last significant infusion of money occurred in the 1960s when the Soviet Union had the "audacity to say that Chinese civilization originated in the U.S.S.R." Chinese archaeologists proved them wrong.

Forty Chinese high school students accompanied us to the site. After a lunch of peaches, hard-boiled black eggs, bread, cold cuts, mineral water, and the ubiquitous orange soda, the students laughingly engaged in an amusing dinosaur-naming contest.

On an oppressively humid day, the Museum of Natural History in Beijing surprised us with a new, impressive exhibit hall, "The Origin of Man." It was more up-to-date than any exhibit I have seen in the U.S. and showed particular Chinese cultural biases.

The first section focused on man as a vertebrate, a mammal, a primate, an ape, and as an unique animal. Cases were filled with excellent color photographs, comparative skeletons, and easy-to-read type in English and Chinese. In the section on "The Origin of Modern Man," three different scenarios of human evolution were shown. For australopithecus, the location of archeological finds were shown on a large map, with several well-known sites shown in floor-to-ceiling color photographs and reconstructed casts such as the footprints at Laetoli in Tanzania. The skeletons, bones, tools, and modes of living were also displayed along with some of the controversies surrounding them. For Homo erectus, Homo sapiens neanderthalensis, and Homo sapiens sapiens, the cases portrayed their notable physical characteristics, tools, and main cultural achievements.

Surprisingly, from an American perspective, the next section focused on "The Origin of the Mongoloid Race" and read as follows:

> The basic racial characteristics of Mongoloids can be seen among the modern Chinese, Mongolian, Japanese, and

> American Indian. Such characteristics can be traced back to the time of Homo erectus, over one million years ago. Researchers have shown that China was a significant area for human origin, especially the Mongoloid origin and its development.

Controversial evidence is given for traces of australopithecus in China--the Yuanmou site, in particular. Physical characteristics of Chinese are traced more definitively to the time of Homo erectus, with an emphasis on the shovel-shaped incisors and on the sagittal keel (ridge) running along the top of the skull. The last section in the exhibit focused on the origin of human life, explicitly showing the fetus's development over nine months and the process of birth.

The exhibit ends with a philosophical expression that would not be found in U.S. museums:

> In contrast to the long history of mankind, life of an individual is extremely short. However, throughout the generation, every limited life can offer brilliant contributions to mankind. It is the sum of these contributions that glorifies our civilization.

The Great Wall

Our next stop both dismayed and delighted our archeological senses. The Great Wall--the eighth wonder of the world, the only human structure seen with the naked eye from the moon--is surrounded, at least at Badling Pass, with the worst of uncontrolled tourism. Buses swarm in by the hundreds to unmarked dusty dirt fields, and hawkers line the blocks on either side of the wall. On this hot summer day, the press of humanity was so great that you had no trouble believing that China had 1.3 billion people. Yet the crush of people could be escaped if you were willing to climb, and climb, and climb--an aerobic challenge. At the top of a guard tower, it was impressive to see the Wall's width (which could accomodate 5-6 horses abreast), its solidity, and its intimidating power. The invading armies would have had to first climb the mountainside, then the wall. The wall also greatly eased communication, an essential glue for a nation as Chinese mounted or on foot relay a message from one guard tower to the next.

Xian

After a rare undelayed flight on China's airlines, we landed in Xian, the old capital of China or the Middle Kingdom as it was called, and the beginning of the ancient Silk Road to India. In this famed city, our delegation "traveled" in time from 6,000 years ago to the present. Our

time travel began with the domestication of plants and animals (the Neolithic Period) well-chronicled at the Banpo Village and Museum, about 1/2 hour outside Xian. Here is an example of a museum erected over an archeological site--a practice common in China, though rare in the U.S. Starting about 6,000 years ago, houses evolved from a round brush shelter to wattle and daub construction to a rectangular adobe walled house with slanting roof, the prototype of the typical Chinese house. As we walked around the well protected site, the post holes were easy to spot along with the remains of semi-subterranean dwellings, a fire hearth, and later a well hole, and an underground cooling area. But these Neolithic wonders do not compete with China's most famous burial.

The Terracotta Warriors and Horses Museum stands about 20 miles east of Xian; the tumulus of Emperor Qin Shi Huangdi is clearly seen, miles before you arrive. Considered China's greatest archaeological attraction, the first Qin emperor forced thousands of his subjects to not only build an impressive tomb, yet to be excavated, but also to "guard" it with 7,500 terracotta warriors, a re-creation of the Qin army. All this was accomplished before his death in 210 B.C. None of this would be known if not for a peasant who was digging a well in 1974 and struck a terracotta warrior. Today an aircraft-like hangar protects the site from the weather and once again allows the public to view an archeological site on location. Most of the warriors have been reconstructed from their fall state; graceful horses and the remarkable individualized expressions and hairdos of the reconstructed warriors are impressive, but even more so imagining them in their original bright colors. During the reception and tea that followed our visit, the museum director said wisely that the tomb itself would not be excavated until preservation could be guaranteed.

Xian is home to dim sum, and one evening we banqueted with over fifteen different kinds of dumplings brought to the table in bamboo steaming baskets. Eating reminded us each day that we were not in the U.S. Chinese generosity to guests meant that lunch and dinner were usually of banquet proportions. At round tables for ten, a lazy susan spun with cold meats, sea slugs, sliced tomatoes, and roasted peanuts. These were followed by slices of potato and pork, roasted duck, a whole carp delicately moist in a sweet sauce, steamed eggplant, green peppers, another green scallion-like vegetable, spicy rice noodles, a soup of greens, noodles, strips of chicken, and, of course, rice, followed by the inevitable serving of watermelon. The usual drinks were hot tea and warm orange soda.

One dominant impression of China is that it is a walled country. The Great Wall stretches for thousands of miles keeping people in and out, defining boundaries, and marking if not creating a concept of China. Cities are walled. Xian's eight miles of walls are still intact and still impressive. A country, cities, even houses are also walled. People pass through gates, and walk inside to a courtyard so that life is lived turned inward, not outward to the street.

Changsa

Changsha far south of Beijing was our most concentrated archeological stop. At the Hunan Provincial Museum and Hunan Provincial Archaeological Institute, Fu Juyou, Associate Professor and Vice Director explained that two laws, one state and one national, protect archeological sites. People are remunerated if they report a new site to an archeological society. People are also punished with imprisonment or even death in some cases for removing artifacts from a

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FILMS FOR TEACHING ETHNICITY

In the 1960s the landmark publication of "Myth of the Melting Pot" by Nathan Glazer and Daniel Moynihan drew attention to ethnicity as an enduring feature within American society. Despite studies that periodically rediscover this phenomena, many Americans and non-Americans continue to be surprised by the persistence of ethnic cultures in the United States. The following recent films use innovative approaches to examine various issues relating to ethnicity and ethnic identity among Americans.

These films do not constitute a complete list of recent films dealing with ethnicity or specific ethnic groups. For information about additional films and resources, consult your school or library media specialist for distributor's catalogues and for indexes such as American Folklore Films and Videos: An Index, compiled and published by the Center for Southern Folklore.

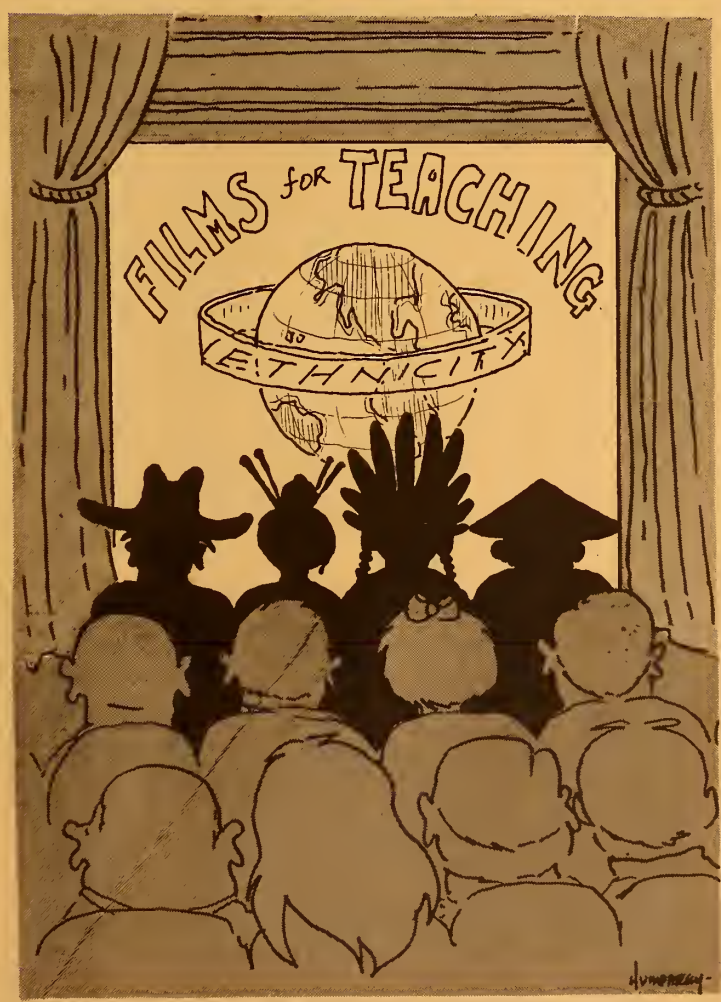
AMERICAN TONGUES. 1987. Louis Alvarez and Andrew Kolker (60 minutes).

It is a commonplace that Americans share the same official language even though Bostonians are often identified by a single phrase ("park the car") and New Yorkers by the fact that they "schlep" rather than "carry." "American Tongues" takes an often humorous look at these and other aspects of language diversity in America. The varied historical causes and social consequences of the fact that Americans speak English differently are explored. The film not only presents regional speech or "dialects" of English, but explores the intimate and taken for granted relationship between how people speak, how they think about themselves, and how they are judged by others. The filmmakers are sensitive to speech not only as the means by which we communicate, but as the principle medium through which we interact and negotiate issues of trust and character. What might otherwise be dry observations about these social aspects of speech are brought to life through voices as diverse as a Tangiers Island waterman, an Italian-American from Boston's North End, and a Kentucky backwoodsman.

Distributor: The Center for New American Media, 524 Broadway, 2nd Floor, New York NY 10012/ (212) 925-5665.

CELEBRATION. 1988. Karen Kramer (30 minutes).

Every year on Labor Day the largest Caribbean community in the United States celebrates carnival along Eastern Parkway in Brooklyn. The event, which brings together Caribbean



immigrants from virtually every island, is a spectacle to rival the pre-Lenten bacchanal that has been celebrated in Trinidad and other islands since the days of slavery. Kramer aptly captures the spirit of the event, coupling infectious calypso rhythms with the striking visual displays of the carnival bands, costumed performers, and rocking and raucous crowds. But the film does more than simply confirm the familiar capacity of Caribbean peoples for celebration. The event itself becomes a window into the thoughts and feelings of expatriate West Indians as they are interviewed during preparations for the carnival. Through these interviews the viewer comes to appreciate the importance of carnival to people determined to maintain their sense of identity and their links with West Indian culture.

"Celebration" presents a mosaic of ethnic experiences in the U.S. in a novel way. Carnival in Brooklyn brings together Jamaicans, Antiguans, Haitians, and Barbadians, although Trinidadian immigrants are at the core of the pagentry of the event. This island diversity serves to remind us of an often overlooked cultural difference within urban American black communities (e.g., between West Indians and Afro-Americans). For teachers interested in exploring this difference with their students, this is an upbeat film that easily holds the viewer's attention.

Distributor: Erzulie Films, 22 Leroy St., New York NY 10014/ (212)691-3470.

FAMILY GATHERING. 1988. Lise Yasui (30 minutes).

In "Family Gathering," Lise Yasui, a third-generation Japanese-American, uses home movies, archival film, family photos, and interviews with family members to chronicle the tale of a Japanese-American family, begun when her grandparents immigrated to the U.S. during the beginning of the century. In the early years the Yasui family story was the embodiment of the American dream: a successful family business; community leadership; and children, raised in America, attending college and becoming doctors and lawyers. However, the upheaval caused by World War II, the resulting anti-Japanese sentiment in the U.S., and the forced relocation of the Yasui family to the internment camps, had lasting concequences, the scope of which Lise Yasui discovered only while making the film.

Lise Yasui's straightfoward narration is filled with warmth and honesty and fully complements the images she presents. In this film an ethnic filmmaker examines her own family and in the process reveals the consequences of ethnic intolerance.

Distributor: New Day Films, 853 Broadway, Suite 1210, New York NY 10003/ (212)477-4604.

MADE IN CHINA. 1985. Lisa Hsia (30 minutes).

Chinese-American filmmaker Lisa Hsia grew up in suburban Chicago, a typical American kid. She was more involved with the concerns of American popular culture than with her Chinese heritage, her experience of Chinese culture limited to Sunday evening Chinese dinners in Chicago's Chinatown. It was with a sense of personal and ethnic discovery that Hsia traveled to China following college to learn Chinese and to discover her roots. While living with distant cousins in Beijing, she tries to learn what it is to be Chinese by attempting to become a good "daughter" in her cousins' household and by trying to absorb the sights and sounds of the land of her ancestors. Instead she discovers a little about the complexity of culture, as she learns that being Chinese-American does

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TEACHER'S CORNER: RELATIVE DATING TECHNIQUES IN ARCHEOLOGY

The question, How old is it?, is basic to the science of archaeology. Dating methods, such as radiocarbon dating, dendrochronology or tree-ring dating, and potassium-argon dating, that may furnish an absolute date for an archaeological site, are a contribution of the physical and the natural sciences. But absolute dating methods are not always useful; the particular circumstances to which they apply do not exist at every site. In such cases, archaeologists may employ relative dating techniques. Relative dating places assemblages of artifacts in time, in relation to [artifact] types similar in form and function.

The classroom exercises below will focus on stratigraphy and seriation, dating techniques used by archaeologists to establish a relative chronology.

I. Stratigraphy or the Law of Superposition

Stratigraphy can be described as a "layer cake" type arrangement of deposits called strata, with the older layer beneath the latest. This technique helps the archaeologist arrange the site in a vertical temporal sequence, which may then be compared to sites of similar age or type. You might ask students to picture a pile of newspapers that have been stacked every day for a week. The oldest newspaper will be on the bottom, the remainder stacked in relative chronological order from the oldest to the latest edition. This is the concept of stratigraphy--or the Law of Superposition.

Stratigraphic sequences in the field, however, are sometimes unreliable. Suppose the inhabitants of a previous site dug a large hole. The top of the heap of excavated dirt would date the oldest. Or perhaps a burrowing animal tunneled down through a site, causing artifacts buried above to fall to lower levels. Natural processes like frost heaving, erosion, and the downslope movement of soils in colder climates (solifluction) can alter the original context in which the artifacts were deposited.

Stratigraphic levels can be horizontal as well as vertical. On beaches, where the configuration of the shoreline has changed through time, the earliest site may be inland, the later site closest to shore. The stratigraphic levels would then be spatially horizontal, conforming to the changing coastline. Horizontal stratigraphy may also occur when a later culture settles next to an earlier abandoned site, thereby appearing to be contemporary to the older site. Despite problems of interpretation, stratigraphy is a powerful archaeological tool in unlocking the mysteries of past lifeways.

Exercises:

1. Ask the students to think of ways that the vertical sequence of newspapers could be disturbed. (If the newspapers were not dated, the chronological sequence could probably still be deduced from their content.)

2. Using the example of the stack of newspapers, ask the students how they might apply relative dating using the concept of horizontal stratigraphy.

3. There are many possibilities for a theoretical sequence, once the students are familiar with the material culture and history of groups inhabiting the United States at various times. Better yet, use the chronology developed for your local area. The students may then generate a "time line," interpreting the ways in which past peoples may have used the artifacts at their disposal in their daily lives.

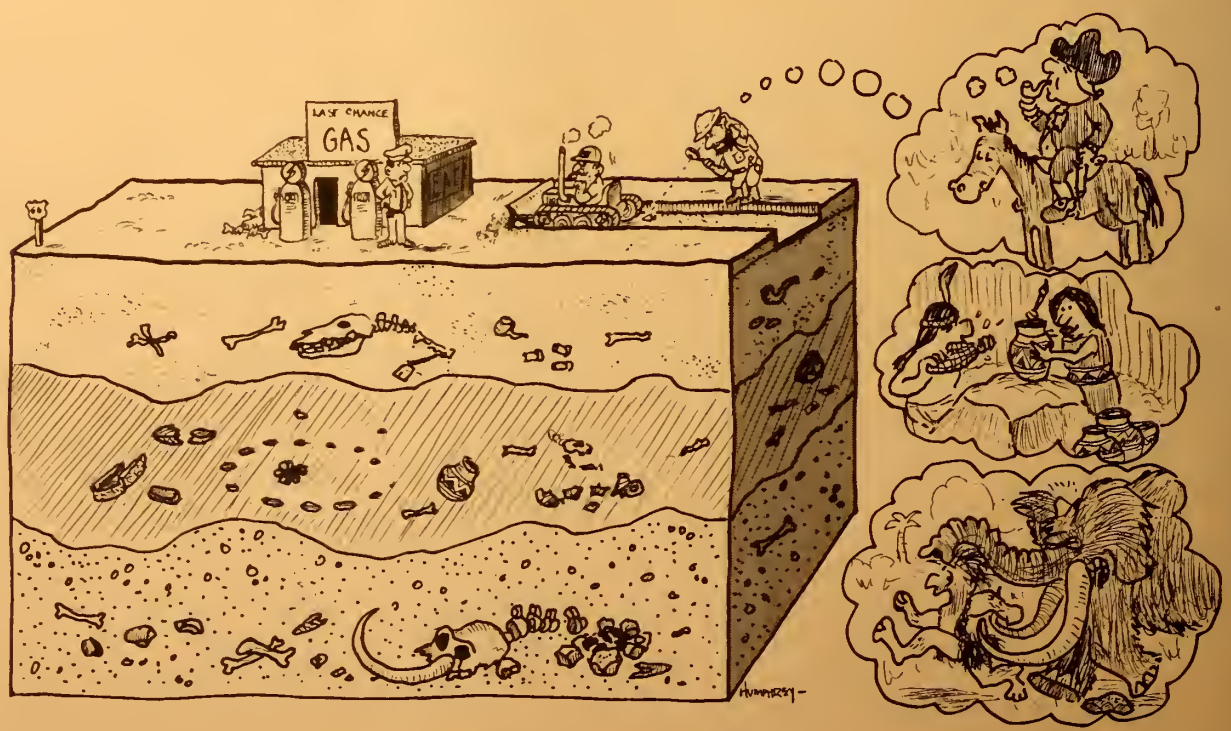
Have your class develop a poster showing a theoretical stratigraphic deposit, or archeological sequence. Then ask them to analyze the cultural materials to deduce what the lives of the people of that time were like. Below is an example of a possible sequence that could be illustrated on a poster.

Level I (earliest): pictures of fireblackened rocks in a rough circle suggesting a hearth; scattered stone tools; and scattered animal bones and fruit pits. These artifacts suggest a people who hunt and gather for a living; who own few material possessions, suggesting mobility; and who have mastered the use of fire and tool making.

Level II (middle): pictures of sherds (broken pieces) of decorated pottery; a mortar and pestle for grinding grain; scattered beads and carved figures; post holes (shown as a regularly patterned darkened areas of soil) for a dwelling; scattered bones of wild game. These artifacts suggest people who are settled, at least part of the time. They make pottery, which is not easily portable, as well as decorative items. They have access to a regular food source, as the grinding equipment shows, but probably still also hunt for wild game.

Level III (latest): pictures of a pipe stem (which can be assigned a date of 1794 by its diameter); a coin dated 1802; a bullet casing; a few grains of corn; the skeletal remains of a horse; a metal coffee pot lid. What can be said of these people? What cannot be inferred from this level? The coin is significant because it provides the earliest potential date of the site. The coin was made in 1802, but could have been dropped any time after that date, as the pipe stem must have been dropped later than its date of manufacture. This concept called the terminus post quem (the date after which) is of particular importance to archaeologists dealing with the historic period.

Your local archeologist may be able to furnish suitable materials, or the sequences in the publications listed



below may be used for illustration. The time line generated by your students will introduce them to the important concept of stratigraphy, as well as to the goal of archaeology: to reconstruct past lifeways and place them in a chronological framework in order to better understand the present.

4. Archaeologists may date deposits on the basis of the newest artifact found in the level. To illustrate this concept, collect a handful of coins of varying dates. Which is the oldest? Which is the latest? If they were all buried together, what date could be placed on the level in which they were found? The answer is that we can only say that the coins were deposited sometime after the date of the newest coin.

5. For younger students, the concept of stratigraphy may be reinforced by gluing the pictures of artifacts to cardboard and cutting them up as one would make a puzzle. These could then be scattered over layers made of crumbled tissue paper, to be "excavated" and "mapped" in levels by the class. A grid of rubber bands or string may be placed over the "site" to aid in the accurate mapping of the artifacts. Students may be divided into teams of excavators and mappers with as many "sites" as feasible. The students then could make a time line based on the interpretation of their finds.

II. Seriation

When a stratigraphic sequence is lacking, another relative dating technique known as seriation may be applied. This technique dates a site based on the relative frequency of types of artifacts whose dates of use or manufacture are known. The basic assumption underlying seriation is that the popularity of culturally produced items [such as clay pipes or obelisk gravestone markers in America] varies through time, with a frequency pattern that has been called the "battleship curve." An item is introduced, it grows in popularity, then its use begins to wane as it is replaced by another form. Certain types of artifacts have been identified as particularly useful temporal markers, for example, gravestones, projectile points, lamps, pottery sherds.

Before being able to interpret materials found at a site, an archaeologist faces the task of sorting the artifacts into manageable units for analysis. This is frequently a difficult task. Sorting is usually based on form and function. What does it look like? What is it made of? Is it decorated in any way? Have you ever seen it before?

Exercises:

1. To acquaint your students with the problems faced by archaeologists in determining the form and use of an object, ask each one to bring in an unusual item or two, whose function may not be well known. Possible objects are: old kitchen implements, personal items [shaving brush, buttonhook], parts of toys, travel souvenirs, and natural objects such as unusual rocks.

Ask the students to exchange their items with others in the class to guess their use. Then ask the students to arrange them in sets according to distinctive characteristics. The kinds of questions they should ask are: Is it made of wood, paper, cloth, metal, pottery? Is it large or small? Is it for personal care, decoration, or amusement, or does it have a utilitarian purpose?

How was it made? Were the materials used in its manufacture from the local area or from far away? Where was the object itself made? How did it get here? Who made it, a specialized craftsman or an ordinary member of the society? The categories for classification will be suggested by the objects

in the assemblage. Are there any patterns apparent in the objects the students have brought to class? Is any item of a greater frequency?

2. Ask the students what they can deduce about the people who use the objects. This exercise will introduce students to the concept of deducing the lifeways of people from the artifacts of material culture, which were used in everyday activities.

For further information:

James Deetz. Invitation to Archaeology. New York: The Natural History Press, 1967.

David Hurst Thomas. Archaeology. New York: Holt, Rinehart, and Winston, 1979. (more technical)

Robert L. Humphrey and Mary Elizabeth Chambers. Ancient Washington: American Indian Cultures of the Potomac Valley. Washington, DC: George Washington University, 1977. (local study containing cultural sequence of eastern U.S.)

Naturalist Center, National Museum of Natural History, 10th & Constitution Ave., N.W., Washington, DC 20560; (202) 357-2804. (Reference materials, self study guides on Indian pottery and stone artifacts, and on human skeletal materials.)

Public Information Office, Department of Anthropology, Smithsonian Institution, Washington, DC 20560. ("Local Archeology Resource Packet: District of Columbia, Maryland, and Virginia"; teacher bibliography and classroom materials on archeology)

Cathy Griggs
George Washington
University
Washington, DC

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not necessarily make it easier to live in China.

Hsia chronicles her journey of self and cultural discovery with humor and off-beat touches, which result in a very personal and accessible film.

Distributor: Filmakers Library, Inc., 133 E 58th St., Suite 703A, New York NY 10022.

ZIVELI: MEDICINE FOR THE HEART. 1987. Andrei Simic and Les Blank (51 minutes).

"Ziveli: Medicine for the Heart" by anthropologist Andrei Simic and filmmaker Les Blank explores the characteristics of ethnicity among a European-derived community--the Serbians of Chicago. As its subtitle suggests, the film is an evocative look at Serbian-Americans as they experience their own ethnicity through traditional music, dance, food, and family celebrations. Life history narratives of immigrant Serbs, the close relationship between family and church, and other historical background on Serbian culture are skillfully woven into contemporary scenes in which identity is celebrated. The return to Serbia (Yugoslavia) by third-generation Serbian-Americans is presented as a kind of pilgrimage in which younger members of the ethnic group claim their culture. The film is an excellent vehicle for exploring evidence of cultural diversity in America.

Distributor: Flower Films, 10341 San Pablo Ave., El Cerrito CA 94530; (415) 525-0942.

John Homiak and Wendy Shay
Human Studies Film Archives
Smithsonian Institution

THE HOPI-SMITHSONIAN PROJECT: BRIDGING A GAP

Alfred Qoyawayma (pronounced ko-YA-way-ma) is an engineer from Scottsdale, Arizona and a Hopi potter in a culture where most potters are women. His aunt, Elizabeth White, encouraged him to learn this ancient craft. Qoyawayma is fascinated by the pottery of the long abandoned village of Sikyatki, the place of origin of his Coyote Clan, located near First Mesa in northern Arizona. These distinctive red and black on yellow polychromes, referred to as Sikyatki, were at their technological and artistic height during the 13th and 14th centuries and went into artistic decline following Spanish contact in 1540.

Hopi potters are reviving the curvilinear designs of ancient yellow ware polychrome pottery. The spiral and serpent motifs painted in reds and blacks are in contrast to the angular geometric designs of other Pueblo wares. Duplicating the technology of this ancient craft, however, remains problematic. The distinctive yellow hue of the fired clay, one of the finest achievements of American Indian ceramic art,has proven to be a major challenge. Was it an unusual clay source or a special technology that gives Sikyatki pots their unusual color?

The Smithsonian Hopi Ceramic Project

While attending a conference in San Diego, Qoyawayma approached archeologist Ron Bishop, a specialist in material analysis with the Smithsonian Institution's Conservation Analytical Laboratory (CAL). He wanted to explore with Bishop the possible sources of the yellow-firing clay by comparing samples from various clay beds around the Hopi mesas with samples from ancient pots. A colleague of Ron Bishop's, anthropologist Veletta Canouts, was recruited to analyze changes in stylistic design over time and among Pueblos. Together with Suzanne De Atley, a California-based anthropologist who specializes in ceramic technology, and Qoyawayma, they established the Smithsonian Hopi Ceramic Project. Employing the latest technological methods in ceramic analysis, they are investigating the nature and transformation of yellow ware over time.

For more than 500 years, yellow ware was the principle manufactured Hopi ceramic, fired at the highest temperature of any pottery produced in the New World prior to European contact. The major questions these scientists are asking are: How did it slowly change in form, decoration, and firing technology over the centuries? How did it change following the Spanish arrival in the American Southwest, and why? Finally, what does the information contained in the ceramic changes tell us about the people and their history? To answer these questions, project leaders are studying firing techniques, tempering traditions, and painted designs with

the aid of sophisticated instruments. Their methods and techniques come from several fields--science, art, and history--resulting in an interdisciplinary approach.

The ceramic samples being tested include pottery (sherds and whole vessels) from seven Hopi mesa pueblos, which were inhabited in the 1300's. Collections from the Smithsonian Institution have formed the resource base for the project along with specimens from the Museum of Northern Arizona, Arizona State Museum, Maxwell Museum (NM), University of Colorado Museum, and the Peabody Museum, among others.

The Hopi inhabited the rocky mesas in northeastern Arizona, where abandoned pueblos still stand, as long ago as A.D. 600. The Smithsonian's Hopi Ceramic Project focuses on the period in Hopi history from 1300, following a severe drought between A.D. 1276-1299, to 1890, covering the period of social change after Spanish contact in 1540. Aside from Hopi oral tradition, little is known about Hopi social organization during this time. Drought conditions led to important social as well as environmental changes as populations fluctuated, causing social realignments that consequently influenced pottery production. Changes in sociopolitical units and exchange relationships are indicated in pottery style changes. For instance, the decline in quality of the yellow ware following Spanish contact is commonly thought to be attributed to the use of sheep dung rather than the hotter burning coal as a firing fuel. The reason for eliminating the use of coal is not clearly known, but according to Hopi legend, the Spanish disliked the smell of burning coal.

Identifying or finger printing the chemical composition of pot sherds and clay sources of the pottery reveals not only technological and temporal changes but also ancient trade routes and social organization. A pot intended for trade may be painted in a design traditional to the distant recipient, but its chemical composition will reveal the source area where it was manufactured. Archaeological excavations provide yellow-firing pot sherds from ancient Hopi pueblos; Hopi oral traditions and historical accounts may help confirm the ancient networks suggested by the chemical analysis.

For the analysis, Bishop explains that "only the smallest sample possible is taken from the vessel, neither disrupting the viewing area or the structural integrity of the piece." Because the Hopi yellow ware is quite uniform compositionally, an area about a third the size of a dime is used. The analysis of coarser textured pottery would require a larger sample, supplied by sherds.

What put the yellow in Hopi pottery? "Lots of ideas surround it," says Canouts. "For example, was it the clay or the firing? Limited experimental work done in the 30's generated the idea that coal and the firing time played parts. But based on Bishop's and De Atley's work on the diversity of the clay, paste preparation, and firing technology, we are finding that the answer to the yellow color is not as simple as anyone believed. We are having to refine our questions."

"We may eventually be able to recreate the appearance of the pottery [at its height]," explained Bishop, " but we are doing it under very controlled conditions, which gives us an ability to do it in a short time rather than the trial and error experimentation that went on over generations."

In project interviews with Hopi potters, traditional technology was defined as "making it the way our ancestors did." "However, water for mixing the clay as is done today was too precious then, so preparation techniques had to differ as did firing

techniques," explained De Atley. For instance, "there had to be enough animals around for dung firing to be used regularly. One of the potters we talked to doesn't sit her pots around the fire to warm them; she puts them in a 400 degree oven before putting them around the fire. 'Traditional technology' changes in ways that relate to socio-economic conditions of the people who are making the pottery and for whom they are making it. Just as Canouts will contrast potting designs among groups or pueblos, I intend to see if firing techniques are practiced slightly differently from pueblo to pueblo and compare my information with hers. In this way we can see if exchange of information about making pottery includes both technology and design."

The Hopi Education and Video Outreach Program

To increase communication with members of the Hopi community who use and produce the pottery, project members established the Hopi Education and Video Outreach Program, funded by the Smithsonian Institution. The outreach program consists of three components: 1) a science course on methods in materials analysis taught at the Hopi Junior/Senior High School during spring semester by project members; 2) one-month internships for six Hopi high school students at the Smithsonian's Conservation Analytical Laboratory in Silver Hill, Maryland during the summer of 1988; and 3) the production of a video by Hopi filmmaker Victor Masayesva Jr. to convey the results of the scientific analyses and relate them to the oral traditions of Hopi ceramic history and art.

What prompted the students' interest in this program? Besides offering an opportunity to visit the Nation's Capital and to meet with Supreme Court Justice Sandra Day O'Connor and John Kyl (Republican, Arizona), a highlight for Paulette Honyouti, the program gave the students a chance to be personally involved in a scientific investigation of an important aspect of their own culture. For some of the students, such as Miguelita Torivio, Kim Garcia, and Francine Honie from First Mesa, known for its famous potters, pottery production is a family tradition that has passed down from the older women to the younger ones. Today, when modern materials and lifestyles are often chosen over traditional ones, the course has given these students, and often their families as well, a new appreciation for a major art form and an interest in learning to pot like their grandmothers and aunts.

Although pottery is no longer produced at Second Mesa, now known for its baskets and kachinas, Charles Cleveland's interest was aroused when he heard that an internship at the Smithsonian would involve learning about new scientific techniques. With the other students, he conducted firing experiments with Hopi region clays and analyzed the results using the x-ray diffractometer and microprobe on the scanning electron microscope. These instruments allow one to see the mineralogical or structural properties of a ceramic. The students also visited the neutron activation analysis facilities at the National Bureau of Standards. Here chemical fingerprinting of clay is achieved by irradiating the material with neutrons generated in a nuclear reactor and counting the gamma rays given up by the radioactive isotopes that are formed, to determine the particular elements of the clay. Regardless of the array of high technology equipment available, visual interpretation with the naked eye remains a significant part of pottery analysis. From the large array of sherds and pots from the museum study collections, Anjanette Tenakhongva devoted much of her internship to a comparison of design styles and also looked at evidence of different firing techniques.

Bridging a Gap

What project scientists are discovering is a correspondence between the Hopi oral narratives and their own findings as reflected in their analysis of the ceramic materials. "Empirical evidence is coming forth to support the Hopi view of their migrations and socioeconomic relationships; Anglos will need to reconsider treating Hopi oral tradition as mere legend," says Bishop.

The Hopi Ceramic Project will have lasting effect both for the Hopi people and for southwest archeologists, bringing 20th century technology to bear on the analysis of traditional technology. In addition to the video, slides of all the vessels studied and data reports from the project will be deposited with the Hopi Cultural Center.

Perhaps more importantly, the project has brought a new approach to education. "By teaching science and history together and by using something [pottery] that is commonly understood and commonly available in the community, we were able to communicate [difficult scientific concepts] in a way that is usually not possible," remarked De Atley. "Hands-on learning is the only way."

The Hopi-Smithsonian project has demonstrated the bridges that can be built using this hands-on approach. The bridges between scientists and artists, Hopi students and their ancestors, and the Smithsonian and the Hopi Reservation, from where the ceramic collections came, that enable both the Hopi and Smithsonian scientists to take a fresh look at the past.

P. Ann Kaupp

(continued from p.4)

site. An archeologist showed us in his workroom 100 pieces of a Shang dynasty pot that he is slowly reconstructing. About 30 archeologists work for the museum.

On the following day, we drove for three hours in three Mitsubishi white buses through the countryside to the ancient (A.D. 600-1,000) Changsha kiln site. On the way, I saw only three repeated messages on billboards: have only one child, obey the traffic laws, and do not drink and drive. Also on the way, rice paddies, blue trucks, human pulled carts, and small villages whirled by us as we moved from paved to increasingly rougher and narrower dirt roads. Our bus had to stop for a funeral proceeding down the street. The family members dressed in white with white hats. One person held a large photograph of the deceased, and others carried a brightly colored paper dragon. The body covered with brightly decorated paper was carried on poles. Firecrackers went off fore and aft sending momentary smoke and noise into the air. Once it had past, we were again on our way until the irrigation ditches, potholes, and eroded road forced the drivers to halt.

From here we walked for half an hour through horticultural hamlets with a lifestyle thousands of years old. Water buffaloes plowed the paddies while people bent over planting and weeding the rice plants. Rice paddies with tender green shoots graced the landscape as far as the eye could see across the valley. We passed through small hamlets with sun dried mud brick houses, some with thatched roofs, some with tile. Laundry floated on the lines. Chickens pecked freely. A mother and baby pig lay by the side of the path. Women slapped wet clothes with wooden paddles at the pond's edge. Wooden huskers, wooden chairs, and wooden water buckets were the working tools. We walked single file on the

narrow mound of packed earth separating the rice paddies. Men walked by us with straw and rice bundles tied on either side of a long pole. People stared at us. On the ground, pottery sherds were everywhere, some earthenware, some stoneware, some proto-porcelain (light green celadon glaze). We saw the wasters--the piles where all the mistakes were dumped. Some sherds have raked designs, some have light brush strokes. The ancient tunnel-shaped kiln, one of many in the area, was found when men were digging an irrigation ditch. I was reminded of the importance of pottery to archeologists; it is made, transported, used, and discarded. It cannot be destroyed.

The next day found us deep in red clay in the middle of Changsha at an urban archeology site. Construction had been stopped weeks ago while a team of archaeologists came in to excavate the recently discovered Western Han dynasty graves (200 B.C. to A.D 100). Song, the archeologist associated with the Changsha Museum, orchestrated the work of our 36 students on the dig. A fully excavated grave revealed that acid had destroyed the skeleton, but bronze and pottery funerary objects (both ceremonial and practical) were intact. Our archeology delegation dug at a tomb site that had been robbed; we could easily see the disturbances in the soil. We each had an opportunity to dig and to carry the mud in two straw baskets hanging from a wooden pole that goes across the back.

We dumped the mud in refuse piles where archeologists sifted through for small, overlooked artifacts. Our digging did uncover parts of a ding (three-legged cooking pot) and black lacquer ware.

A 4,000 Year History

In exploring archeology in China we discovered the common concerns with U.S.archeologists--the difficulty of preserving a site, the concern for funding and the need for greater funding, and the development and use of up-to-date methods. We also discovered some differences. In China, museums are often built on the actual excavation site, and many are more modern than in the U.S, yet the lifestyle surrounding them is still often primarily horticultural. Tough archeological laws protect sites. Unlike the U.S., China preserves a 4,000 year written history of rulers and dynasties along with the technological achievements of the distant past. Paper was made from rags and wood fiber a thousand years before Europe learned the technique. Books were printed centuries before the Gutenberg Bible in Europe. The Chinese produced cast iron in the 4th century B.C. about 18 centuries before Europe discovered such an ability. They were the first to discover the destructive power of gunpowder and the more restorative power of tea. Yet, today China remains a land where one can experience the living past.

JoAnne Lanouette

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SMITHSONIAN EXHIBIT OPENS

The first Soviet-North American exhibition,"Crossroads of Continents: Cultures of Siberia and Alaska," opened at the National Museum of Natural History, September 23. Ten years in planning and co-curated by a team of Soviet and North American scholars, Crossroads presents a spectacular display of artifacts.Through an accident of history, the earliest collections of Alaskan peoples were made by Russian explorers; the earlist collections of Siberian peoples by American anthropologists. These collections, now displayed side by side, bring to life little known traditional cultures on both sides of the Bering Strait. After April 2, 1989, the exhibition will travel to cities in the U.S., Canada, and the Soviet Union.

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Anthro.Notes Staff: P. Ann Kaupp, JoAnne Lanouette, Ruth O. Selig, Alison S. Brooks, editors; Robert L. Humphrey, artist.