

THE PRECERAMIC EXCAVATIONS  
AT THE HUACA PRIETA  
CHICAMA VALLEY, PERU

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## ABSTRACT

The Huaca Prieta is a late preceramic mound in the Chicama Valley on the north coast of Peru. It is a midden 14 m thick and rests 122 m from the shore. Corrected radiocarbon dates place the time of the preceramic occupation from 3100 B.C. to about or before 1300 B.C.

In 1946 and 1947 the archaeologist Junius Bird, accompanied by his family, lived and excavated at Huaca Prieta. Preliminary excavations defined the structure of the mound and guided the excavation strategy. Two large pits were then dug stratigraphically in the preceramic midden. A large quantity of artifacts, botanical specimens, bones, and shell were removed from the layers. These materials formed a basis to begin the definition of a prehistoric period which, at the time, was very poorly understood, and has since been called the "cotton" preceramic.

The Huaca Prieta preceramic population emerges as a group of agriculturalists who utilized a range of domesticated and wild plants. Some subsistence was based on mollusks, fish, birds, and, to a lesser degree, mammals. The dependence on animals may have decreased during the occupation. The occupation appears to have had few contacts with other areas except, perhaps, coastal Ecuador, and persisted with few technological innovations for more than 1500 years.

Fabric construction was the population's most complex craft and its major medium of artistic expression. Throughout the occupation, finger-manipulated twined cotton textiles predominated, along with smaller, relatively stable amounts of weaving, netting, and looping. It is evident that many changes in textile technology took place during the site's occupation.

Lithic implements were abundant, but relatively simple, without pressure flaking. The use of gourds for vessels, scoops, and net floats was common. Ornaments were rare. Various basketry and matting techniques were well advanced. Burials were shallow, with flexed bodies. Exostoses of the external auditory meati indicate that contact with cool water was common. The graves contained few gravegoods other than mats or textile fragments. One burial (99.1/903) contained a number of unique artifacts.

There is little evidence, other than hearths, for the first Huaca Prieta dwellings. Sometime during the occupation, semisubterranean houses with cobble and mud-mortar walls became common. These, and storage units, were often used later for burials.

The present-day environment suggests that agriculture was possible because of nearby fresh-water ground seepage. As the midden grew, wave and wind erosion destroyed its southwestern side. A limited coastal uplift protected the mound from continued wave erosion. Following the preceramic occupation, a tidal wave washed the mound, leaving a thick, sterile cobblestone layer on its lee side.

The conservation and study of the excavated materials from Huaca Prieta took place at the American Museum of Natural History, and, occasionally, elsewhere in North America. Those analyses continued with interruptions for a period of over 30 years, during which time Bird and others published articles on diverse aspects of the remains. This volume draws together the basic excavation data with other published and unpublished information.

## EDITOR'S COMMENT

My task has been to write, compile, paraphrase, or edit, as necessary, the existing information about the Huaca Prieta archaeological site. Junius Bird left most of this material carefully organized in filing cabinets and drawers. Throughout much of his life, Bird worked on the extensive artifact collections from Huaca Prieta, and he left a substantial written and taped archive which has never been published. Whenever possible, his written or recorded words are incorporated into this monograph to make it as much his as possible. Perhaps even the general outline of this publication is not much different than

he would have envisioned, since the structure of his filing system, cataloging methods, and publications, gives one an idea of how he wished to organize and present data.

Before I began this task, the Junius B. Bird Committee at the American Museum of Natural History decided that no new analyses of data should be carried out, and that this report should reflect, as thoroughly as possible, Bird's work. With few exceptions (primarily in the botanical, faunal, and burial chapters), no specialists were used to supply information not already on file or published. It should be noted that Junius Bird had carried out

almost all analyses of materials so completely that there are very little data in this report of which he was not aware.

I have handled various chapters in different ways, depending on the amount and nature of the available information. In some cases, Bird's manuscripts, notes, or tape recordings are cited directly. In other cases I have paraphrased at length, drawing together disparate material from numerous sources (see Bibliography). The descriptions of the burials and excavations are examples of this. I have used footnotes extensively to guide scholars to the unpublished material upon which much of the text is based. Very often it has been necessary to condense the available material to make it manageable for publication.

The most special part of this report may be the textile chapters and code. No excavations before or after Huaca Prieta have excavated such an extensive collection of pre-ceramic fabrics, or analyzed them in such detail. Bird's primary collaborator on this textile analysis was Mrs. Milica D. Skinner, an anthropologist who assisted Bird from 1960 to 1975 as a Research Associate at the American Museum of Natural History. Guided by Bird's ingenuity, Mrs. Skinner assisted and contributed in three areas: the plotting of the transposed-warp textiles, the creation of the Textile Code, and the computer analysis of the textile statistical data. In a note for the Introduction to the Textile Code (Appendix 1), Bird wrote that he was "fortunate in having as an associate Mrs. Milica Dimitrijevic Skinner." He went on to compliment her on her knowledge of textile terminology, her meticulous attention to detail, her interest in accepting responsibility, and

her ability to handle complex problems. He also noted her patience, hard work, and integrity.

In this past year Mrs. Skinner has now made a fourth major contribution to the textile-related segments of this report. She has written the chapters on transposed-warp construction and other major textile techniques. She carefully reviewed Bird's introductory chapter on the Huaca Prieta Textiles and supplied many of its tables and statistical data. Moreover, Mrs. Skinner has guided me with detailed and insightful information concerning how this monograph should be compiled. Her collaboration is a very fundamental part of this publication.

Junius Bird left written mention of the unique role of his wife, Margaret (Peggy) McKelvy Bird, in the fieldwork at Huaca Prieta. She ran the base camp, kept field records, and managed labeling and packaging. Peggy Bird has been a major force behind the efforts of the past year to compile this publication. As the senior member of the Junius B. Bird Committee at the American Museum of Natural History, she established the completion of this report as a major priority. She supplied encouragement to Milica and myself when at times the task seemed endless and frustrating. Her recollections of important information, proofreading, and constant concern have been an invaluable and charming stimulation.

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Research Fellow  
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New York City  
May 1984

## CHAPTER 1. INTRODUCTION

During 10 months of 1946 and 1947 the archaeologist Junius Bouton Bird lived in a tent encampment with his family at the preceramic mound, Huaca Prieta, in the Chicama Valley of Peru's Pacific Coast. The name Huaca Prieta means "black" or "dark" "mound." Bird excavated a number of trenches and test pits in and near the mound, and from them emerged some of the first substantial evidence of sedentary coastal peoples who lived by exploiting marine and terrestrial resources in the three millennia before Christ. For their time, these investigations incorporated advanced excavation techniques and strategies. The recovery and analysis of the artifacts resulted in the development of many new techniques for their preservation and study.

This monograph may be of considerable historic interest because it presents much new information about Andean preceramic culture, and because it documents the thoroughness and originality that characterized Junius Bird's archaeological research. His work at the Huaca Prieta has long been regarded by scholars as a key to the definition of the Andean preceramic since he was the first to investigate it in detail. The publication of this report brings together for the first time much unpublished and published data based on the materials excavated at the Huaca Prieta. It is the first thorough presentation of the stratigraphic data necessary to understand certain aspects of the artifacts.

The Huaca Prieta site is a deposit of late preceramic material nearly 12 m high (fig. 1). On the north side of the mound there are ceramic period remains (Initial-Ceramic period, Cupisnique, and Gallinazo), which were also briefly excavated by Bird. This report will deal primarily with the preceramic component of the site since Bird's primary objective was to study preceramic remains. He chose the Huaca Prieta for excavation because it was a preceramic midden.

Unfortunately, Junius Bird did not live to write all of this final report on one of his life's most important investigations. In 1981 he expressed a clear interest to friends and family to go forward with the Huaca Prieta report. Delfin Zúñiga began the redrafting of a

major test pit profile for him. Shortly thereafter his illness and subsequent death on April 2, 1982, cut short those intentions.

During the 35 years between the conclusion of the Huaca Prieta excavations and Bird's death, the nature and significance of the site became well known. Bird wrote two general articles (1948a, 1948b) which described the site and reported some general preliminary results of the excavations. In the next 35 years more than 10 articles would appear relating new evidence from the artifactual analysis carried out on Huaca Prieta material. Since the site yielded large amounts of organic and inorganic material, it was not always easy to find the specific expert capable of commenting on little-known prehistoric species and varieties of such things as fibers or seeds. Bird made numerous loans of Huaca Prieta material to experts throughout several decades, and, although they occasionally did nothing with the collections, a series of reports were written and submitted. Bird carefully filed them in envelopes marked "for final HP [Huaca Prieta] report." Some were published in specialized botanical, museum, or trade journals, but have not been easily accessible to the archaeological community. It took many years to accumulate these reports, and one objective of this publication is to draw the information in them together with the basic excavation data.

The investigations at Huaca Prieta were part of the Virú Valley Project, a multimember archaeological and anthropological investigation of a north coast Peruvian Valley (Ford, 1954; Willey, 1974; Bird, 1977). The general sponsor of the project was the Institute of Andean Research in New York City. Wendell Bennett is given credit for first putting forward the idea of the Virú Valley Project. Bird (1977, pp. 3-4) wrote:

In 1936 Wendell had worked in the Virú Valley and he sensed the potential rewards if the various aspects of its prehistory and ecological setting could be studied in greater detail. The valley was small enough to be surveyed with reasonable accuracy; aerial photographs were available; it was close enough to a major pre-Spanish administrative urban center, Chan Chan, to show influence from there and the cul-

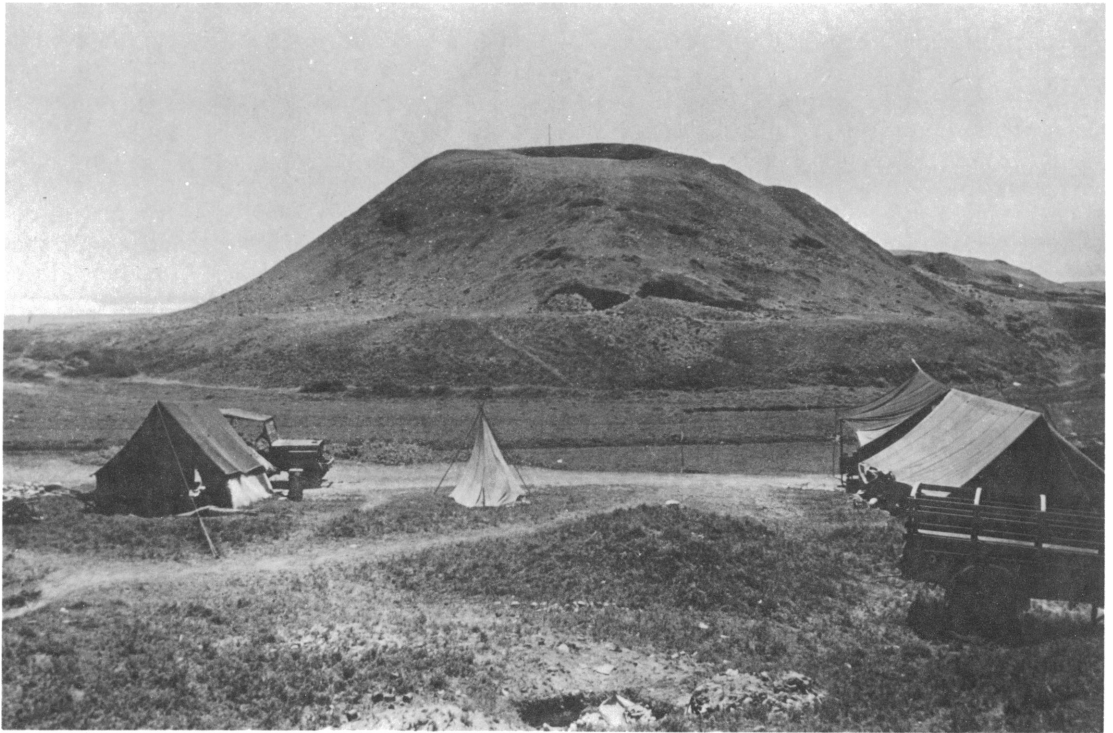


FIG. 1. Foreground: Junius Bird's camp. Background: The south side of the Huaca Prieta.

tural record which preceded it. Wendell discussed his concept with Julian Steward, Gordon Willey, and others, incorporated various suggestions, and won the enthusiastic support of the other members of the Institute of Andean Research. Funding was extremely modest. The Wenner-Gren Foundation supplied enough to the Institute to buy and ship three ex-army jeeps, a freight trailer, and other items to be shared by all participants . . . . The Voss Fund at the AMNH [American Museum of Natural History] covered my field expenses, . . .

We were fortunate in that Dr. Luis Valcárcel was then Minister of Education in Peru and while there was the usual normal delay in obtaining the presidential decree permit (*Decreto Supremo*, March 21, 1946, signed by José Luis Bustamonte, President of Peru, and Luis E. Valcárcel), we had an understanding friend at court. Also, at Hacienda Chiclín in the Chicama Valley we had loyal friends, the Larco family. From the start they did everything possible to assist, made their remarkable archaeological collection available to us, and shared their expertise and intimate knowledge of the region and its archaeology with us. Don Rafael had long before mentioned the preceramic mounds of the

Chicama, and Huaca Prieta and Pulpar, to me, and his brother Don Constante, first drove me to the Huaca Prieta.

Junius Bird was the only participant of the Virú Valley Project whose investigation did not actually take place in that valley. A preceramic midden in Virú had been considered and rejected in favor of the Huaca Prieta, which is located 80 kilometers to the north, in the Chicama Valley. A more complete account of the decision to dig outside of the Virú Valley is found in the chapter on Site Selection and Field Strategy.

On May 17, 1946, Junius Bird, his wife, Margaret (Peggy) McKelvy Bird, and three young sons, Bob, Harry, and Tom, set sail from New York to Callao, the port of Lima. The first two weeks of June were spent in Lima with bureaucratic procedures involving customs, immigration, vehicle registration, and licenses. On June 23 the Birds arrived at the Huaca Prieta and excavation began two days later. They continued on a six-day schedule every week until the end of Novem-

ber. Crews of 7 to 10 men were employed. For the following four months the excavated material was cleaned, reinforced, classified, and then packed. On April 7 the Birds left the site for the city of Trujillo. Junius Bird spent the next seven weeks working with colleagues in the Virú Valley, and then took the Huaca Prieta collections to the National Museum in Lima. On May 29, 1947, Bird and family set sail from the Port of Salaverry for New York City.

Meanwhile, the Huaca Prieta collections, together with others from the Virú Valley Project, remained in Lima where they would be inspected by authorities at the National Museum of Archaeology, whose Director then was Rebeca Carrión Cachot. At that time Peruvian officials chose whatever they wished for the museum in Lima, and authorized the exportation of the remaining materials. The authorization was in accord with the Ministerial Resolution No. 1122 of March 31, 1948. That resolution was signed by the Minister of Education, Oscar N. Torres, in conformity with Law 6634 of June 13, 1929, which was in effect in 1948. Ministerial Resolution 1122 noted that the archaeological work had been carried out under the Supreme Decree (*Resolución Suprema*) No. 1814 of August 3, 1948. It noted that the commission named by the National Trustees of Archaeology (*Patronato Nacional de Archaeología*) had inspected the collections, selected pieces for the museum, and submitted its report. The Ministry of Education then sent ten official communications (*oficios*) to Peruvian and United States authorities advising of Resolution 1122. At that point, the National Museum in Lima sent the collections to the United States.

Much later, when journalists in Lima raised some question concerning the legality of the above matter, the former President of Peru, Don José Luís Bustamante y Rivero, during whose administration the Virú Project worked, wrote a letter to the newspaper *El Comercio* (June 24, 1975) explaining the absolute legality of the Virú Valley Project and the exportation of the scientific material which it recovered. A year after he left Peru, Bird received in New York City those parts of his collections from the Huaca Prieta which had not been selected for safekeeping in the

museum in Lima. "As far as I could tell from my list, they had given me everything I wanted" (1982, p. 17).

Thus began many years of cleaning, restoration, and analysis, principally of lithic, textile, and botanical specimens. This work was carried out in the American Museum of Natural History in New York City, with occasional loans of specific materials to specialists in other institutions. The Huaca Prieta materials are stored in the American Museum of Natural History. Scholars who visit the museum will be able to examine specific artifacts or collections by utilizing the catalog numbers which appear in the text of this volume.

Junius Bird's excavations at Huaca Prieta are notable for many advanced techniques which he employed in the field and which he and others developed for the analyses of materials. Bird's excavation strategy and methods were meticulous and complex, and may be of interest today. The site was the first in South America to be dated by a series of radiocarbon tests. At the time, the excavations recovered some of the earliest evidence for agriculture in South America. The coprolite analysis utilized a new reconstitution method.

For more than two decades, Bird personally supervised the conservation and study of the collection of textile fragments from the site. A full-time research associate, along with National Science Foundation funding, contributed to a comprehensive analysis of thousands of specimens. The use of a computer to aid this effort was an innovation in South American archaeology. Bird devised new techniques to plot textile structure and designs. In 1960, representational motifs were discovered in the twined fabrics. These became, and remain, the earliest corpus of textile art in prehistoric America.

#### ACKNOWLEDGMENTS

The archaeological fieldwork at Huaca Prieta was sponsored by the American Museum of Natural History and the Institute of Andean Research, New York City. The Frederic G. Voss Fund for Anthropology provided financing for field expenses.

In Peru, acknowledgments are extended to

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In the Chicama Valley, a very special appreciation is extended to Don Rafael Larco Herrera and his family, Rafael, Zavier, and Constante Larco Hoyle, and Isabel Larco de Alvarez Calderon, now director of the Museo Rafael Larco Herrera. Special mention is made of Rafael Larco Hoyle who, from the very start of the project, gave his friendship and encouragement, and supplied much camp equipment. He was the organizer and host of the Chiclin conference at Hacienda Chiclin.

Anthropological colleagues participating in the Virú Valley Project were: Wendell Bennett, Donald Collier, Clifford Evans, James Ford, Allan Holmberg, Webster McBryde, Jorge Muelle, Duncan Strong, and Gordon Willey.

The field crew and helpers were: Sr. Marchena, Rosario Gomez, Manuel Gomez, Claudio Barregas, Pedro and Raul Villegas, America, and Elvira Sanchez. Their interest, diligence, and companionship were frequently mentioned by Bird.

Visitors to the site were Mary and John Collier, who made a photographic record, and Enee and Richard Stock, who participated in aspects of the excavations. A volunteer student, Andrew Dingwall, participated for several months.

During the period of analysis of materials at the AMNH (American Museum of Natural History), a large number of people contributed considerable effort. Tora Ogren prepared textile specimens. Joy Mahler Lothrop worked on the initial study and cataloging. Dorothy Menzel and other museum volunteer assistants, Judith Friedlander, Eunice Glenn, and Bruce Tapper worked on analyses. Bella Weitzner did the first proofreading of Bird's manuscripts. Nicholas Amorosi drew most of the textile illustrations, basing his work on plottings and drawings by Junius Bird and Milica Skinner. Gary Vescelius prepared some charts and worked on profiles and dates. Glen Ruby prepared skeletal remains. Joe Brown took aerial photographs of the

mound. Owen Henderson provided support and consultations for the computer analysis. The National Science Foundation supplied funds for that analysis. Delfin Zuñiga worked on profiles. In a manuscript introducing the Textile Code, Junius Bird wrote that "if future archaeologists are as lucky in their associates, they can count themselves fortunate."

In 1981 the members of the Junius B. Bird Committee at the American Museum of Natural History (Margaret Bird, Robert Bird, Barbara Conklin, Craig Morris, and David Hurst Thomas) decided that the Huaca Prieta materials should be published. The work was initiated in February 1983, and completed in May 1984. Many people contributed to the publication effort. Robert Bird proofread with care, and made major contributions to the texts of the botanical chapter and the section on the excavations north of the mound. Harry Bird donated an Apple word processor, and supplied computer advice. Tom Bird organized the Huaca Prieta motion picture archive. The names and contributions of a number of specialists who identified or analyzed botanical, shell, and bone materials are noted in the respective chapters.

At the American Museum of Natural History, many people aided the publication effort. Museum volunteers included Lynda Fielkoff, who arranged much of the information on burials, and Stephanie Gartner, who reduced and produced textile charts. Nicholas Amorosi drafted profiles, and continued his drawing of textile designs. Barbara Conklin maintained the best possible working conditions. Paul F. Beelitz and volunteer Francine Flynn cataloged thousands of botanical specimens. The textile conservation specialists Vuka Roussakis, Cynthia Weinstein, and Janet Strom aided with the preparation of fabrics.

Stuart Rockefeller made a thorough study of the distribution of textile traits and other artifacts. Chapter 15 is in great part the result of his work. A special thanks is extended to the archaeologist Robert Feldman, who, as a reader of this report, made helpful suggestions.

The Junius B. Bird Committee thanks Ms. Brenda Jones, editor of scientific publications of the American Museum of Natural History,

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## CHAPTER 2. THE PHYSICAL SETTING

### PRESENT-DAY CONDITIONS

The Huaca Prieta is a preceramic midden resting on the northern side of the Chicama River on the north coast of Peru (fig. 2). It is a flat-topped, roughly oval mound about 125 m long, 50 m wide, and 12 m thick. The midden's top reaches a height of about 18 m, including a rock conglomerate base about 6 m thick. The Pacific Ocean is now about 122 m to the west.

The rock shelf on which the mound rests is approximately 4 km long from north to south, and has a roughly triangular shape which rises above the irrigated terrain and therefore appears on aerial photographs as a white desert plain with cultivated or humid land on the north and east, and the Pacific shoreline on the south and west. The low, triangular desert plateau north of the Huaca Prieta is covered with the refuse and structures of later ceramic-period structures and cemeteries (fig. 3). Two tall constructions, the Huaca Cortada (El Brujo) and the Huaca Blanca, lie 2 km and 1.5 km, respectively, to the north.

The location of the mound (77°19'W, 7°55'S) is 17 km southwest of the Pan American Highway where it passes the Hacienda Chiclín, once owned by the Larco family, well-known Peruvian archaeologists. At the time Bird worked at the Huaca Prieta, Don Rafael Larco Herrera and his sons Rafael, Constante, and Xavier managed the estate. The nearest present-day communities are Magdalena de Cao, 6 km to the north, and the Hacienda Cartavio, now a cooperative, 9 km to the east. The current location of the mouth of the Chicama River is 3 km southeast of the Huaca Prieta. The Chicama Valley is one of the major cane-growing areas of Peru, and is famous for its production of sugar and rum. Regions of coastal desert separate the Chicama from the Moche Valley to the south and the Jequetepeque (Pacasmayo) Valley to the north. The coastal plain is approximately 30 km wide in the Chicama region. Inland, the Andes Mountains rise abruptly to altitudes above 4000 m. There, the Chicama River originates among mountain peaks, a region now free of glacial ice but where rain-

fall creates the water discharged by the Chicama River.

Bird was concerned with the paleoenvironment of the Huaca Prieta, and discerned two important events which were highly significant for understanding its past structure, cultural characteristics, and modern form. The first was a limited coastal uplift which appears to have taken place prior to and after the first excavated occupations of the mound (3100 B.C.). The second was a tidal wave which occurred after the preceramic occupation during Cupisnique-Chavín times (A.D. 900). The following is a discussion of the logic and evidence for these events.

### COASTAL UPLIFT

Bird wrote (1948b, p. 300):

We found that the entire western face [of the mound] had been eroded away by waves cutting back the underlying conglomerate rock. This obviously happened during a period when the relative level of the land and sea remained constant . . . . Subsequently, a slight coastal uplift raised the base of the line of these [shores] above the storm level, and they are now, for the most part, protected by more recently formed beaches. Had this uplift not occurred, the Huaca Prieta, as well as many other sites next to the shore, might have been completely destroyed.

Bird noted that wave-cut cliffs were visible in close proximity to the present beach along great extensions of the Pacific coast, and that other mounds, such as the midden Milagro some miles to the north, had steeply eroded western slopes due to the cutting of the underlying conglomerate by wave action (1948a, p. 22). In his fieldnotes (nb. B, p. 1) Bird estimated that "5 m may be a safe estimate for maximum possible uplift since the first occupation, and 3 m the probable minimum." Elsewhere he noted (nb. B, p. 14):

[The] west side of the midden in its present condition is roughly parallel to [the] present beach. At low tide an outcrop of the conglomerate is awash just outside of the sand. The presence of this outcrop accounts for the jig in the coastline at this spot. Conceivably there was

# HUACA PRIETA, CHICAMA VALLEY, PERU

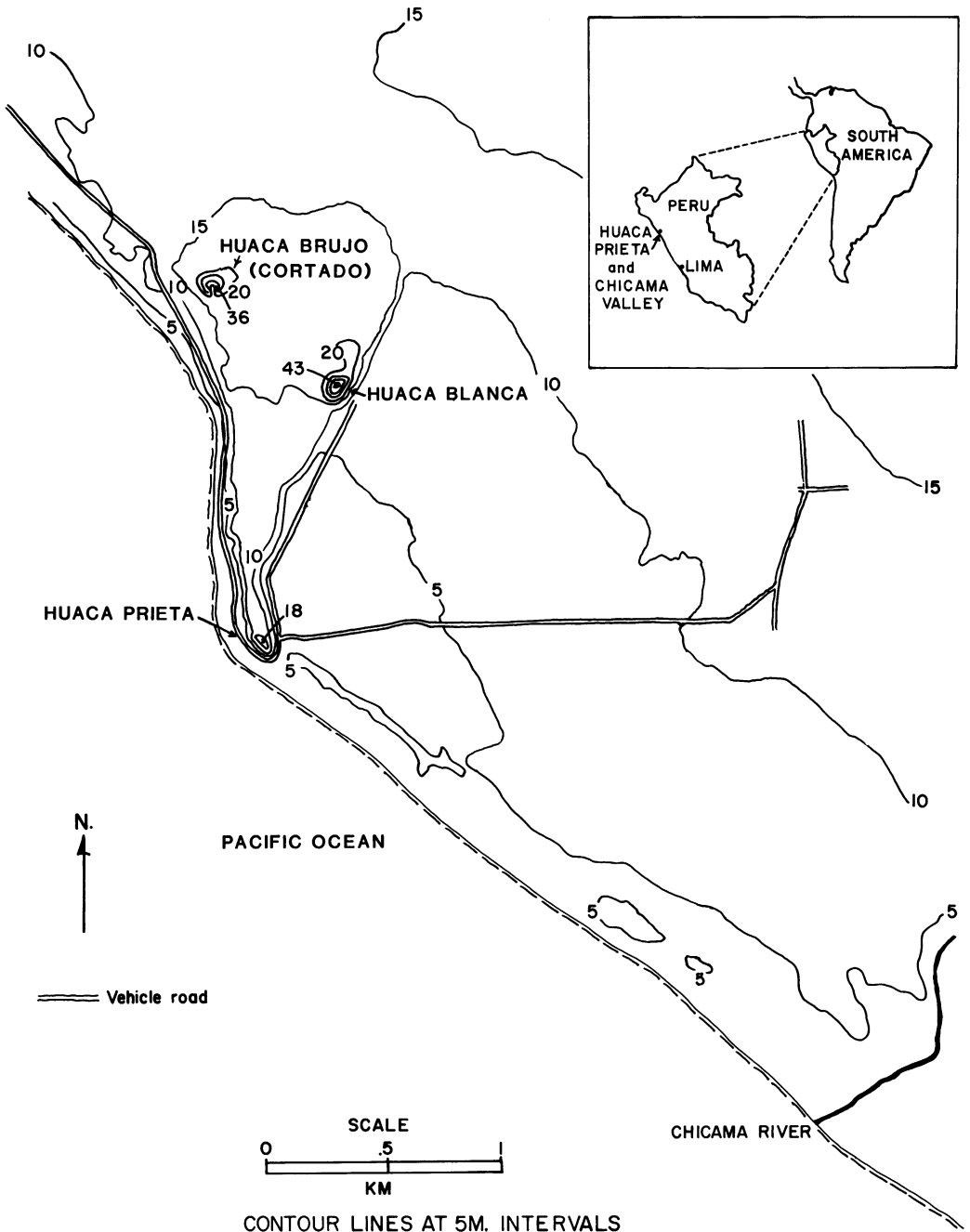


FIG. 2. The Huaca Prieta and surrounding area.

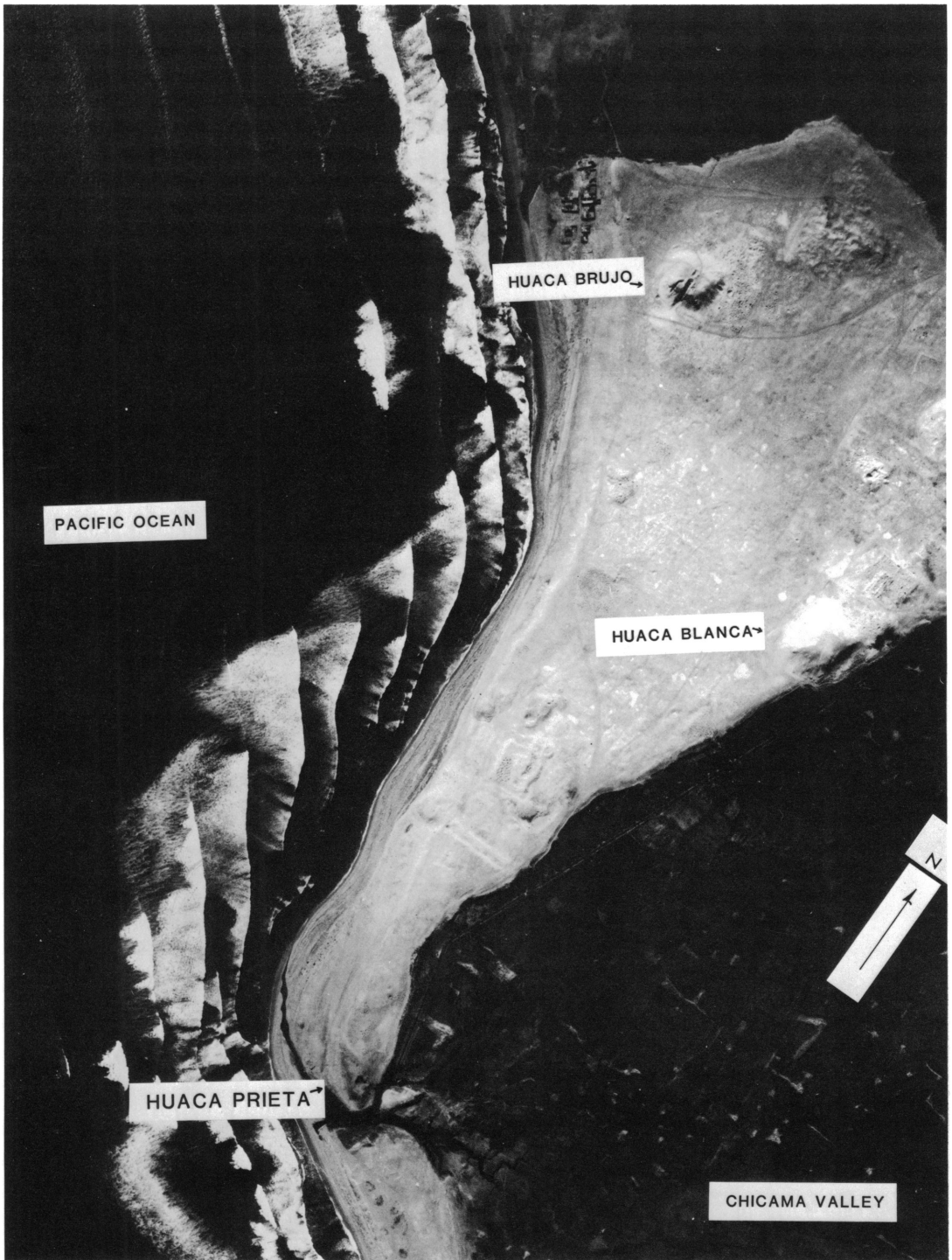


FIG. 3. Vertical aerial view of the Huaca Prieta. Servicio Aereofotográfico Nacional, Lima, 1943, no. 171-207.

SECTION DIAGRAM OF THE HUACA PRIETA  
VIEW TO NORTHWEST

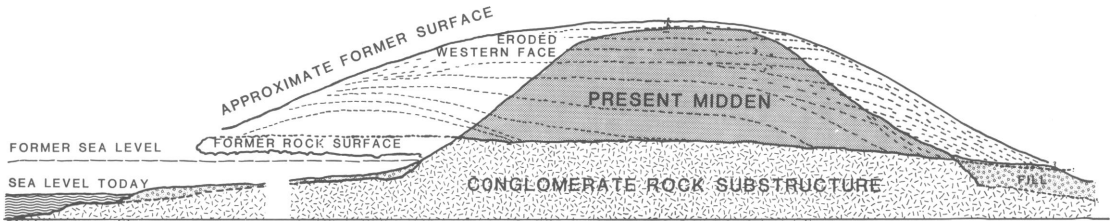


FIG. 4. Structure of the Huaca Prieta.

formerly a low heartland or point of this rock giving greater protection to the shore [more] immediately north than it enjoys today. Continuous wave action has cut this down to its present level. Some slight uplift must have occurred otherwise the rock along the west edge of the midden would still be effected.

Additional evidence for coastal uplift was discovered in the stratigraphy of Test Pit 2 (see Chapter 4, Excavation Information—Test Pit 2). There, the lower layers of the excavation were inclined upward to the west (fig. 19) as observed in the profile of the test pit's southern face. This suggested that part of the midden once existed outside the western eroded face. Bird observed that wave action when the mound was lower probably destroyed not only the western part of the mound, but its underlying shelf of conglomerate rock matrix (fig. 4).

More evidence for uplift was observed by Bird when he reached the bottom of Test Pit 3 and excavated into the sterile rock matrix at the bottom of the pit. His fieldnotes (nb. B, pp. 45–46) record:

The yellowish soil which is primarily the decomposed matrix [became] harder. This had to be removed with drills and sledges. But even at the bottom of the pit the matrix was stained and not white as exposed in the first [East-West exploratory] trench. This alteration of the basic conglomerate I believe occurred before occupation and can be taken as evidence the conglomerate lay exposed for a long time before the occupation. This is interesting as this surface is only about 5 m above the present maximum high water, and fixes maximum possible coastal

uplift since the beginning of occupation here as something less than this.

Much later (tape, 1982b, and its transcript pp. 1–2) Bird suggested that the coastal uplift may not have been as great as his early estimates. He indicated that it was 1.5 m or more and related that observation to the implications of an uplift for early agriculturalists who probably utilized the terrain to the east of the mound. Bird's logic for this involved observations about that zone which, when he worked there, was

rather swampy ground in places with little streams carrying off drainage water. One immediately at the south end of the Huaca Prieta dries up periodically. Larger ones further north seem to carry drainage water all the time. Well, that ground water to the east is not good for much in the way of agriculture. The Indians in the past must have been troubled by concentrations of salt on the surface. And they [present-day owners] have scraped the surface dirt and piled up small mounds which are highly saline. Quite a good many of those have been bulldozed away today. But that did no good. Wherever they spread them out they couldn't raise anything. Now, when people first started to live at Huaca Prieta there had been a recent uplift of the coast. That uplift must have amounted to at least a meter-and-a-half, if not more, and when it uplifted, ground water dropped—probably when people first came [occupied the site]. In other words, the location must have been appreciably better for simple agriculturalists in their being able to raise things on the surface of the ground—have the salt flush off with summer run-off of water, and give them no problem.

The East-West irrigation canals now present to the east of the Huaca Prieta were not present when Bird worked there. At that time there was a drainage canal which almost constantly carried water beside the triangular dry plateau on which the Huaca Prieta was located.

### THE TIDAL WAVE

Sometime after the preceramic population abandoned the Huaca Prieta, probably during Cupisnique times (around A.D. 900), a tidal wave struck the mound and altered some of the Preceramic and Ceramic Period remains in and near it. The wave also had an effect on the general structure of the mound and the stratigraphy which Bird found in his exploratory trenches and in Test Pit 3.

The most apparent evidence for the tidal wave was a layer of hard, consolidated beach gravel and cobbles free from any evidence of human occupation. This layer was clearly visible in the North-South exploratory trench (fig. 11) and composed layer B in Test Pit 3. Bird at first thought the cobblestone layer had been spread over the area by people for some "inexplicable reason." After a more careful examination of the layer, and the accumulation of other types of evidence, he decided it had been left by a tidal wave. He described the discovery of the layer (tape, 1982b):

As we deepened our [N-S exploratory] trench, we began to run into a lot of beach gravel—gravel identical in its ranges of size and material with the gravel on the west side of the Huaca Prieta, forming the beach. At first I was puzzled why anyone would bring what proved to be literally tons of this gravel from around the west shore and dump it against the base of the mound. The more we exposed of it, ultimately exposing a lot in what was to become the wheelbarrow trench, the mystery deepened. What in the name of goodness could this be? And it was all fairly clean gravel, no different at all from what lies on the beach. And then it dawned on me that it might have been a tidal wave. If a tidal wave had struck that coast, the plateau of the Huaca Prieta, and the Huaca Prieta itself would force the water around the south end of it. And apparently this was a dilly of a tidal wave and it carried a great quantity of gravel with it, and then with the run-off of the water this had washed up against the side of the huaca and was deposited there.

Additional evidence for the tidal wave was found in a house reutilized for burials on top of the mound. In the house there was a layer of water-deposited silt which suggested that water had actually passed over the entire midden (tape, 1982a):

So I worked [on top of the mound] until we got these skeletons all brushed free and then I discovered that over the surface of that floor and in parts of the bones was a fine dry, mud silt. Now if the source had been rain, there's nothing about the composition of the Huaca Prieta that would provide a brown, fine silt to wash down on the floor and onto the bodies. And it seemed to me logical that the tidal wave, in coming back down the valley, had completely swept over the huaca—and that there was some sort of a little opening down into that tomb. Now a lot of that muddy water had gotten down in there. You can't prove this, but there was no other source for fine, brown silt. So from everything that I saw, there wasn't any question that there had been a tidal wave . . .

Yet another burial supplied evidence for the tidal wave, and helped to date the inundation. In the N-S exploratory trench, burial 99.1/867 rested beneath the sterile cobblestone layer. The burial had been disturbed by water. Stones had fallen into the chamber, and the skeleton had broken apart and was "out of order." The grave could be dated by the presence of a bone artifact "with a figure on it that looks like Cerro Sechín. In other words, it's apparently Early Cupisnique" (tape, 1982b). Since the wave-deposited cobblestone layer rested over the grave, Bird concluded that the wave had taken place after Cupisnique influences had arrived at the site. Still more evidence for dating the wave came from Bird's excavations of a wall with Cupisnique ceramic associations in Test Pit 5, in the area north of the mound.

The wall that I suspect may have been sheared off by the wave was of conical Cupisnique adobes, and sherds of that type were in the fill at the base of the wall. This fill, slowly built-up compact debris, had preserved the lower section of the wall which rested on a house wall of the initial Ceramic Period. After the upper part of the conical adobe wall had been carried away [by the wave], and the remainder weathered flush with the surface, a preceramic-type subterranean house was constructed. The excavation [in building the house] cut down through the con-

ical adobe wall. Refuse in the house and in the debris over it is classic Cupisnique. This could mean that the tidal wave occurred sometime after the Chavín-Cupisnique people were well established, but long before the end of that period. (letter, 1981)

Bird found additional evidence for the tidal wave in stratigraphy exposed by the Chicama River near its mouth to the southeast of the mound (Bird, 1948b, pp. 229–300). There,

his examination of a section cut by the river in the valley bottom revealed a layer of cobblestones and gravel similar to that observed at the Huaca Prieta. The section exposed a rising layer of subsoil, and “all up over that subsoil is a nice big layer of those beach cobbles washed way in, and subsequently covered by wind-blown dirt from the beach and other debris” (tape, 1982a).

## CHAPTER 3. SITE SELECTION AND FIELD STRATEGY

Junius Bird's part in the Virú Valley Project was to investigate that area's earliest sedentary inhabitants. The concept of a coastal Preceramic Period was poorly understood, if at all, at that time (Moseley and Willey, 1973). Bird was one of the few archaeologists who had had experience excavating coastal preceramic middens. His experiences in north Chile (1943) gave him some criteria for evaluating such sites and selecting one for comprehensive excavation.

Bird knew about the Huaca Prieta well before he ever saw it. Don Rafael Larco had told him in New York City about mounds without pottery in the Chicama Valley (fig. 5). Moreover, an examination of coastal aerial photographs had suggested a site at the location of the mound (P. Bird, personal commun., 1983) (fig. 6). However, before he went to the Chicama Valley, Bird studied the potential sites in the Virú Valley. One had already been tested by the archaeologist William Duncan Strong.

One site where Strong dug early in the season was the Huaca Negra near the fishing village Guanape. Test pits revealed that this was an occupation mound built up in large degree by windblown sand. The latest occupation was in Chavín times, with this material resting on what one would now call Initial Ceramic Period debris and which Strong designated as "Guañape" culture. This in turn rested on preceramic material. . . . When I first visited Virú, Strong and Evans' pits were still open so I could see the nature of the deposit and the evidence of occupation. This was most discouraging, for there were only vestiges of such perishable material as textiles, and the yield of any artifact per cubic unit was very low. The reason is simple for, as mentioned, the deposit has a high wind-blown sand content, it rests on a sand base in which ground water level fluctuates annually. The same proved true of the two other preceramic deposits (314 and 315) and, as these were the only big sites of this period in the Virú, it was discouraging.

In contrast, when Constante Larco drove me down to the Huaca Prieta in the Chicama we found it to be pure occupational debris resting on a conglomerate rock outcrop well above any influence of groundwater. The result was almost maximum-quality preservation for an open site, and within about twenty minutes we concluded

that this would yield far more information than the Huaca Negra could possibly produce. (1977, pp. 7-9)

Once the site had been selected, Bird devised a scheme for excavating it. "One of the important things about understanding the excavations at the Huaca Prieta is to understand the strategy used in planning the work" (1982, p. 1). Bird's major efforts were devoted to excavating three exploratory trenches, three test pits, and several house units in or very near the mound. The first excavation was the East-West Trench on the north side of the Huaca Prieta. It went from the low valley bottom up onto a saddle on the mound (see fig. 5). Bird explained that the main purpose of this trench, and the accompanying Test Pit 1 (HP 1), was to train his workers (1948b, p. 299). Neither the trench nor the test pit are in the mound proper, but just outside its northern edge. The debris in the East-West Trench was very consolidated, "so hard that it can be broken with a pick only with difficulty" (diary, 6/25/46). Bird then turned his trench southward toward the center of the mound and found somewhat softer material. This is designated the North-South Trench on the maps, although in the field notes it is sometimes designated South Trench. The North-South Trench eventually extended up to the top of the mound and would form the western side of the Test Pits 1 and 3 (HP 1 and HP 3).

By June 27 Bird had outlined the block of Test Pit 1 at the northern side of the Huaca Prieta. His excavation techniques for a test pit involved cutting exposure trenches from around a block of stratified debris, and then removing the strata layer by layer. He described this technique in the report of his excavations in north Chile (1943, p. 181):

When possible, narrow trenches were cut to expose four sides of a block of midden refuse which was then sifted, layer by layer, following the most obvious strata lines. The layers removed generally averaged twenty-five centimeters in thickness, with a minimum of ten centimeters. Where a single layer increased to over forty centimeters in thickness, the thickest part was subdivided into two or three layers. As an aid to the workmen, the debris to be removed

# THE MOUND HUACA PRIETA AND AREA TO NORTH

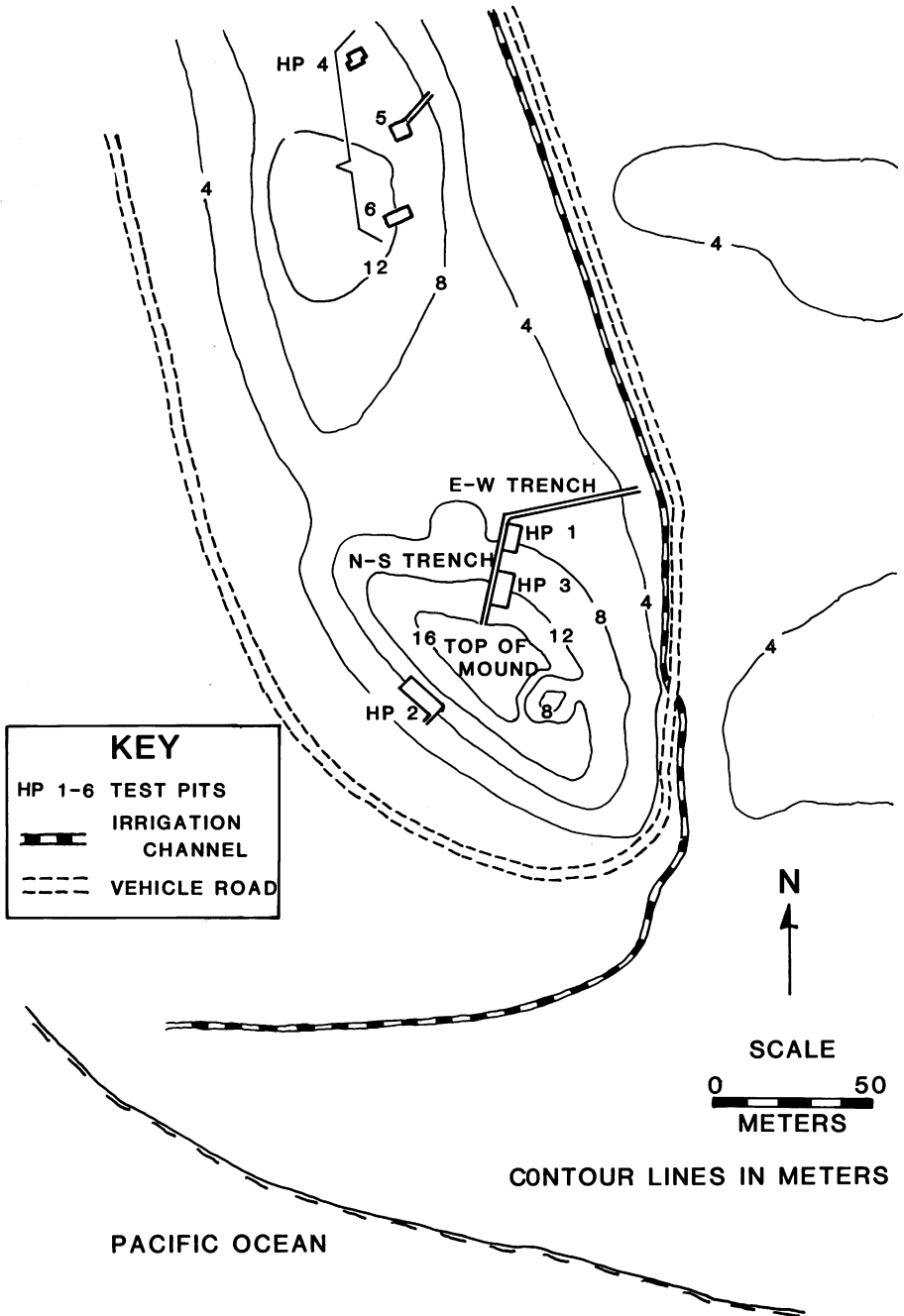


FIG. 5. Map of the Huaca Prieta and area to north.



FIG. 6. Oblique aerial view to north over the Huaca Prieta. (Joe Brown)

from each level was marked with short pegs driven into the refuse along the strata lines.

The refuse was sifted on a quarter-inch screen sifter set at an angle of about forty degrees against a pier or abutment placed wherever the refuse could most easily be brought by wheelbarrow. A sifter measuring one by two meters was found adequate for the type of dry refuse encountered.

The system is necessarily slow, though it enables one to secure nearly maximum accuracy of results with an untrained crew. The time taken to sort the debris from the sifter sets the pace for the work and limits the number of men who can be profitably employed. In working a really large portion of a midden of this type, two or three such sifters could be used without danger of increased error, provided the men were reasonably careful and the foreman adequately trained.

The work at Test Pit 1 continued for nearly three weeks, with two workers cutting out strata. Two others ran the wheelbarrows while two worked at each sifter (diary, 7/2/46). The sorting and bagging was the most laborious task, which also took up time on Sundays when the workers were off (fig. 7). Peggy Bird often worked with the sorting operations.

Bird invented the dump sifters he used, and considered them far more efficient than the sifters used by many archaeologists. The dump sifter was utilized by him from 1936 onward, and he published a complete description of it and how to use it (1948, 1980). One of the many advantages of the dump sifter was that "a certain percentage of the objects small enough to pass through the openings will slide down into the sorting area." Bird recommended a metal screen with openings "just over one-quarter of an inch square." The mesh should be the type hot-dipped in zinc after it is woven. "As a matter of policy one should have as an adjunct, smaller, finer mesh hand screens to periodically check samples of the sifted dirt for small items which may have passed through the screen."

During the excavation of Test Pit 1, work continued on the North-South Trench. On July 9, 1946, the field diary noted: "At the bottom of the trench that runs south into the mound we are finding many pieces of cloth similar to the few scraps we found in the oldest material in north Chile—not woven,

but made by twining cotton strands. No pottery or corn, but many gourd fragments. Also, fragments of netting." As the North-South Trench neared the top of the mound, two tomb-houses were opened. They were similar to adjacent houses.

By July 16 the North-South and East-West Trenches and Test Pit 1 were completed and work began on the western face of the mound. That excavation would be Test Pit 2 (HP 2), and its accompanying exploratory trench. Bird chose its location on the basis of a number of factors he had observed. He wanted (1948a, p. 22) to take advantage of the erosion of the west side of the mound to examine the lowest strata with a minimum of excavation. Since the western face was eroded, Bird located the surface of the conglomerate rock base of the mound with an exploratory trench which was then used as the south side of his Test Pit 2. He was able to calculate the placement of the trench to expose only the lowest strata because the earlier work on the north side of the mound demonstrated that a rock base underlay the mound, and that its height was some 5 m above the nearby vegetation. Bird wrote (1948b, p. 300): "We made this test because I was somewhat in doubt as to whether or not we would be able to remove an adequate sample of the debris from near the bottom by cutting down through the total depth of the deposit."

On July 31, 1946, Bird began the excavation of the largest of his test pits. Named HP 3, it rested on the north face of the mound on the eastern side of the North-South Trench. It was 7 m south of Test Pit 1 (HP 1). Bird's previous excavations had exposed the top and bottom strata in the mound. Now the objective was to excavate a stratified deposit from top to bottom. He avoided placing the pit on the top (central part) of the mound because he knew that the subterranean structures there would confuse the layers.

[I] had found that its [the mound's] upper half was filled with a complicated mass of small subterranean structures. In constructing them, the builders necessarily distributed the stratified debris, mixing artifacts of different ages. To secure accurate chronological data on specimens in such a situation would have required far more time than we could spend. Therefore, as the best place



FIG. 7. Junius Bird examining textile, botanical, and cordage specimens at the Huaca Prieta. (John Collier)

for our main excavation, we chose the part exposed by our first exploratory trench. This was on the northern side of the hill, beyond the subterranean structures, where trash had been dumped more or less continuously and lay undisturbed. Accordingly we opened a pit (HP 3)

36 ft long and 16 ft wide with a wheelbarrow trench leading out to the sifters. (1948b, p. 301)

Work continued on the large HP 3 test pit until September 25 when the bottom layers were removed.

Excavations in the Huaca Prieta mound revealed it to be a place abandoned prior to the use of ceramics. Bird therefore looked for a nearby location which "might reveal something of the subsequent record" (1948b, p. 335). Some of that record was then located in shallower refuse, Test Pits 4, 5, and 6 (HP 4, HP 5, and HP 6), located more than 100 m to the north of the mound (see fig. 5). He later regretted the HP (Huaca Prieta) designation given to those excavations since they were not in the mound or *huaca* proper and "people assumed that what came out of those, came out of the *huaca*, which is definitely not so" (1982, p. 8). These excavations produced primarily Cupisnique (coastal Chavín) and Initial Ceramic Period pottery. They will be dealt with very briefly in this report since they are not directly related to excavations in the Huaca Prieta or to the topic of the coastal

preceramic. The field notes with the excavation data from these test units are located in the Junius Bird Laboratory of South American Archaeology at the American Museum of Natural History. Test Pit 4 was begun on September 26, 1948. By mid-October work began on Test Pit 5. Soon thereafter, Test Pit 6 was opened, and on November 25, 1946, this final excavation was concluded.

From October 22 to November 4, John and Mary Collier visited the site and took photographs of the excavations. A number of the photographs by Collier in this report were taken at that time.

Junius Bird filmed aspects of his fieldwork with 16 mm color film, and produced an hour-long silent motion picture. In 1983 a videotape copy was made, dubbed with Bird's voice. These are stored at the American Museum of Natural History in New York City.

## CHAPTER 4. EXCAVATION INFORMATION

This chapter describes the stratigraphy and archaeology found in the excavations at Huaca Prieta. The two long exploratory trenches are discussed first, then Test Pits 1, 2, and 3. Finally, the excavations on top and to the north of the mound are described (figs. 8, 9).

### EAST-WEST (E-W) TRENCH

This was the first excavation by Bird at the Huaca Prieta. It was deliberately placed just outside the base of the mound on its north side. It was dug with the intention of exploring the subsurface of the rock on which the mound rested, and to train the workers, none of whom had ever worked with a professional archaeologist.

The trench was about 80 cm wide, large enough for a wheelbarrow to pass, and 43 m long (fig. 10). Some Gallinazo (negative-painted) sherds and the remnants of a stone wall were found. The bottom layer of the west end of the trench revealed a cobblestone layer that bore no artifacts. The cobblestones were mixed with sandy dirt and rested over a freshly eroded white conglomerate base. That same base was stained and decomposed under the Huaca Prieta proper. No preceramic layers were exposed by the trench (nb. C, p. 39).

### NORTH-SOUTH (N-S) TRENCH

The main purpose of this excavation was to explore the structure of the mound itself. Like the E-W Trench, it was 80 cm wide, the width of a wheelbarrow (fig. 11). In Bird's field notebooks this trench was originally designated South Trench. This N-S Trench revealed that the cobblestone layer found in Test Pit 1 (HP 1), and in the E-W Trench overlay some of the north side of the mound. Cutting through the cobble deposit, Bird found debris below but no pottery (nb. A, p. 11; nb. B, p. 12).

Two samples were removed from the trench and sifted to learn what kind of yield could be secured in that part of the mound (nb. A, p. 47).

Sample I was located in the pottery-bearing debris above the cobblestone layer, and included parts of layers D and E which contin-

ued southward from Test Pit 1. The sample was taken from a point 3 m south of the southwest corner of Test Pit 1 and extended southward close to Sample II. Sample I produced a cache of hanks of unused *junco* rope made into a single bundle and wrapped in mat fragments. This was found in a continuation of Test Pit 1's layer D, in a shallow hollow just above the cobblestone layer. A sample (#323) of this rope produced an uncorrected radiocarbon date of  $2632 \pm 300$ .

Sample II was taken from beneath the cobblestone layer, much of it to the west of the area later occupied by Test Pit 3. The sample was removed in three parts: top, middle, and bottom (nb. B, p. 46). These layers were later plotted in relation to the layers observed in Test Pit 3 (HP 3). That plotting showed that the top sample included parts of the cobblestone deposit, and parts of Test Pit 3's layers C, D, and E. The middle incorporated parts of the cobblestone deposit and layers C, D, E, F, G, and H. The bottom held small amounts of layers I, J, and K. Sample II demonstrated that prepottery debris rested beneath the cobblestone layer, and that much perishable material was present in "a condition much better than anticipated. Twined fabrics like one from Quiani, Arica, [were] abundant. Plant remains (rush and totora) [were] common. Range of artifacts [was] meagre" (nb. B, p. 11). Sample II also revealed that the strata within the mound were rather steeply inclined (fig. 12).

The N-S Trench was too narrow to attempt to safely reach the bottom of the stratified debris where the mound was higher. Reaching the lowest layers of the mound would require a large excavation unit, and Test Pit 3 (HP 3) on the east side of the trench would later achieve that goal. The N-S Trench was

4.67 m below the surface at the deepest part without reaching subsoil. It showed that the sherd-bearing material of Test 1 tapers to nothing in against the mound slope, that the sterile cobblestone and pebble layer also tapers and disappears as it rises on the slope, and that beneath this there is the prepottery refuse of the mound proper. The upper or southern end of this cut [trench] exposed what remains of a re-

# HUACA PRIETA

## TRENCHES AND TEST PITS

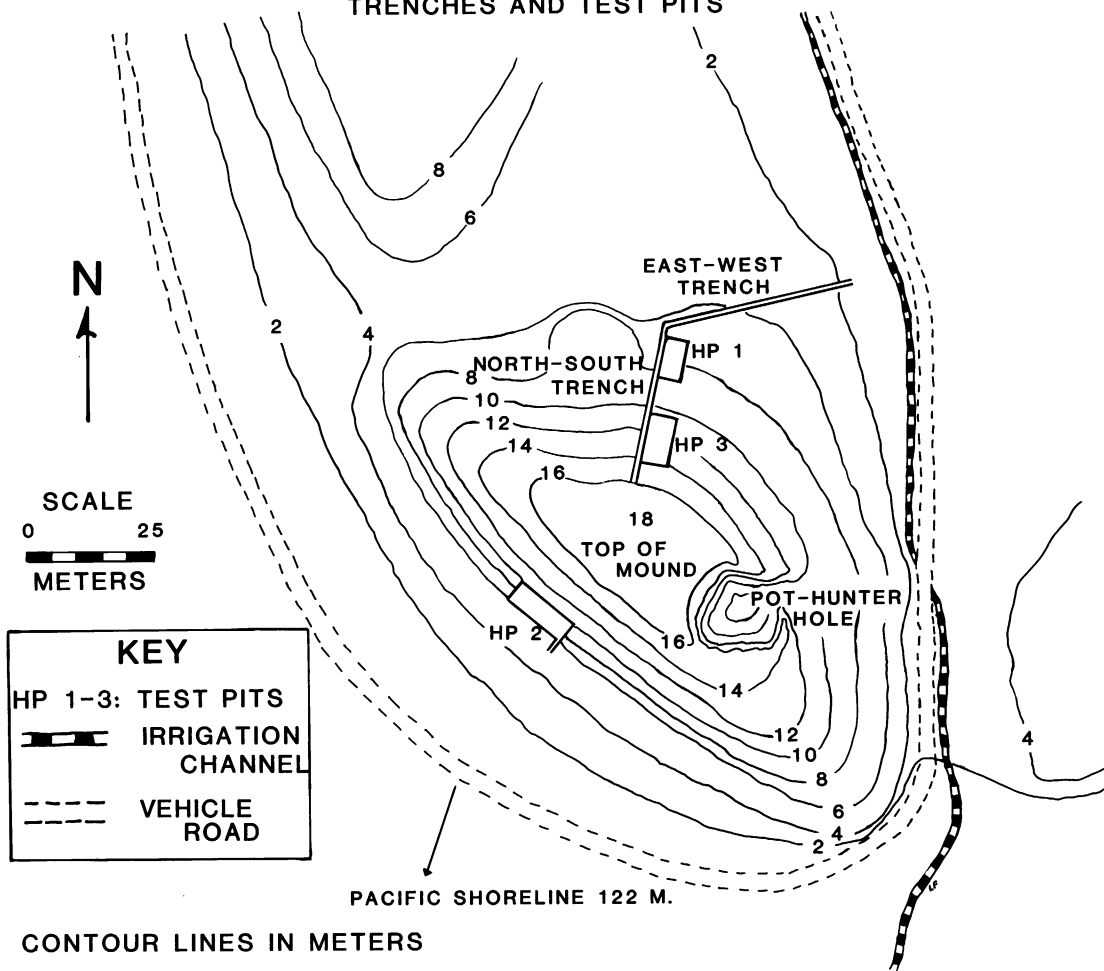


FIG. 8. Map of the Huaca Prieta.

taining wall encircling, or at least crossing, the northern part of the mound. (nb. B, p. 30)

The N-S Trench and holes made by treasure hunters show that the top of the mound

is a mass of walled structures, obviously subterranean, imbedded in gritty grey ash and refuse but with relatively little perishable debris. The construction of these structures has obviously altered the stratigraphy [there] and their presence makes any separation of strata difficult. (nb. B, p. 30)

### TEST PIT 1 (HP 1)

A block of debris 8 m long and 3 m wide was exposed on four sides by trenching, leaving a narrow portion intact across the trench at the northeast corner to serve as a wheelbarrow run. The North-South Exploratory Trench ran along the western side of the test pit, and the East-West Exploratory Trench ran 2 m to the north of it. Sectional data were taken on the east and west side of the excavated block. The accompanying profile is of



FIG. 9. Oblique aerial view to south over the Huaca Prieta and area to north. Test Pit 3 is visible on the mound's face (left). Test Pits 4, 5, and 6 are visible on the bank to the right. (Joe Brown)

the western side (fig. 13). It varies only slightly from that on the eastern side. The stratigraphy of this test pit is described below because it was significant in Bird's understanding of the structure of the mound and the development of his excavation strategy. Test Pit 1 yielded only ceramic-associated artifacts. These are not described in this report on the preceramic occupation of the mound.

#### THE LAYERS (nb. B, pp. 4–10)

A. This surface layer was composed of wind-drifted sandy dirt from the mound.

B. Salt-hardened clay-lined cavities began to appear in this layer. A clay floor, 2 to 5 cm thick, was found in the central part of the layer.

C. The layer was subdivided into two parts, C1 and C2, in the southern part of the test pit where it was thickest. An additional subdivision, C3, composed the central and

northern parts of the layer. A number of clay-lined cavities and one large, intact ceramic jar occupied much of C1 and C2 (see observations on the jar and cavities below) (fig. 14).

D. The layer was divided into two parts, D1 and D2. The southernmost part, D1, was badly disturbed by clay-lined cavities and was therefore separated from D2. Some cobblestones were present in this layer.

E. This layer was composed of a thin accumulation of dirt and refuse, mostly gray debris, and sand blown from the top of the mound. The bottom of a large pottery jar was found in layer E on its north side. As with layers C and D, the southern part of layer E was isolated from the central and northern part.

F. F was a small hollow in the surface of the cobblestone layer beneath E. F was not a layer.

Below E. A combination of cobblestones

# EAST—WEST EXPLORATORY TRENCH

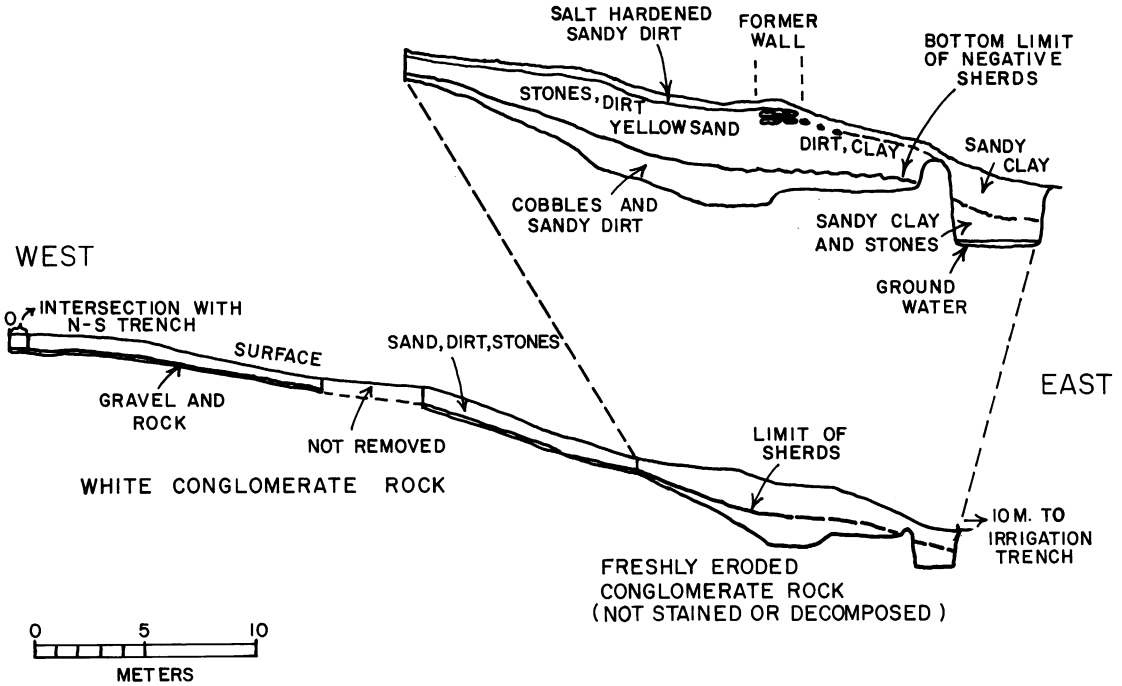


FIG. 10. Profile of East-West Exploratory Trench.

in a salt matrix was found below layer E. The layer contained little dirt and its cobble deposit was irregular on the surface.

### OBSERVATIONS

The vertical lines running through the profile in layers C and D on the south side of the excavation unit indicate the area disturbed by the presence of storage pits on the test block's southern side. These disturbed strata were not mixed with the layers in the central and northern part of the test pit. There was some disturbance by pothunters on the northern end of the pit above the pottery jar bottom found in layer E.

**Pottery Jar:** The mouth of this large jar was covered with small sticks over which was a piece of matting. There was nothing inside

the jar, not even dirt. The jar was 70 cm wide at its broadest point.

All the layers above the sterile cobblestone layer were pottery-bearing. The greatest concentration of sherds per cubic meter was in layers C and D.

**Clay-lined Cavities:** Six clay-lined cavities were excavated. Their locations at the division between units C1 and C2 are illustrated in the Plan View diagram of Test Pit 1 (fig. 13). Their approximate dimensions (depth and width in cm) were: 1. 70 × 50; 2. 53 × 40; 3. 90 × 60; 4. 50 × 45; 5. 58 × 50; 6. 90 × 57; 7. 50 × 95.

The clay walls of the cavities were a maximum of 5 cm thick. Cavity no. 1 was slightly outside of the excavation block in the west wall of the North-South Trench. The cavities were storage pits. "The contents of the pits

## NORTH-SOUTH EXPLORATORY TRENCH

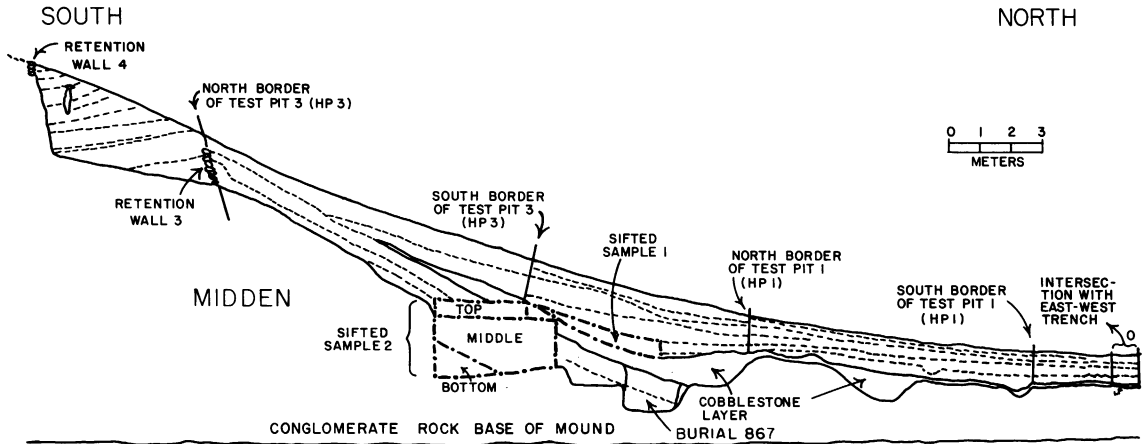


FIG. 11. Profile of North-South Exploratory Trench.

are limited to dry loose trash not all made and used at any one time” (nb. A, p. 8). The debris included textile fragments, sherds, gourd fragments, stone tools, maize cobs, and cordage.

All layers of Test Pit 1 produced Gallinazo (negative-painted) sherds. Textile specimens totaling 358 were of the following techniques: 316 woven, 6 twined, 6 netted, and 10 looped.

### TEST PIT 2 (HP 2)

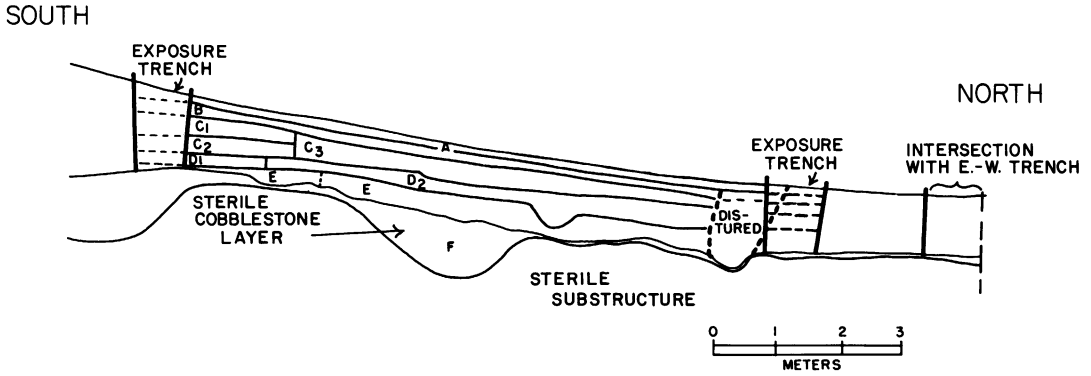
“We made this test because I was somewhat in doubt as to whether or not we would be able to remove an adequate sample of the debris from near the bottom [of the mound] by cutting down through the total depth of the deposit” (Bird, 1948b, p. 300). Test Pit 2 not only removed some of the mound’s lowest strata, but tested the consistency of the debris to evaluate the possibility of a larger, deeper excavation (Test Pit 3). This was achieved by taking advantage of the erosion on the mound’s steep western face.

One proof of the erosion on the mound’s western face was that the strata in it were visible. Small pot hunters’ holes in the face seemed to indicate that those layers ran into the mound horizontally rather than with a

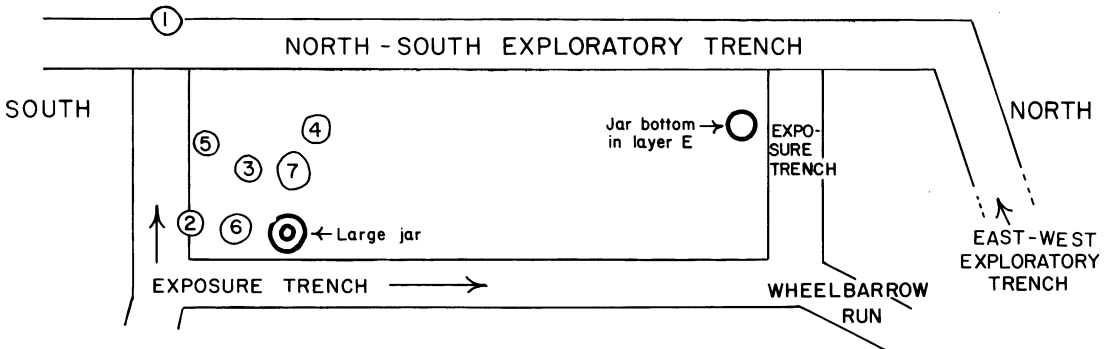


FIG. 12. View to south of North-South Exploratory Trench. Beginning of excavation of Test Pit 3 (HP 3) to left of trench.

# LAYERS OF WEST FACE OF TEST PIT 1



# PLAN OF TEST PIT 1



- Clay lined pits- between layers C1 and C2
- Pottery jar

FIG. 13. Profile and plan of Test Pit 1 (HP 1).

downward slope toward the western edge of the mound. If the mound had not been eroded away, one would expect the strata to dip toward the mound's edge. Also, the strata would not be so visible nor the face of the mound so steep. Because the strata were exposed on the eroded western face, it was "possible to cut out a section along this slope which will yield an adequate volume of the lowest debris and data on the [rock] substructure without moving a lot of overburden" (nb. A, p. 13).

Bird began Test Pit 2 by trenching into the Huaca Prieta at what he calculated was the height of the rock conglomerate base upon which the Huaca Prieta rested. That narrow trench became the south (actually southeast) side of the test pit. The base of the trench penetrated 5.75 m into the mound and at its innermost point was 4 m deep.

A sample section of refuse at the inner end of this trench was put on the sifter. This piece [was] 1.4 m long, 1.5 m wide, and 1 m thick at the east end . . . All debris over the sifted portion



FIG. 14. View to west over south side of Test Pit 1. Clay-lined storage pits and one ceramic jar are visible.

[was] shoveled or carried out in wheelbarrows [and] not sifted" (nb. B, p. 14). [The exploratory trench located] the lowest refuse strata which rested on fairly level sterile disintegrated conglomerate. [The strata were] actually rising and increasing in thickness toward the west. It is clear that the first utilization of this site lay outside the present limit of the midden [and] that a mound of some size had accumulated before the debris started to form over the area beneath the existing midden. (nb. B, p. 13)

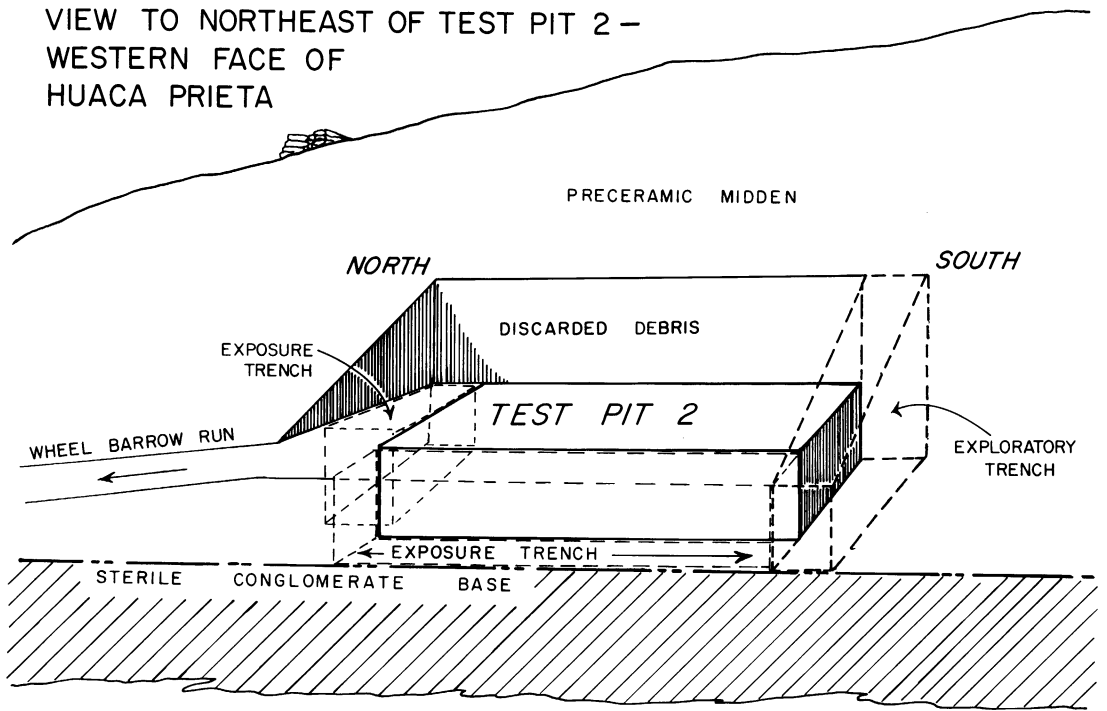
Test Pit 2 rested on the mound's steep western slope (fig. 15). That steepness required Bird to devise a special procedure which would expose a block of strata that could be excavated stratigraphically. First, stones above the excavation site were rolled down the slope to points below where the workmen would be digging. This eliminated the danger of stone slides on the mound's face. The next procedure was to remove the compact, salt-hardened debris from the top

and western side of an area 12 m long (north-south), 3 m wide (east-west), and 3 m high. The resulting excavated block was somewhat smaller (12 by 2.8 by 3 m) due to exposure trenches dug on the north and west sides. This block of stratified midden rested directly to the north of the exploratory trench and directly on top of the sterile substructure (decomposed conglomerate) upon which the mound rested (figs. 16, 17).

The removal of debris on top of the block exposed a horizontal surface on top of strata labeled A and B in the excavation profile. The removal of the debris on the front (west) face of the excavation block revealed the entire sequence of strata in the block from top to bottom. The exploratory trench on the block's south side revealed those same strata.

To provide an additional guide for his removal of the layers, Bird placed a narrow exposure trench on the excavation block's northern side which exposed the northern

VIEW TO NORTHEAST OF TEST PIT 2 –  
WESTERN FACE OF  
HUACA PRIETA



SECTION VIEW TO NORTHWEST OF TEST PIT 2

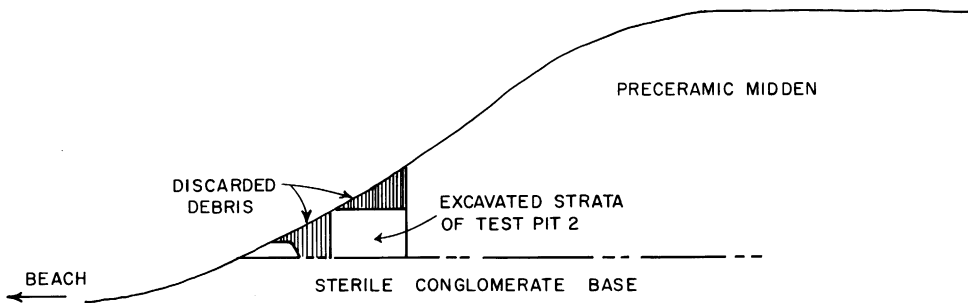


FIG. 15. Drawing of placement of Test Pit 2 (HP 2).

layers. A small earth “bridge” was left in the northwest corner as a wheelbarrow run. With three sides of a stratified block resting on the mound’s base now visible, Bird began the removal and sifting of the layers.

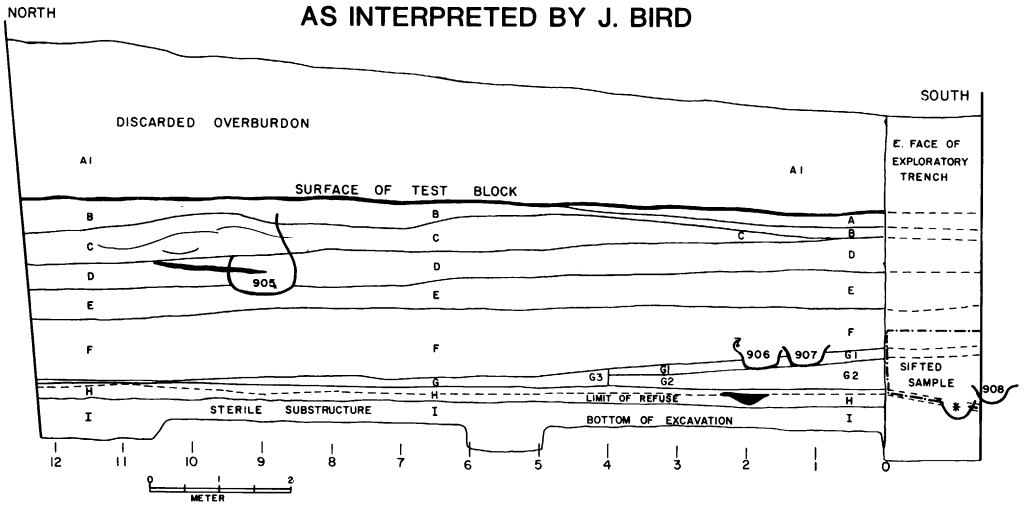
THE LAYERS (nb. B, pp. 6–21)

A. This layer was found only on the southern end of the excavation block. Material similar to it was removed with discarded debris above the surface of the northern end of

the excavation unit. Layer A was composed of fine, compact yellowish ash. By mistake, a small amount of the surface of layer B was removed with layer A. Some materials (labeled A1) were found within the limits of the curving clay wall (?) just above layer A in the east wall of the excavation (fig. 18). These materials consisted of bone, shell, squash, gourd (*matê*), *juncos* matting, and one rotted fabric (nb. B, p. 26).

B. Layer B was mainly ash, with few artifacts other than stone flakes. The layer was

LAYERS OF EAST FACE OF TEST PIT 2  
AS INTERPRETED BY J. BIRD



PLAN OF TEST PIT 2

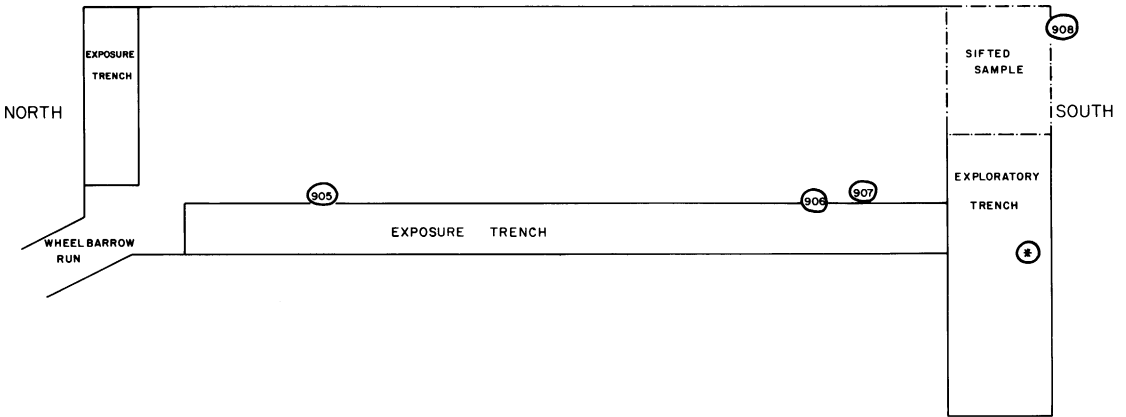


FIG. 16. Profile and plan of Test Pit 2 (HP 2).

very narrow on the south side and tapered to nothing on the east side of the block. The layer widened to the north. None of the southern 3.4 m of B were sifted.

C. Layer C was composed of mixed ash streaks and brownish ash, with some shell. Like layer B, layer C became thinner as it went from north to south. It disappeared on the south end of the excavation unit.

D. The northern end of the layer was mainly ash, which was apparently dumped there and mixed with patches of brown dirt and bits of unburned plant remains. Also

present were charred *junco* tubers. The central and south segments of the layer had somewhat less ash than C. There were a few fire hearths evidenced by perfectly flat, thin streaks of ash. The bottom of layer D was the best-defined juncture of layers yet seen in this test pit. The bottom surface of D was defined in the south part of the block by a thin streak of crushed mussel shell (small *choro*) which had lost its blue color. There were also small, purple whelks. The bottom surface of D in the north contained a considerable amount of hard bits of the small, fragile fragments of



FIG. 17. The excavation of Test Pit 2 in progress.

the local grass known as “Barba Tigre.” A small amount of layer E was taken out, in error, with material from D. This amounted to less than 30 cc and occurred between 1.2 and 2.2 m on the layer’s eastern side.

E. No specific description was made of this layer. A small amount of F was removed with E on the east side between 1 and 3 m.

F. This layer was composed of compact gray ash, shell particles, and sea urchin spines. Burned stones were present, particularly in the center and south. One unlined storage pit began just below the surface of F and reached down 65 cm. It was 45 cm wide at the tip and 77 cm wide at the bottom. It contained *junco* and stones, clay, and a squash stem. Layer F was 3.1 m wide at 11 m.

G. The debris in layer G was hardened by salt. The stratum was much thicker at the south end than at the north. It was subdivided into G1 and G2 from 0 to 4 m along an easily traceable yellowish band. The debris was so hard that it was chiseled out and broken with hammers. G1 and G2 increased in thickness to the west (fig. 19). “There must have been a fair-sized mound of refuse with crest somewhere southwest of test 2 outside the present limit of the huaca” (nb. B, p. 20).

H. The upper part of this layer was streaky and mixed with yellowish underlying dirt. Signs of human occupation were confined to the upper part of the layer. H was the lowest layer of human occupation.

I. This layer was composed of disintegrated conglomerate mixed with cobbles fractured by salt crystallization. The matrix was stained yellow, probably from some iron. Layer I was completely sterile. 2565 cobble fragments in it were examined for evidence of a pre-Huaca Prieta culture. Six of the cobbles may be artificial, but show no wear or chipping. “Any earlier utilization [of the site] may well have been on ground well outside the present limit of debris . . . as strata show [the] first utilization of site by Huaca Prieta people was to W and SW” (nb. B, p. 20).

Bird’s observations follow (nb. B, p. 21).

The refuse exposed by this cut is remarkably uniform in character—predominately ash, compact throughout. It has accumulated very slowly. Shells and shell fragments and burned firestones occur throughout, with the shells forming only a small percentage of the total volume. No traces of structures or dwellings [are] seen except one questionable example of a wall above the top of layer A. Fire hearths show [that] the area

removed was lived on. Some few hearths were in shallow hollows but most fires [were] made on flat surfaces. The test has been very satisfactory, and fulfilled the desired objective—that is, to provide a check on the oldest debris. Only in one respect [did it not provide] all that could be desired—the perishable material [is] in extremely poor condition as a whole.

### TEST PIT 3 (HP 3)

The main excavation unit at the Huaca Prieta was Test Pit 3 (HP 3). It was, and remains, one of the largest single blocks of stratigraphically excavated material in South America. On the surface of the Huaca Prieta the test pit was 11 m long (north-south) and 4 m wide (east-west). If one counts the exposure trenches on the eastern and western sides of the excavation block, the unit was about 5.6 m wide. At its deepest point, the test pit reached to a level 11 m below the surface of the mound (fig. 20). Bird cut the walls of the excavation with a pronounced incline (toward the center of the unit) so as to lessen the danger of their collapse. This pitching reduced the size of the pit as the excavation proceeded. By the time Bird reached the sterile conglomerate base of the pit, it was only 5 m long from north to south. Bird wrote (1948b, p. 301): “Deep pits can be dangerous if the refuse is loose, and in such cases one has to cut the side walls with so much pitch that the area of the pit is greatly reduced at the bottom. I need not have worried, for the mound proved to be largely of compact ash, with a relatively small amount of shells. Nearly vertical walls could be cut in it without danger of collapse.”

Bird's main excavation unit was not placed in the top of the mound because the stratigraphy there was disturbed by subterranean houses. The northern slope of the mound was chosen for a number of reasons:

During the occupation of the mound refuse was dumped outside the retaining walls. As the northerly side is away from the prevailing wind, we can assume that this was the preferred side for dumping. The [north-south] trench showed well-stratified debris on this side with relatively well-preserved perishable remains. The decision to make our test along the east side of the [north-south] trench was made more as a matter of convenience [for sifting and dumping] than



FIG. 18. The excavation of unit A1 of Test Pit 2.

otherwise, for there seemed no promise of difference in the debris to the east or west [of the north-south trench]. (nb. B, p. 30)

One notable aspect of Test Pit 3 is that the upper half (layers A to M) of its southern side is defined by the remains of stone walls. Bird wrote (1948b, p. 301): “We found four successive retaining walls partly encircling the upper portion [of the mound]. They were apparently built more to extend or stabilize the top of the mound than for defense. But it was obvious that at no time had any fill or dirt been brought into the mound (fig. 21). Continued dumping of trash on the slope had ultimately submerged each wall in turn.”

Bird felt that the deposits excavated in Test Pit 3 were in part the result of dumping over the walls, and that this dumping was also responsible for the steeply pitched strata (fig. 22). The pronounced incline in the strata from south (high) to north (low) caused Bird to vary his usual excavation procedure. Instead of placing exposure trenches on all sides of the block to be excavated, he used trenches only on the east, west, and north.

## LAYERS OF SOUTH FACE OF TEST PIT 2

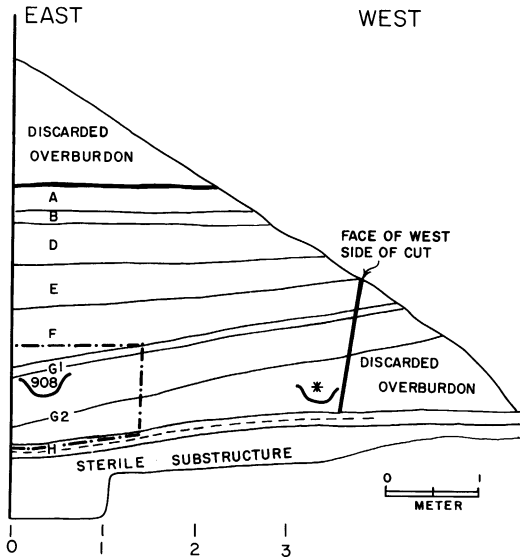


FIG. 19. Profile of south face of Test Pit 2.

The steep dip of the strata, instead of being a handicap as anticipated, proved a help. A second trench [the first was the north-south trench] was cut parallel to the first with four meters of undisturbed debris between them. Usually I like to expose four sides of the unit to be sifted, but there equally good results [were] obtained by following the strata . . . across the south end of the block along the face of the old retaining wall[s]. Then [I] traced [the strata] down [across the eastern and western] trenches. (nb. B, pp. 30-31)

### THE LAYERS (nb. B, pp. 35-45)

A. The layer was composed of wind-blown sand and ash from the top of the mound. Two rectangular adobe bricks (30 × 24 × 13 cm and 29 × 19 × 9 cm) and fragments of several broken ones were found on the south side of subdivision A2 about 20 cm below the surface. The material in layer A was built up during the same time as the debris removed from Test Pit 1. Therefore, Test 1 will amplify the cultural data limited to layer A in Test Pit 3.

B. Layer B is the sterile cobblestone stratum present on the north side of the HP 3

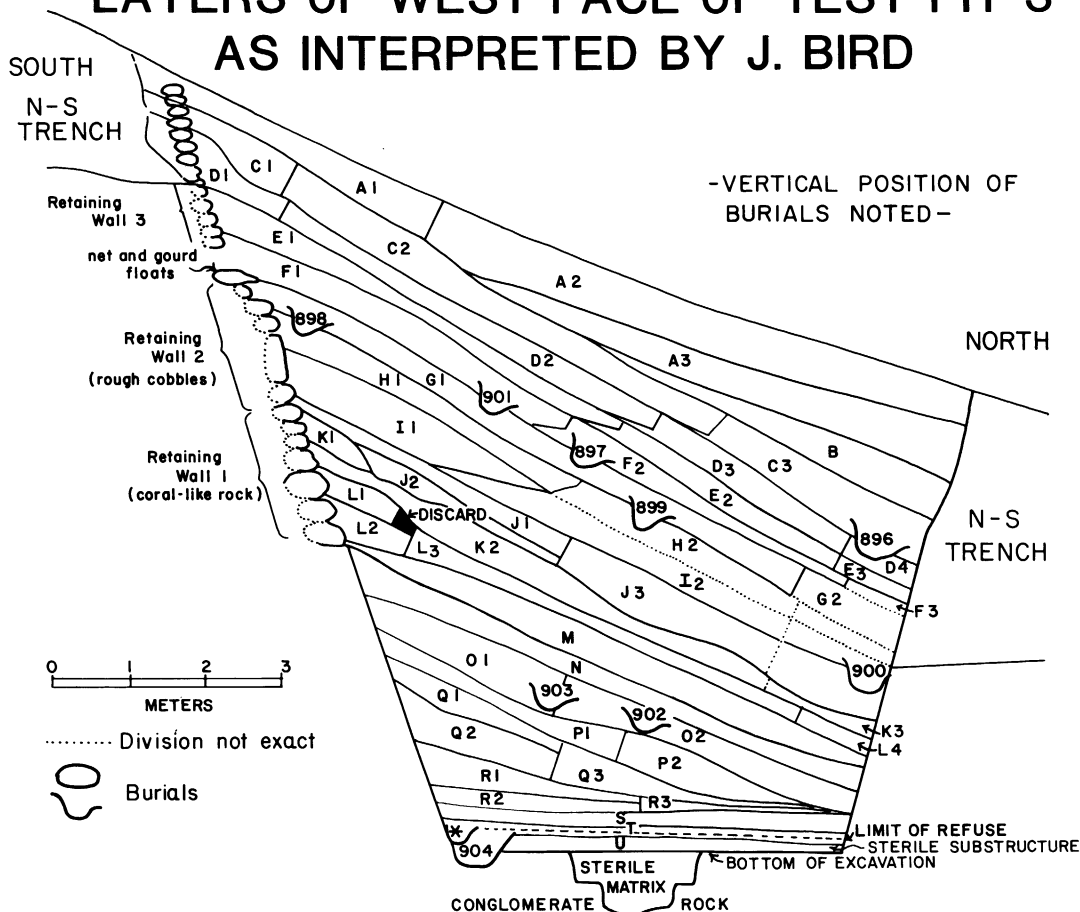
excavation unit. This is the uphill manifestation of the sterile cobble deposit found below the debris of Test Pit 1. Layer B was extremely solid due to salt in it. A large turquoise bead in the stratum was probably intrusive. Several gourd fragments listed from B came from surface of layer C.

C. Layer C was subdivided into three areas for a number of reasons. C1 was separated from C2 because of the possibility that its contents were mixed with dirt from behind the retention wall where some stones were missing. Also, the structure of the strata divisions was not clear. C1 and (presumably) C2 were composed of compact, gray, sandy dirt with a high percentage of sea urchin spines and relatively little perishable material. The division between C2 and C3 was established in order to leave the stratum's lower portion (C3) intact while removing the higher portion. C3 consisted almost entirely of salt-hardened gritty, gray dirt (ash?) and contained little perishable remains. C3 was extremely hard and hammers were necessary to dislodge and break it before sifting. Some burned cobbles were present in C3.

D. Layer D was subdivided like layer C, for the same reasons. Subdivision D4 was in the northeast corner of the test pit under the wheelbarrow ramp where the possibility of accidental admixture was present. The northern part of the stratum had a large number of burned firestones. D1 and the southern portion of D2 had a very high proportion of plant remains (*junco*, *titora*, grass) except on the western side where there was almost pure, dumped ash. The layer had many small purple welks (the largest 1 cm in diameter) and some lima beans and peppers. Burned stones and loose powdery dirt increased toward the north end of the layer. Subdivision D4 was created because of the wheelbarrow ramp and because of the risk of contamination from the north wall of the test pit.

E. The layer consisted mainly of much perishable material in proximity to the wall on south side of pit. Otherwise, it was composed largely of ash and dirt. No subdivision was necessary in the layer near the wall (as with layers C and D) because the wall stones were intact and the stratum undisturbed. Layer E2 was left in situ while the upper

# LAYERS OF WEST FACE OF TEST PIT 3 AS INTERPRETED BY J. BIRD



## PLAN OF TEST PIT 3

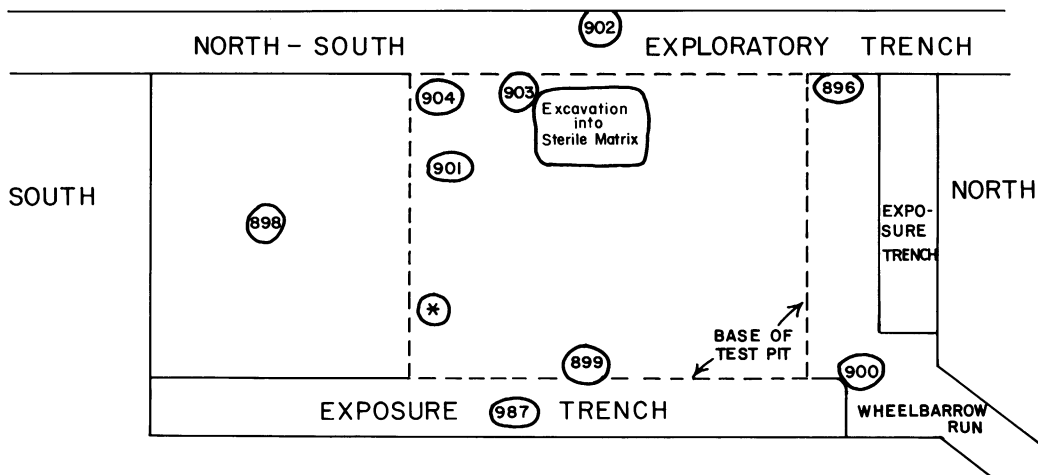


FIG. 20. Profile (west face) and plan of Test Pit 3 (HP 3).

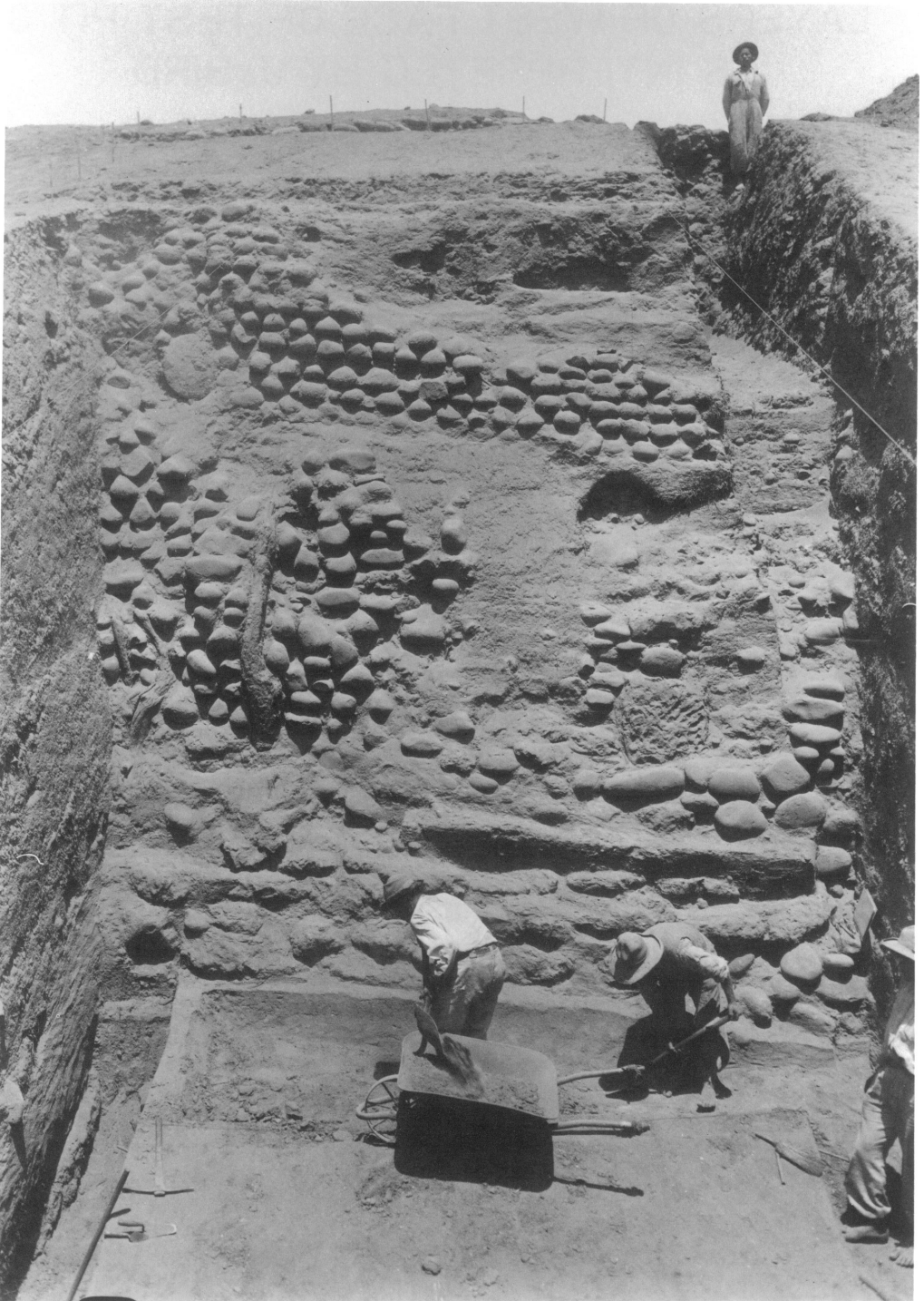


FIG. 21. The excavation of Test Pit 3 in progress. The mound's retaining walls are seen on the south face of the pit.

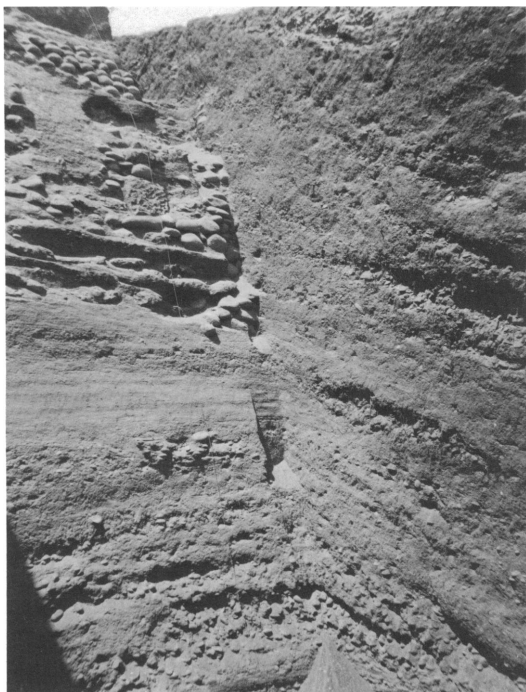


FIG. 22. View of southwest corner of Test Pit 3.

(southern) portion of the stratum was removed. E3 was the part sustaining the wheelbarrow ramp in the northeast corner of the pit. There was no easily marked separation in the debris between E1 and F1. The division between E2 and F2 was defined by a slight crust on the surface of F2. Layer E2 had considerably fewer firestones than D3 above it. A storage pit, first visible in layer C, had its bottom in layer E on the top surface of layer F. The storage pit was exposed in the north wall of the excavation.

F. Layer F was composed mainly of gray ash and dirt, with a preponderance of perishable material in its upper, south end. That material was mainly *junco*, *totor*, grass, and fragments of twined matting. F1 was separated from F2 in order to leave F2 in place during extraction of F1. F3 was separated from F2 because of its high concentration of firestones. This subdivision could not be sifted, but some artifacts were removed from it. The stone retaining wall found at the south end of layer F was apparently constructed on

part of that layer. A thin layer of salt crust curved out from the lowest stones into the middle of F. Also, layer F debris appeared to run under the lowest stones.

G. Layer G was subdivided into two units: G1 and G2. G1 ran from the south end of the test pit up to 1.5 m from the north end of the pit. It consisted of almost pure ash and dirt, sea urchin shell fragments and spines, and other bits of shell, charcoal, and plant remains. G2 was removed separately, but not sifted. It had a high concentration of firestones and may have been contaminated with material from other layers, as it served as the wheelbarrow ramp while the N-S Exploratory Trench was lowered.

A large fishnet with gourd floats was discovered embedded in layer G. It was located partly below and partly outside the retaining wall. It may have been hidden there prior to construction of the wall.

The juncture between layers G and H was easily traced along the south retaining wall. It was a thin streak of small, thin, smooth, tan, mussel shells. Down the slope (northward) these disappeared, but the G-H division was still clear, as the surface of H was slightly harder.

H. This layer was divided into two parts, H1 and H2. H1 consisted of ash, bits of charcoal, sea urchin spines and shells, and plant remains. H2 consisted of firestones, with fine, gray dirt and perishable material between the stones. It was removed with the layer beneath it, I2, since there was some doubt as to whether there was a line separating the two. H1 and I1 were separated by a thin stratum of loose, perishable material.

I. The layer was divided into two parts, like layer H. Subdivision I1 was composed of the same material as H1 in the zone near the (south) retention wall. To the north it broke into fine laminations and was compact. I2 consisted of firestones with fine, gray dirt and perishable material between the stones. It was removed with layer H2 above it because no real separation may have existed between the layers.

J. Layer J was divided into three parts, all of which are the same age, even though the division between J1 and J2 was "horizontal." J1 was relatively loose debris while J2 was

compact and easily separated from J1. J2 was a small segment of the lowest portion of layer J. It was 1.5 m wide and ran only along the western side of the test pit. The bottom of J2 was clearly marked by a salt crust which may have formed immediately after the construction of this portion of the retaining wall. The crust may have come from water used to mix mortar, or from rain. It covered well-stratified debris (layer K) and clearly preserved the marks of digging tools, apparently pointed sticks, where part of layer K was removed. The J3 subdivision on the north side of the layer had the same concentration of firestones as several of the layers above it. The division between the I and J layers was not so apparent on the surface of J3, so the upper part of J3 was discarded. The lower surface of J3 was defined by the same salt crust visible elsewhere under layer J.

K. Layer K was subdivided horizontally on its southern side because of its considerable thickness. The top subdivision, K1, appeared to be a small segment of the refuse by the wall. It may have been left by the wall builders who had dug away part of the same layer (see description of layer J). K1 may have decreased in thickness and merged with K2. K1 had the same kind of debris (ash, gray dirt, plant remains, sea urchin spines, a few shells, and fragments of rock crabs) as K2, but K2 was probably older and had more plant remains near the wall. A small segment of the layer under the wheelbarrow ramp (northeast corner) was K3 but was accidentally marked K2.

Layer K is the top layer of debris behind the first retaining wall on the south side of the trench. Bird described that wall as coral-like, but later defined it more accurately as sabellariid reef rock, created by marine worms.

L. Layer L was composed of very compact, finely stratified dirt with small bits of plant remains. It was very uniform from top to bottom and perhaps was wet repeatedly during its formation. The layer was quite hard and the friction of the work tools on it produced the smell of ammonia—obviously where people had urinated from the top of the retaining wall over a considerable period of time. On its south side by the retention wall, the layer was subdivided where it was

thickest in L1 and L2. Subdivision L3 continues downhill (south) to within 75 cm of the north side of the test pit. L4 was on the north side of the test pit and was separated from L3 to avoid error in case anything might have fallen on it from the pit wall. The surface of layer L was the most clearly marked of any yet encountered in the HP 3 test pit.

M. Layer M was one single unit. At its south end it was composed of ash, dirt, and bits of plants and shell. In the middle and northern portion of the layer, burned cobbles appeared and increased in proportion toward the north. They were generally in the lower half of M, resting on the surface of N, and underlaid with thinly scattered plant remains and fly pupa cases. The dirt above the firestones in M was fairly compact and powdery with ash.

N. This layer was not subdivided. It was yellowish in color, overlaid with black. The southern half of N was solidly compact, breaking into fine laminations that were free from stones. It also included thin mussel shells that were finely broken. It appeared to be dirt that had accumulated slowly and in the process had been well trodden. The northern end of layer N was less compact and had many firestones. It was fine and powdery and resembled disintegrated adobe earth.

O. This layer was subdivided into several units because of its irregular structure. O1 was the southern part of the layer. It was composed of dark ash with bits of charcoal, etc. under a streak of adobe-like dirt. The division between the O and P layers was not easily traced under O1, and some of the surface of P may have been removed with O1. Subdivisions O2, O3, and O4 were horizontal divisions of the layer to the north of O1. Unit O2 rested between layer N and the subdivision O3. It was composed of dirt and firestones somewhat similar in composition to layer N. O3 rested between O2 and O4 and was composed of yellowish adobe-like dirt. Unit O3 was a widened or thicker continuation of the yellow streak observed in O1. O4 lay between O3 and layer P. It was composed of dark-colored debris. Bird suggested that subdivisions O2, O3, and O4 might be combined and labeled O2.

P. During the excavation, layer P was di-

vided into two equal parts, P1 and P2. P1 occupied the southern part of the test pit and was gray in color. It was generally harder than P2. The divisions above and below it with layers O and Q are not distinct. The P2 subdivision had a greater concentration of firestones, which form about one-quarter of its volume. P2 was otherwise grayish, fine, powdery dirt with little perishable material.

Q. Layer Q was very broad on the south side of the test pit and it tapered into nothing before reaching the north side. It was divided into three subdivisions. Q1 and Q2 were on the southern side of the test pit and Q3 was to the north of them. Q1 was somewhat softer and less compact than Q2, and the division between the two was on a somewhat hard surface. The eastern part of Q2 contained many firestones. Along the bottom of Q1 there was a streak of unburned cobblestones which were apparently dumped at the same time, since several of the thinner ones were lying on edge. Several of the cobblestones had ash mortar adhering to them and that mortar bore the impressions of stones which had been next to them. This evidence would seem to demonstrate the use of mortared-cobble construction at the time of layer Q. The cobbles were comparable in size to those in the subterranean structures on the top of the mound. They are smaller than the stones in the retaining wall on the south end of the pit. One lima bean pod was found in the upper part of Q2 but was in too poor condition to save.

R. This layer was subdivided, like Q, into three parts. The refuse in all three was compact. Parts of R2 were "cemented" together and the layer's lower surface containing firestones had to be pried and hammered before sifting. R3 was apparently a living floor. It contained small, flat fire hearths and ash lenses, but no greater concentration of firestones than in adjacent contemporary debris. The layer contained no evidence of stake or post holes, or structures of any type.

S. Layer S was composed of firm, tramped, light brown earth. Its lower surface rested on the yellowish brown subsoil surface. The layer had some firestones and shell fragments in it, but otherwise had very little perishable debris. In the lower half of S and upper surface of T there were two roughly oval, flat, hearth areas, each 1.2 by 1.5 m. The exact

measurements were impossible to make as both extended into the test pit walls.

T. This layer was composed of yellowish, tramped, compact dirt and contained streaks of shell refuse, charcoal, and a few burned stones. It appeared similar to the bottom of the refuse in Test Pit 2. The lower part of the layer was sterile. That part was yellowish and full of salt-fractured cobbles. It is apparently the disintegrated top of the conglomerate rock base on which the mound rests. Layer T produced a fragment of what is probably a shell fishhook.

U. This layer of yellowish dirt and split cobbles was taken out and sifted with negative results. A pit was dug even deeper in the center of the layer to insure that the excavations had revealed the very first human occupation. That pit revealed the same structure as in layer U. However, in the pit the percentage of split cobbles became less and the yellowish dirt, primarily decomposed matrix, became harder. At the bottom of the pit the matrix was stained and not white as observed in Test Pit 1 (figs. 23, 24).

#### SIDE TRENCHES AND WHEELBARROW TRENCH LOTS

A number of units which crosscut two and occasionally three layers were removed from the side trenches. The artifacts from these units were analyzed as described in "Groupings into Layers," below. Five lots of excavated artifacts came from Test Pit 3's wheelbarrow trench. These cannot be associated with the stratigraphy of the test pit, and artifacts from them are usually listed separately in tables.

#### COMBINATIONS OF LAYERS

Bird experimented with combinations of layers in Test Pit 3 but never made definitive groupings or analysis of materials based on them. The following combinations are put forth in a nondated three-page manuscript (notes, n.d) which Bird typed up probably in the 1950s or 1960s. It was never meant for publication. A brief summary of those pages gives an added dimension to our knowledge of Bird's thinking about the organization of the stratigraphy of Test Pit 3 and the way the layers might be grouped. Bird does not ex-



FIG. 23. The excavation of Test Pit 3 nearing completion. View to south.

plain just how he arrived at the combinations, noting only that they were “suggested by [earth] structure and other features.” It is apparent that the three retaining walls on the south side of the test pit are fundamental features used to determine the combinations.

These combinations of layers, with minor alterations, are the basis for the analysis of chronological changes presented in Chapter 15.

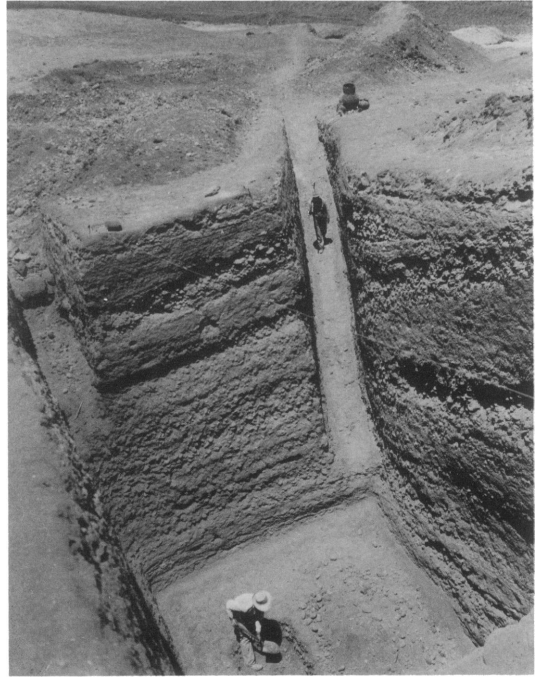


FIG. 24. The excavation of Test Pit 3 nearing completion. View to northeast. The wheelbarrow trench (right) and North-South Trench (left) extend out from the pit.

**Combination I:** This is a CDE combination formed from the group of excavation units from layers C, D, and E, to which might be added Sample 2, top, and CDE material from the side trenches. “C formed during the final stage of [preceramic] occupation of Huaca Prieta and probably in large part after its abandonment. Certainly the layer contains more of the fine, gray dirt blown from the top of the mound and less tossed out debris than the D layer and those below. In appearance it was comparable to A1, A2, and A3, but contained much more artifact material. Its surface marks the time of the tidal wave which left the cobblestones of B layer. Layers D and E [were] deposited during occupation after [retaining] wall 3 was constructed.” (notes, n.d.)

**Combination II:** This is a grouping of layers F and G. “During the formation of G the top of the retaining wall 2 was submerged. Most of F was deposited prior to the construction of [retaining] wall 3. If any cultural distinctions appear in the E-D material some

traces might be expected in F, but not below.” (notes, n.d.)

Combination III: This is a grouping of the material from layers H, I, and J. A small lot of GHI material can be added to this combination since that lot has very little G material. “I suspect that all HIJ can be combined and Sample 2, bottom, added to it. If so, the trench lots HI, IJ, J, and HIJ might be added to it also. Layers J, I, and H were deposited after construction of [retaining] wall 2 and may be quite uniform in their cultural composition. They may contain a little older material, as some of this seems to have been used for fill back of wall 2 and as this wall broke down, some of this debris could have mixed with the H or I debris.” (notes, n.d.)

Combination IV: This is a grouping of layers K and L, with some trench material associated with K. “When [retaining] wall 1 was constructed, the surface was along the M-N division. When wall 2 was built the surface was at the K-J juncture. Hence the three layers K, L, and M represent a period between the two stages of construction and organization of the community.” (notes, n.d.)

Combination V: This is a grouping of layers M, N, and probably O. There is no further explanation of this combination.

#### GROUPINGS INTO LAYERS

Bird carried out his artifact analyses and studies of textile traits always maintaining the most minimal excavation units. This resulted in very large, complex tables where the artifacts of every side trench unit and every layer subdivision were tabulated separately. The editors have decided to group these side trench units and layer subdivisions with their most closely associated layers to simplify the tables presenting the distributions of the artifacts and, in the case of textiles, the distributions of specific traits.

Excavated units which crosscut more than one layer came from the exposure and exploratory trenches around the stratigraphic block since these trenches were excavated before the stratigraphy could be studied in detail. The side trench units generally produced very few artifacts. These have been united with the layer from which most of the materials of the trench unit probably came. Thus the artifacts and other specimens from Sam-

ple 2, top, are placed with layer D. Trench unit CDE is placed with layer E. Trench unit FG is with layer G, and trench unit GH is with H. Side trench units GHI and HI are placed with layer I. Side trench units IJ, HIJ, IJK and Sample 2, bottom, are all grouped with layer J. Side trench unit OPQ is placed with layer O. Side trench units, J, K, and M are placed with their respective layers. Only one large combination of materials from more than one layer is preserved in the tables and analyses of artifacts. It is subdivisions H2 and I2 (designated H2I2), which were intentionally removed together during excavation.

The subdivisions of individual layers (labeled with numbers 1, 2, . . .) have likewise been grouped under the designation of their layer.

After a careful examination of the distribution data in their most complex form, the editors have decided that the grouping of smaller excavation units into units representing entire layers has not significantly altered the distribution of artifacts or their traits. It is recognized that a few specimens originally from one layer have been classified with the adjoining layer, but their number is small, and the effect on distributions is minimal.

Junius Bird might well have followed the same procedure if he had been confronted with preparing the tables within a manageable format for publication. Bird was a splitter, but he was also capable of uniting different excavation units and subdivisions if their contents proved to be essentially similar. This is demonstrated in the subsection where he suggested the possibility of uniting layers into larger combinations.

A number of the excavation units, and some isolated artifacts, cannot be placed within a stratigraphic context. Sample 2, middle, crosscut too many layers to be safely placed with any specific layer. Five units from the wheelbarrow trench (labeled Lots 1 to 5) cannot be placed within the stratigraphy. Finally, some artifacts are labeled “position uncertain.”

#### THE TOP OF THE MOUND

Bird examined the top of the Huaca Prieta by the excavation of a number of subterranean house-tombs which he found there (fig. 25). These houses, often reutilized for human burials, were found in two areas. One zone

### TOP OF HUACA PRIETA HOUSES AND FEATURES

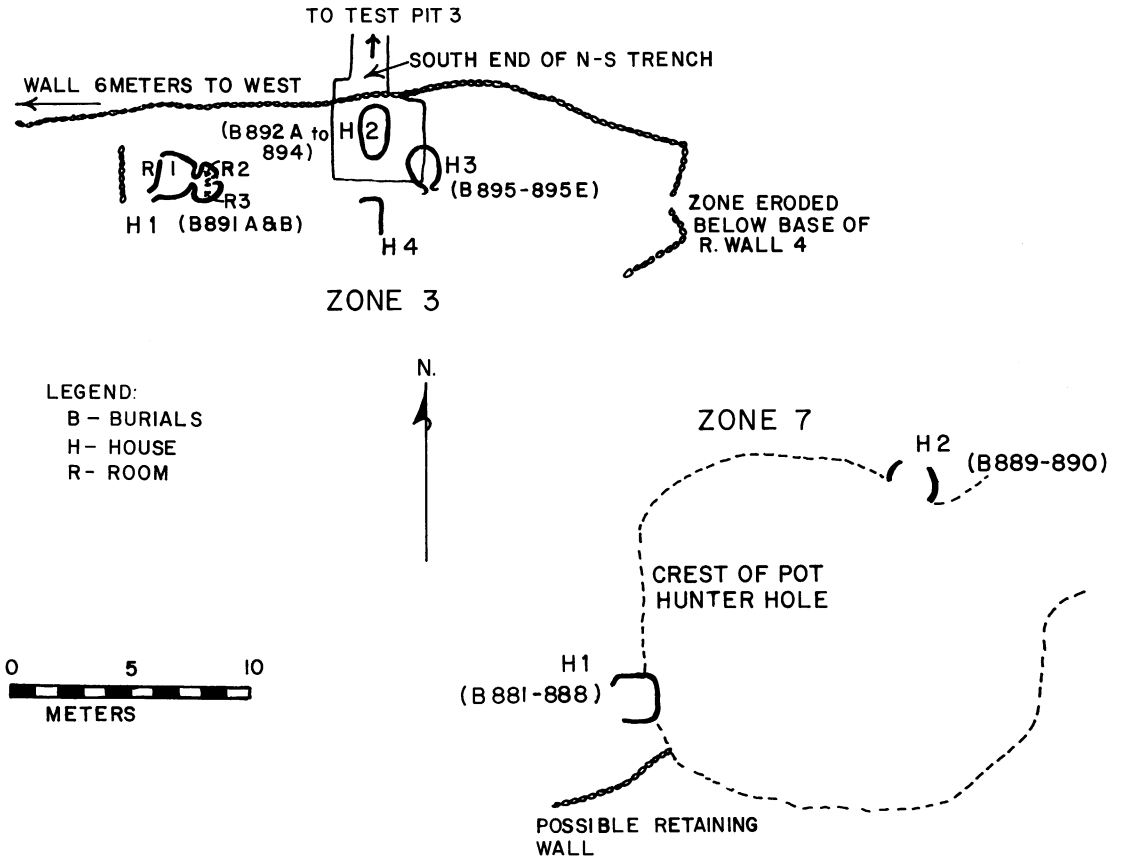


FIG. 25. Plan of houses and features on top of the Huaca Prieta.

was given the number 3 because of its proximity to Test Pit 3. This area is directly south of the remains of the highest retaining wall (no. 4) and is on the northern side of the top of the mound. The second zone was given the number 7. It is the area of a large hole dug by treasure hunters years before Bird's arrival. The remains of Zone 7 will be discussed first.

One of the most distinctive characteristics of the Huaca Prieta is a large, irregularly shaped hole on the southeastern side of the top of the mound. It is a minimum of 13 m in diameter and almost 9 m deep on its high (northwest) side. Bird recalled (tape, 1982a) that Peruvians blamed the hole on the Chileans, who were said to have dug it during the War of the Pacific in the last century. Whoever

was responsible for it is not certain. Bird observed that the hole had "ruined" that part of the mound for excavation. The craterlike hole was perhaps the principal reason why the mound was known by pot hunters as a place where nothing of value (i.e., ceramic, metal, or other saleable objects) could be found (fig. 26). In that hole Bird was able to observe that the top 3 m of the surrounding mound were composed of a mass of subterranean house units, often with human burials in them. The walls of these structures were often made of stone cobbles mortared together with mud (fig. 27).

Bird examined two of the houses on the edge of the pot-hunter hole, and removed the human bones in them. House 1 of Zone 7 was located on the western side of the hole.



FIG. 26. View to south over pot-hunter hole on the top of the mound. Bird's camp is in the distance.

It had walls of cobbles with wooden roof beams slightly more than 1 m above the floor (nb. C, p. 42). The wall cobbles were 15 to 25 cm long and 6 to 10 cm thick, laid in 12 courses (nb. C, p. 49). The house had one main room, at least 2.5 m long, and a small recess on one side. The main room contained most of the burials (nb. C, pp. 48, 49). The skeletal remains are given the AMNH catalog numbers 99.1/881, 882, 883, 884, 885, 886, 887, 888.

The second unit, House 2, examined by Bird in Zone 7, was on the northern side of the pot-hunter hole. There is little information about that structure, which appears to have been partially destroyed by the collapsing rim of the large hole. It was filled with burned stones, and contained burials 99.1/889 and 890.

Bird also examined subterranean houses in the area directly south of Test Pit 3, near the fourth retaining wall. In this area, Zone 3, four houses were located, and three of them held human burials. These excavations confirmed that subterranean structures were located elsewhere on top of the mound, and not just near the pot-hunter hole.

House 1 of Zone 3 had been opened by pot hunters. It was a complex structure with three rooms. Room 1 had a subrectangular shape and measured about 2 by 2.5 m. The southeast corner of the room contained a cache of

sea urchins, round stones, and crabs. Next to it was a smaller cache of sea algae locally known as *machocho*, in large lumps. A doorway was closed with masonry. Two wooden beams supported a low stone and mortar roof. On the west side of the room there were two small recesses. The remains of one poorly preserved burial were found in the room (nb. A, p. 19; nb. C, p. 45). Room 2 of the house was small, about 1 m in length and width. Room 3 was about 1.5 by 1.5 m. It contained a cache of crabshell and sea urchins, and two burials, 99.1/891A and 891B. The roof was supported by a wooden beam and was 75 to 77 cm above the floor (nb. C, pp. 45–47).

The second structure (House 2) of Zone 3 examined by Bird was just south of the fourth retaining wall (figs. 28, 29). It had an intact roof supported with wooden roof beams. It was 2.2 m long from north to south and 1.25 m wide from east to west (nb. A, p. 2; nb. C, p. 40). The remains of at least four burials (99.1/982A, 982B, 983, and 984) were found in this house.

Bird excavated House 3 of Zone 3 just to the southeast of House 2. It contained the remains of at least four individuals (AMNH catalog numbers 99.1/895A, 895B, 895C, 895D, 895E).

Another unit, House 4, was located in Zone 3 to the south of Houses 2 and 3 (see fig. 29). It appears to have had a circular shaft en-

trance of mortared cobbles. The chamber rested 1.75 m below the surface of the mound, and was approximately 3 m long from north to south (nb. B, p. 2; nb. C, p. 40). No burials were found in it.

The presence of so many subterranean houses on top of the mound convinced Bird that the area would not be a good location for a major stratigraphic excavation because of the disturbance caused by the houses. Bird reminisced that as a child he had dreamed of discovering a subterranean village, and excavating it. He claimed that the hard work digging the houses on and near the Huaca Prieta had cured him of this dream (tape, 1982b).

#### CORRELATIONS BETWEEN THE EXCAVATIONS

Layer A in Test Pit 3 is an extension of the layers of Test Pit 1. All are ceramic-bearing and rest on top of the sterile cobblestone layer (nb. B, p. 35). The preceramic houses on top of the mound in Zones 3 and 7 probably equate with the upper preceramic layers (C to E) in Test Pit 3 (notes, 1948). Test Pit 2 layers A, B, C, and D are probably roughly equivalent to layers P and Q in Test Pit 3. Test Pit 2, layers G and probably F are most likely equal to layer R in Test Pit 3. Layer H in Test Pit 2 is equivalent with layers S and T in Test Pit 3 since both rest on top of the sterile substructure and are partially mixed with it. The above observations from Bird's nondated (n.d.) record notebook were probably written before the carbon dates were received. Those dates do not contradict the above interpretation, but do not resolve the question, raised in Chapter 15, that Test Pit 2 might better equate with layers K to O of Test Pit 3.

#### EXCAVATIONS NORTH OF HUACA PRIETA

In the last weeks of excavation activity at the Huaca, Bird dug three test pits in a zone 100 to 150 m north of the mound (see figs. 5, 9). His intention was to search for additional preceramic deposits, but the excavated remains were associated mainly with pottery (Initial Ceramic Period and Cupisnique). The



FIG. 27. Northwest side of pot-hunter hole. Cobble walls of preceramic structures are visible in the slope.

purpose of this section is to give a brief description of each test pit, but not present the entire range of data found in Bird's fieldnotes and in the extensive artifact collections from the excavations, now stored at the American Museum of Natural History. Most of the artifacts have not been analyzed nor published. Classifications of most of the specimens were made in the field. Bird's field notebook C contains more than 100 pages of data on burials, architectural features, and stratigraphy in test pits 4, 5, and 6. There is an accompanying photographic archive, much of it by John Collier.

Test pits 4, 5, and 6 are labeled HP (Huaca Prieta) in the field notebooks and museum catalogs. This is somewhat misleading since those excavations were not made in the mound, Huaca Prieta. The units of each layer were arranged both horizontally and verti-

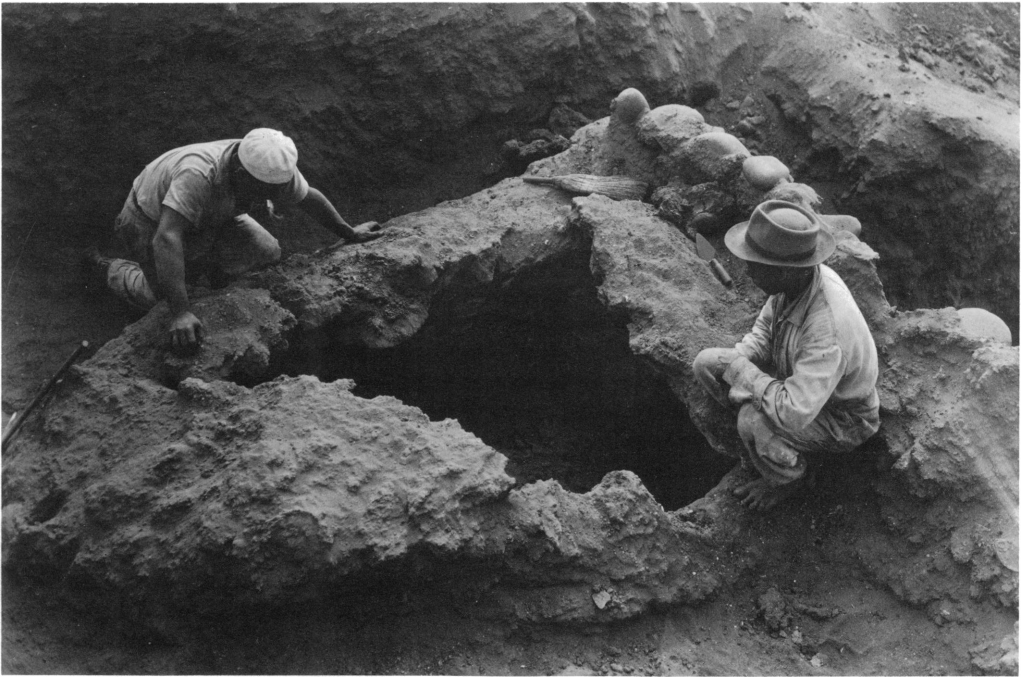


FIG. 28. Opening the roof of House 2 on top of the mound in Zone 3.

cally, separated by walls and other features. The area of Test Pits 4, 5, and 6 has a midden about 4 m deep with numerous architectural features varying greatly in form. The surface of the area is relatively smooth, and the locations of the three pits were not determined by features but were spaced at 25 m intervals.

TEST PIT 4 (nb. C, pp. 3, 6, 7, 9-13, 33, 37, 38, 43)

This excavation was the northernmost in the zone to the north of the Huaca Prieta. It was located 150 m to the north of the East-West Exploratory Trench. A preliminary hole

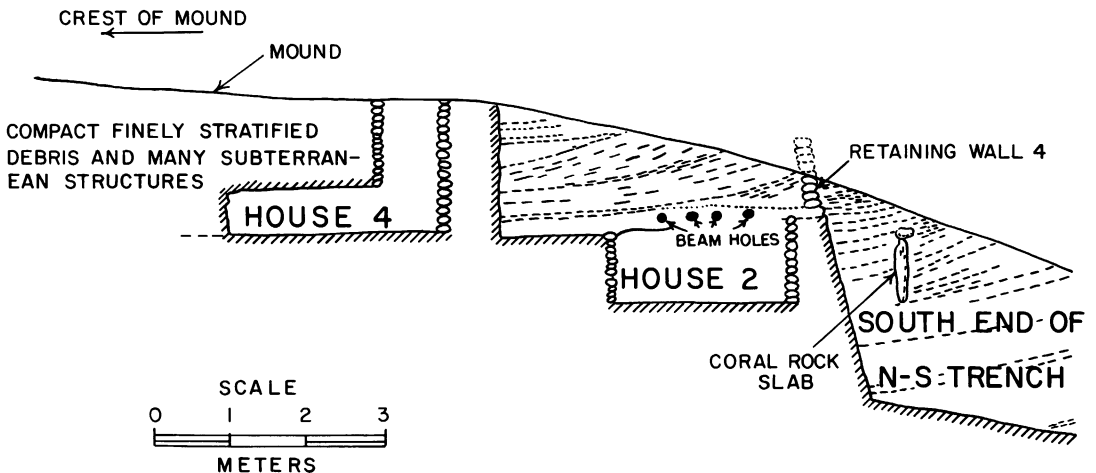


FIG. 29. Section drawing of Houses 2 and 4 on top of the mound in Zone 3.



FIG. 30. Artifacts from Test Pit 4 (left to right): cylinder stamp (41.2/4713), figurine (41.2/4717), jet mirror (41.2/6998), pottery stamp (41.2/4699).

1.5 by 1.2 m was expanded on all sides to a pit 5 m long (east-west) by about 4 m (north-south). A wheelbarrow trench extended 8 m out from the northeast corner in a northeast direction. The pit was excavated to a depth of over 3 m, and 12 layers were defined. Several construction phases were encountered: a group of cobblestone and mud-mortar walls with bases ca. 1.4 m below the surface; a flat, well-made cobble and clay floor (layer F) covering all of Test Pit 4 at about 1.9 m depth; a smoothed wall with a deep niche and floor 1.7 m below the 1.9 m floor; and several subterranean tombs. From the wall with the niche, the trench was extended to the northeast where it was observed to bend by House 3.

A number of human skeletons (burial nos. 872–879) were found in a stone-enclosed house-tomb (no. 1) with wood roof beams. A number of matting and textile fragments were associated with those burials. Burial

873's gravegoods included 150 shark's teeth (41.2/4706), bone weaving tools (41.2/4700 to 4704), a pottery stamp of a bird (41.2/4699), and a jet mirror (41.2/4698). Burial 874 was associated with a lump of red paint (41.2/4709). An incomplete, seated human, pottery figurine (41.2/4712) was with burial 878. Burial 879 was associated with a soft stone roller stamp (41.2/4713) (fig. 30).

A second house, oval, with walls of cobbles in ash mortar contained a complete, ceramic, seated, human figurine with raised knees and a humped back (41.2/4717) (fig. 30).

A third house, oval, with walls of cobbles, contained a burial (no. 880) and numerous artifacts including: a string of 106 tubular bird bone beads 4 m long (41.2/4724), a broken jet mirror (41.2/4718), a sea turtle pendant (41.2/4723), a whalebone snuff tablet (41.2/4721), a bone snuff tube (41.2/4722), and traces of fabrics.

Test Pit 4 appears to have contained only



FIG. 31. Excavation in progress of Test Pit 5 (HP 5). Low center: House 2. Center: conical adobe wall over House 7, and wall of cylindrical and biscuit adobe bricks.

Initial Ceramic Period and Cupisnique Period remains. Only 18 textiles were found, of which 11 were woven, 6 twined, and 1 looped.

TEST PIT 5 (nb. C, pp. 3, 4, 5, 8, 32, 51–91)

This excavation was located 25 m southwest of Test Pit 4 and 25 m north of Test Pit 6. It began as a trench 22 by 2 m. Its southwestern end was expanded in several directions to excavate various constructions and to find less-disturbed midden. Bird attempted to excavate with natural layers and was able to define 50 subdivisions of layers A through J. The southwestern 8 m of layers D to J were fairly level strata totaling ca. 1.5 m in depth. Elsewhere, the stratigraphy was complicated with the remains of seven houses, tombs, or storage chambers, some with burials. “Houses” 1 and 2, possibly large storage units, were subterranean and apparently contemporaneous. House 2 had intact wood

beams holding up a stone roof. These two cobble and mud-mortar chambers were 1.3 m to 1.8 m long, 1.4 m to 1.6 m wide, and 1 m to 1.5 m deep with entrance passages well above the floors. House 2, contemporary with the bottom of layer A, was cut through a surface wall made of conical adobe bricks associated with layer B. This, in turn, overlay surface Houses 7 and 8, with complex walls 50 cm thick and well-defined floors. The walls may be unique in construction, with vertical stacks of adobe “biscuits” mortared with adobe (fig. 31). House 7 had once been remodeled with 20 cm of carefully leveled clay fill placed on rushes and/or grass covering the first floor, part of layer C. Houses 3, 5, and 6, associated with layer B, were small storage vaults with small entrances and chambers, built like Houses 1 and 2, though earlier. House 4 had one burial, no. 871; its cultural associations are uncertain. House 5 had three burials, nos. 868, 869, and 870. “House” 9

and a storage chamber next to House 2 were similar to 3, 5, and 6.

Ceramics were associated with all Test Pit 5 layers except J, which had refuse similar to that of the mound. Initial Ceramic Period pottery, characterized by undecorated reddish pots with upturned rims, were associated with layers C to I. Layers A and B had Cupisnique ceramics, characterized by red and black neckless pots with thickened rims and, often, incised lines. Bowl fragments, gray to black polished sherds, zoned punctation, fine line incision, modeling, and orange-red ware, present in layer A, were essentially lacking in B. Initial ceramics were found from Layers C to I. Pyroengraved gourds were common in Layer A (55 specimens) but absent from layers I to B. Eleven peanut specimens came from layers C and E, the earliest there. Maize was common in most A units, but only one cob was found in layer B. The test pit produced 589 textiles, of which 511 were woven, 25 twined, 41 netted, 9 looped, and 3 twined with weaving. The upper part of the conical adobe wall, associated with the B features, had been destroyed without depositing remains in situ, possibly indicating tidal wave destruction. A timber from the roof of House 1, built after this event, produced a radi-

ocarbon age (Lab. Sample no. 75) of  $2665 \pm 200$  years. A digging stick imbedded in a wall of House 7 (Lab. Sample no. 322) gave ages of  $3278 \pm 250$  and  $3333 \pm 340$  years. For a discussion of the dates see J. Bird's commentary in Chapter 5.

#### TEST PIT 6 (nb. C, pp. 98-101)

Test Pit 6 rested 25 m south of Test Pit 5. It was 8 m long (east-west) and 6 m wide (north-south). It was "made in the hope of finding prepottery debris nearer the surface than in test 5." Bird excavated 17 layers, which reached a depth of over 3 m. Remains of house walls, firestones, roof timbers, pottery, and ash were found. A subterranean construction associated with layer 8 was found with wood roof beams in place. Layer 14, at slightly over 3 m depth, produced some dirt, with no sherds. Layers 15 to 17 could be excavated only on the south and southwest side of the pit. They may have been preceramic, and contained burned stones, foundation stones, ash, shell, sea urchin spines, and some small fragments of unburned plant remains. Together, these lowest three layers were almost 1.5 m thick. The test pit produced only five textiles, all woven.

## CHAPTER 5. RADIOCARBON DATES

### BACKGROUND

Junius Bird submitted the first archaeological specimens from South America for age determination by radiocarbon content. A number of these samples came from the Huaca Prieta and the Ceramic Period deposits to the north of the mound. In 1949, Bird began an extensive collaboration with Willard F. Libby and is mentioned in one of the first public pronouncements of the radiocarbon technique (Libby, Anderson, and Arnold, 1949, p. 227). Bird was listed as the principal collaborator for South America in Arnold and Libby's publication (1950, p. 14) of many of the first dates from their world wide assay.

The Huaca Prieta had been excavated before carbon dating was invented. The dated samples were selected from collections of excavated organic materials that were at the American Museum of Natural History in New York. Bird received his first accurate carbon date in August, 1949, in a letter from W. F. Libby:

Dr. Arnold and I have finished measuring the sample you sent us from the subterranean house structure found at the mouth of the Chicama Valley in Peru. The final date is somewhat older than the preliminary one I sent you some months ago. The value is  $2738 \pm 200$  years. We have every reason to believe that the measurement on this sample is sound and that this result is the answer the radiocarbon method gives. We would appreciate receiving further materials from you, especially at lower levels.

Thus opened the age of absolute dating in South American archaeology. The  $2738 \pm 200$  date was Libby's sample 75 (from a Cuspisnique house, no. 1, in Test Pit 5). It was adjusted to  $2665 \pm 200$  in the following year due to corrections made in determining the half-life of radiocarbon (Arnold and Libby, 1950, p. 14).

After receiving the date based on sample 75, Bird sent Libby an elaborate collection of organic materials from the Huaca Prieta, most from preceramic layers. Using these, Libby produced a set of nine additional dates in 1950. They bore his Chicago laboratory's sample numbers (C-) 313, 315, 316, 318a,

318b, 321, 322, 323, and 362. Sample 318a ( $1989 \pm 196$  years) gave, in Libby's words, a "dissonant result" and was run again, producing the considerably different date of sample 318b. Libby suggested that sample 318a may have gotten dirty during preparation. Bird suspected it may have been contaminated with alovar or ambroid (1951a, p. 39, footnote). Thus the date of sample 318a was not used by Bird in his evaluation of the dates for Huaca Prieta. Bird was aware that the Huaca Prieta samples had not been selected or collected with the prescribed care which should be used to extract specimens for dating. Moreover, the dated specimens were not always the most effective types of materials.

The ones [samples] submitted to Libby and Arnold are not necessarily the ones which would have been sent had we known of the process at the time they were collected. In a region where wood can survive virtually unaltered for thousands of years, it is particularly important to choose material which was alive close to the time of the cultural remains with which it is associated. A good example is the digging stick, sample 322. Granted that this yields a date beyond which the age of the associated house cannot go, it would have been far better to have tested the fragrant "yerba Luisa" grass which had been strewn on the original floor before laying the new one during the alterations which sealed the digging stick in one of the walls. The grass must have been gathered fresh at that particular moment and there would be none of the speculation with which we must consider the digging stick. (Bird, 1951a, pp. 46-47)

In general, Bird thought the "figures secured seemed to fit in well" (1951a, p. 41) and arranged for only one additional date, sample 598, which he asked Constante Larco in Peru to extract for him from a hearth that was at the bottom of the eastern wall of Test Pit 2 (fig. 32). That sample was selected and removed with prescribed care (see Addendum by Bird in a subsequent section on dated specimens versus stratigraphic position in this chapter) and sent to Libby in Chicago. In March, 1951, Libby informed Bird that that sample's date was  $4298 \pm 230$  years. It confirmed Bird's expectations that the preceramic occupation at the Huaca Prieta began well



FIG. 32. Constante Larco collecting sample no. 598 for radiocarbon dating. The specimen was taken from a hearth at the bottom of the east face of Test Pit 2.

into the third millennium before Christ. It also suggested that the other samples were not defective due to collection procedures.

#### THE ORIGINAL DATES AND CALIBRATIONS

Tables 1 and 2 list the carbon dates produced at the Institute for Nuclear Studies at the University of Chicago in 1949, 1950, and 1951. The location of the specimen within the excavations and the materials dated are summarized in Table 1. Table 2 lists the carbon dates. After the sample number, the original dates, both B.P. (Before Present) and B.C. are given. These dates are based on a  $5568 \pm 30$  year half-life. The solid-carbon method of analysis was used. Problems involved with the solid carbon method are discussed by Browman (1981, pp. 244–245). These uncorrected dates suggest that the preceramic occupation took place from about 2400 B.C. to sometime before 1200 B.C. Samples 75, 322, and 323 are not associated with prece-

ramic remains, and, with the questionable exception of 322, are younger. It is now recognized that the type of plant material will cause some variation in the date produced (Browman, 1981, pp. 268–274). Corrections for these material variations are not presented here.

In the 1960s the scientific community learned that temporal variations in the radiocarbon content of atmospheric carbon dioxide required that conventional carbon dates be calibrated to obtain a more exact date in years. Many different calibration charts have appeared in the last decade and a half. All demonstrate similar long-term changes in atmospheric radiocarbon, but vary in their analysis of variations over short periods. Bird frequently commented that the Huaca Prieta preceramic dates would actually be several hundred years older than the uncorrected dates. This is demonstrated by table 2 in which the original dates are calibrated according to three different correction schemes. They are: (1) Ralph, Michael, and

TABLE 1  
Radiocarbon Sample Locations and Materials

Sam- ple No.	Material	Location
323	Fiber rope	Test Pit 1—Bottom Gallinazo associa- tions
75	Algarroba wood beam	Test Pit 5—House, with Cupisnique associations
322	Digging stick	Test Pit 5—House 7, with initial pottery
321	Gourds, chewed fiber, squash stems, cotton, barkcloth, wood	Test Pit 3—Layer D
318b	Twigs and treated huarango wood	Test Pit 3—Layer J
362	Carbonized cattail roots	Test Pit 3—Layer K
315	Shell	Test Pit 3—Layer M
316	Misc. woody plants	Test Pit 3—Layer M
313	Misc. woody plants	Test Pit 3—Layer Q
598	Charcoal	Test Pit 2—Bottom

Han (1973), (2) Damon et al. (1974), and (3) Klein et al. (1982). The charts from Ralph and colleagues are based on dates calculated with the 5730 year half-life. Thus the dates for Huaca Prieta have been corrected by multiplying the B.P. date by 1.03. The corrected dates on the charts by Ralph and colleagues

are given as a limited range or midpoint of a larger interval. The Damon calibrations use the 5568 year half-life and feature the corrected dates as midpoints of intervals. The Klein calibrations use an improved set of radiocarbon measurements and express corrected dates in terms of 95 percent confidence intervals according to six different radiocarbon uncertainties. These calibrations thus result in new dates with a relatively wide interval, but a high level of confidence that the date falls in that range. Midpoints have been calculated for the purpose of comparison with the two other correction schemes.

The corrected ages of the dates from Huaca Prieta indicate that the preceramic occupation began around 3100 B.C. and concluded around 1200 B.C. or earlier.

Before radiocarbon, Bird was concerned with the age, in years, of the Huaca Prieta remains. Using estimates based on the regular deposition of soil (1948a, pp. 27, 28), he calculated that the earliest occupation was 5150 years old (3200 B.C.). He offered his estimate as not conclusive, but to stimulate discussion.

#### ANALYSIS OF THE DATED SPECIMENS VERSUS THEIR STRATIGRAPHIC POSITION

Junius Bird published (1951a) an analysis of the first radiocarbon dates from South

TABLE 2  
Radiocarbon Dates

Lab. Sample No.	Corrected Age (3 Different Calibrations)							
	Uncorrected Age		Damon et al., 1974		Ralph et al., 1973	Klein et al., 1982		B.C. Midpoint
	Half-Life 5568		B.P. Midpoint	B.C. Midpoint	B.C. Range or Midpoint	B.C. 95% Confidence Interval	B.C. Midpoint	
	B.P.	B.C.						
323	2632 ± 300	682	2775 ± 304	825	820-840	1400-175	788	
75	2665 ± 200	750	2816 ± 206	866	880-900	1260-405	833	
322	3310 ± 250 <sup>a</sup>	1360	3646 ± 254	1696	1680	2090-1137	1614	
321	2966 ± 340	1016	3199 ± 341	1249	1270-1300	1845-605	1225	
318b	3550 ± 600	1600	3960 ± 614	2010	2070	2885-1110	1998	
362	4044 ± 300	2095	4604 ± 317	2654	2650-2780	3355-1895	2625	
315	3572 ± 220	1622	4252 ± 239	2302	2080	2520-1555	2038	
316	4380 ± 270	2430	5030 ± 290	3080	3160	3760-2400	3080	
313	4257 ± 250	2307	4876 ± 276	2926	2970	3370-2410	2890	
598	4298 ± 230	2348	4927 ± 258	2977	2990-3110	3480-2420	2950	

<sup>a</sup> Average of two dates.

America soon after they had been produced. Most of those dates came from the Huaca Prieta. Others came from a Paracas mummy, a Mochica pyramid, and a Nasca grave and atlatl (see also Strong and Evans, 1952, p. 226). Bird's discussion of the dates from Huaca Prieta in that article is reproduced below. A chart demonstrating the dates in relationship to their stratigraphic positions accompanied the article. That chart (fig. 33), with non-Huaca Prieta dates removed, is reproduced here. Bird (1951a, p. 37) commented, "The accompanying chart was prepared to clarify what is bound to be tedious reading. On it, the plotting of the radiocarbon dates is obvious. The insertion with them of sectional profiles of the midden excavations may be confusing, but does show where the tested material was found."

In response to a comment by the archaeologist Donald Collier, Bird recognized (1951a, p. 47) that his analysis and chart might give the erroneous impression that a correct radiocarbon date must necessarily fall within the plus or minus range of one sigma. "What I have attempted is a comparison of the most probable figures in terms of the known stratigraphy of the samples." Age-correction calibrations had not yet been devised for radiocarbon dates when the following discussion was written and therefore all dates in the text are original and uncorrected.

From Bird, 1951a, pp. 37-41, 48-49.

*Samples 313, 316* (miscellaneous woody plant remains). On the basis of stratigraphy, sample 313 is older than 316, although the mean radiocarbon dates indicate the reverse. Both consisted of the same type of material: scraps of twigs and plant stems, mainly residual material from fireplaces. Most, if not all, of this must have been living matter shortly before it was used. The two samples were separated by 1.45 m of ash and occupational debris, with the strata dipping approximately 22°. This must have accumulated slowly for the community was small and they obviously disposed of trash all over the occupied area. We have no good method for translating this into years. In this instance a conservative guess would be that the accumulation between the samples represents something over a century. In contrast to this, we can

compute the minimum average time necessary for the accumulation of the intermediate debris by subtracting the maximum figure for 313, dividing by the number of meters between the layers D and Q. Applying this rate to the Q-M interval, we have a figure of 222 years. The faults with such a procedure are obvious. Not only does it use dates which we are supposedly examining but applies the years-per-meter figure as if the growth rate had been constant. Its only interest lies in the fact that it does not conflict with the "more than a century" guess.

With this in mind, plus the fact that 313 is actually older than 316, a comparison of the two date blocks tells the following. It is obviously impossible to accept both means as correct; the lower portion of 316 and the upper portion of 313 cancel out as impossible, and within the remaining portions of each, sections equal to a minimum of 100 plus (?) years can be classed as improbable because of the time span between the samples (see fig. 33). This leaves the interval between years 4507 and 4210 as the span in which the age of 313 should fall, and for 316 the span between 4407 and 4110.

This is as far as the present archaeological data can be applied to these two samples. Actually, there is no reason not to accept the figure of 4257 years for sample 313 (layer Q). For reasons already mentioned, the date for 316 (layer M) would then fall in the upper portion of the sample 316 time span, perhaps between 4157 and 4110. (See discussion of sample 598 at end of this paper).

*Sample 315.* The shells used for this test came from the same layer in the midden as the plant material used in 316 and, therefore, are of the same age. The discrepancy in the two sets of figures needs explanation, for if we accept 316 as correct, then all of 315 must be ruled out. Looking at 315, however, in its relationship to 313, without considering 316, we see that the interval of 215 years between the minimum figure for 313 and the maximum for 315 is within the range of possibility. The difference between the means is, on the contrary, quite improbable for the Q-M interval. On this basis more than half of the 315 time span must be classed as impossible. Where one places the limit of possibility depends on what can be considered the maximum length of time between Q and M. In figure 33 this is drawn at 400 above the minimum figure for 313; namely, at the 3607 level.

This is as far as the archaeological data apply and does not explain the discrepancy between 316 and 315. This may well be due to the difference in the material tested, and should be checked on

RADIOCARBON DATES VERSUS STRATIGRAPHIC POSITION

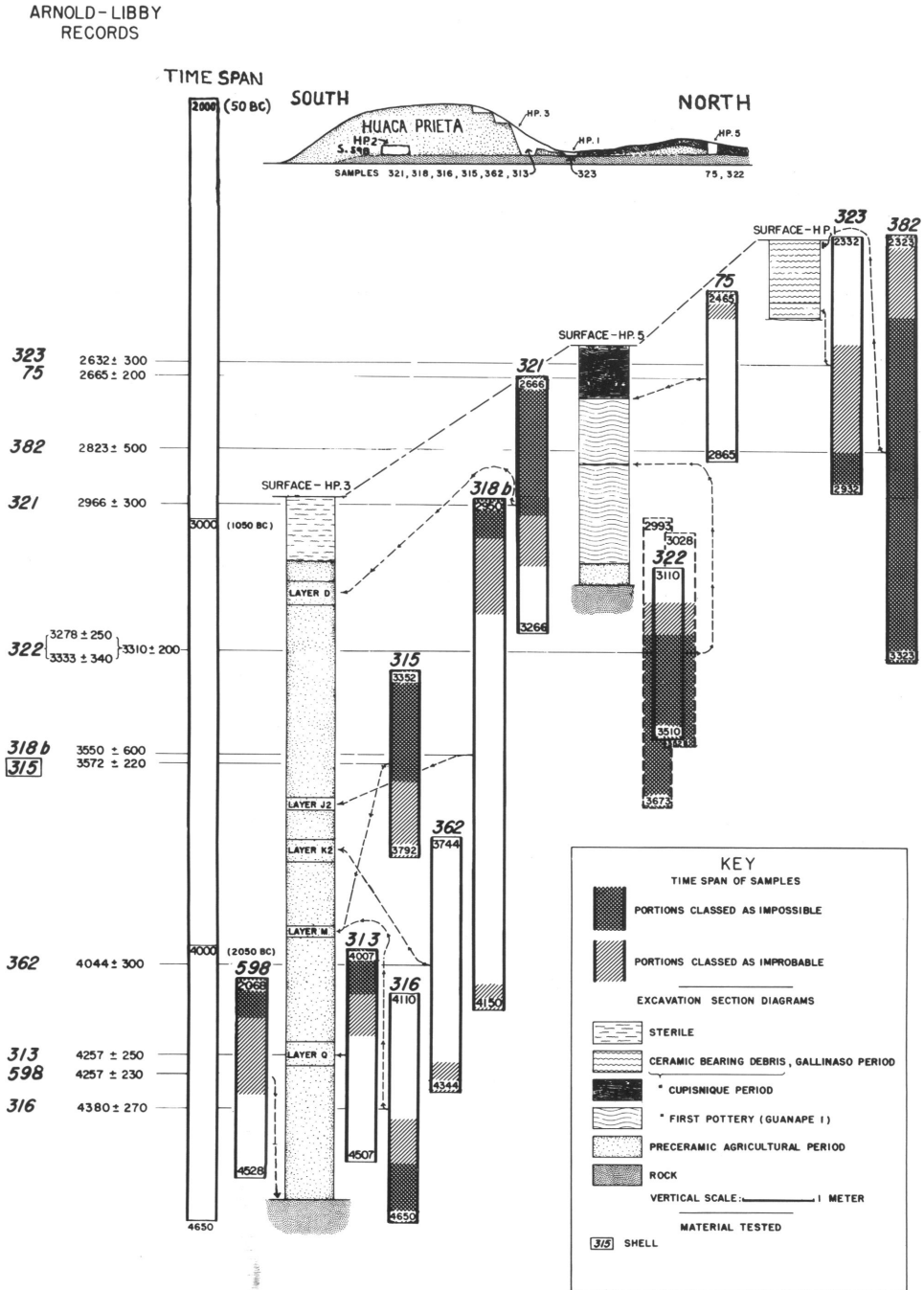


FIG. 33. Drawing of radiocarbon dates versus stratigraphic position.

that score. I am reluctant to express an opinion on it without fully understanding what differences can be predicted for tests of shell versus plant remains. [It is now generally recognized that radiocarbon dates based on marine shell from the Peruvian coast are inaccurate. This was not known when Bird wrote this analysis. JH]

*Sample 362* (carbonized cattail roots). Here, as in other parts of the world, cattail roots were gathered, roasted and eaten. Such charred examples as these are ideal material for radiocarbon tests, for they were fresh when brought to the site. The results in this case do not conflict with the figure derived from the plant material of the older layers. The obvious comment, that the oldest acceptable date cannot fall closer to the maximum figure for 313 than the length of time necessary for the accumulation of 2.5 m of debris, is of slight help. If the Q-M interval equals 100 plus (?), then the Q-K<sub>2</sub> interval, if the rate of growth was constant, equals 172 plus (?) years. The more reasonable minimum rate per meter, using 313 and 321 figures, suggests 382 years as a possibility. In the first instance, 4335- (?) would be the oldest limit for 362, while the second points to 4125. Regardless of which may be more nearly correct, we can justifiably question the lower portion of the 362 block. The mean figure of 4044 years could be correct, but if not, the right one should be later rather than earlier.

*Sample 318b*. Since the Arnold and Libby (1950) publication of radiocarbon dates there was a rerun test on a second portion of the 318 sample. The results here designated as 318b confirm the conclusion that all of 318a must be wrong. The large plus or minus leeway, the result of a relatively short counting period, fits in surprisingly well within the framework of the adjacent measurements. Perhaps a few years at the bottom in the 4050 to 4150 section might be graded as improbable on the basis of the K<sub>2</sub>-J<sub>2</sub> interval.

At the top the possibilities are more clearly defined by the 321-322 results. [The date for sample 322 is an average of 2 measurements. JH] Some of the time span of 318b, where it overlaps the questioned portion of 321, has to be considered impossible. I have arbitrarily indicated that this falls between the years 2950 and 3040. The interval between 318b and 321 has also to be considered. Estimates for this time span, during which 2.75 meters of debris accumulated, vary from 190 plus an unknown amount to perhaps 420 years. Thus a conservative assumption would be that 318b cannot approach closer than 250 years, the minimum date for 321. If this is close to 2993 years, as will be explained, then 318b should not be less than about 3240 years.

*Samples 321* (gourds, chewed wads of fiber,

squash stems, cotton, bark-cloth and wood); 322 (digging stick). Most of the plant material in sample 321 is composed of either annuals or the external parts of plants which must have been living only shortly before they were discarded. Its position in the mound is quite close to the time of final abandonment of the village which, I think, marks the end of the Preceramic Period. The validity of the date derived from this is then of considerable general interest. The indicated time span does not conflict with the sample already discussed, although it does overlap with part of 318b. There is, however, a conflict with the results obtained from 322, comparable to the 313-316 situation. Hence, 321 must be reviewed together with 322.

The stratigraphic occurrence of the latter was considerably later than 321. For this reason, all those portions of the time blocks beyond the direct overlap have to be classed as impossible and a section of each, equal to the estimated interval between the two, can be classed as improbable. This narrows the choice for 321 to the span between approximately 3100 and 3266, and for 322 to the interval between 3160 and possibly 3000. All of this hinges on the assumption that 322 was contemporary with the level at which it occurred. There is, however, a chance that 322 was made from an old piece of wood, or that it had been made long before the time it was put away.

It appears to be huarango—a hard, dense wood which is not particularly slow growing—but does last indefinitely. I would suspect that, with the extremely crude wood-working tools in use at that time, unseasoned wood of nearly the right diameter would have been chosen for such objects. When found, it was still sound enough to use, so it could well have been an old artifact when discarded. While several such digging sticks were found in the pottery-bearing debris, associated with adobe bricks, none of this type were found with the preceramic material. Hence I am reluctant to consider that it existed as an artifact before the material of the 321 sample, in spite of the evidence of the radiocarbon tests.

*Sample 75* (roof timber of huarango). This beam, apparently freshly cut for the roofing of a subterranean house, is an important sample because it is contemporary with the first appearance of maize and Cupisnique pottery at this site. As the diffusion of maize in Peru seems to have been from north to south, an accurate date for this level is extremely useful. As far as the present study is concerned, it sets a limit beyond which the maize-associated samples 323, 382, 271, and 521 [samples 382, 271, and 521 are from other sites] cannot go.

The stratigraphic position of 75 makes it ob-

viously younger than 322 which came from the same excavation. In the interval between the samples, the following events occurred: (1) House 7, a structure made of cylindrical adobes placed vertically, was being remodeled when sample 322 was incorporated into the wall, following which another room or structure was built against it to the northwest. This might have immediately followed the alteration. (2) Both structures were occupied, then abandoned, the walls broken down, the interiors filled with trash to a depth of about 50 cm. If the house walls had been deliberately destroyed, one would expect to have found some of the broken adobes inside—which was not the case. The nature of the fill, then, implies the passage of time after abandonment. (3) For some time, for which there is no measure, the walls of House 7 were weathering until they were flush with the surface of the ground, then 60 cm above floor level. Over this a wall of conical adobes was constructed, running diagonally across the buried structure. In its turn, the lower portion of this wall was partially buried, while the upper portion weathered away completely. (4) The surface at this stage remained fairly stable for awhile; then came a new period of construction in which subterranean houses or vaults, similar to the preceramic type of house, were built. In excavating for these, the conical adobe wall was cut through and part of the House 7 addition was exposed. Sample 75 came from one of these subterranean structures.

In terms of years we can guess that the events mentioned might have taken place during several centuries. Adobe walls of similar thickness, erected after the Spanish conquest and abandoned by 1600 A.D., are still standing at a site not more than a mile away. The natural decomposition of such walls is, then, a slow process, provided they stand on constantly dry ground. Therefore the minimum time between 75 and 322 cannot be less than a century, and although it may well be several times that, it is impossible to make a close estimate. In order to indicate that the uppermost portion of 75 can be questioned, I have marked the portion separated by over 600 years from the limit of the 322 average as improbable.

*Sample 323* (rope). Next in sequence are the figures secured by processing two hanks of small, three-ply rope of twisted sedge (*Scirpus [americanus?]* Persoon). Ten of these carefully tied hanks were found together, wrapped in an old piece of matting, at the bottom of the Gallinazo or Virú period debris in HP 1. They were obviously new when hidden away and had never been used. The close similarity of the hanks suggests that a standardized product was being made, perhaps for trade.

The stratigraphic position of the specimens was

sharply delineated, for directly beneath was a sterile deposit of beach cobbles, which we believe were left by a tidal wave. This effectively sealed off the earlier debris and eliminated the possibility of misinterpreting the cultural association. Sherds around and over the specimens are types which in the Virú Valley occur at the beginning of the Gallinazo or Virú period, with negative painting common on the decorated pieces. Thus a date for this specimen, although it may not mark the precise first appearance of negative ceramic painting in the Chicama Valley, is close to it and does give a maximum terminal date for the preceding Salinar period.

#### ADDENDUM

*Sample 598* (charcoal)  $4298 \pm 230$  years. As the preceding comments go to press, Libby reports the measurement of a charcoal sample secured by Larco from the surface of the decomposed conglomerate rock below the Huaca Prieta preceramic deposit. It was secured from fire hearths in the bottom of an excavation in the main mound designated as HP 2 in the field notes, but not previously mentioned as no other material from it was tested. There can be no question that these hearths are stratigraphically equivalent to the absolute bottom of the HP 3 excavation, for the subsurface in HP 3 and HP 2 is on the same level, with the lowest debris in both of the same nature and content. Apparently the strata run horizontally between the excavations and expand in thickness only as they cross HP 2 away from HP 3. Further, the subsequent build up of debris over the thin bottom material produced strata which amplify this trend and dip from HP 2 in the direction of HP 3.

Photographs of the exposed hearth sections were sent to Larco, with explicit instructions as to procedure in collecting and packing. He, personally, cut back the old excavation wall and found as expected that the hearths continued back under the deposit. The outermost portion was discarded and from the rest over 400 grams of charcoal were secured. Several kinds of wood are represented, some clearly of small diameter, an inch or less, so we are certainly not dealing with the remains of a single large log. The pieces were packed at the site in a tin container with some of the dust and ashes which had been separated by sifting. The container was sealed and not opened until it reached the American Museum. Here the contents were re-sifted, examined, and packaged in foil for shipment to the Chicago laboratory.

To complete the history of the sample, it should be mentioned that the presence in the lowest strata of some cotton yarn, seeds and other perishable items, although in poor condition and not abun-

dant, implies that there has been no water seepage at that level.

The age figures secured by Libby,  $4298 \pm 230$  years, have been plotted in figure 33. On the basis of the rate of midden growth as indicated by the other measurements, I had estimated that the age of the bottom of HP 3 should be about 4660 years. Hence, the mean figure for sample 598 is 362 years less than anticipated, with its maximum figure 132 years less.

Comparing the three consecutive samples (598, 313, 316) we see that 598 supports the deduction that the lower portion of the 313 block should be questioned, that if the uppermost portion of 313 is not acceptable, the same arguments would hold for the upper limits of 598. As the amount of debris between samples 598 and 313 is greater than between 313 and 316, we can expect a greater lapse of time. Proportionately this comes out as 120 plus an unknown number of years and might amount to 260. As with 313, I have used the minimum figure and have classed as improbable the section of 598 which is separated by less than 120 years from the upper probable limit for 313. This gives us the span between 4320 and 4528 as the most probable place for the actual age of 598, with the implication that if it falls outside of these figures we should expect it to fall on the plus rather than the minus side.

#### NEW DATES

On April 24, 1984, four gourd (*Lagenaria siceraria*) samples were submitted for radio-

carbon dating to Beta Analytic Inc. of Coral Gables, Fla. The samples were submitted in an attempt to refine the sequence obtained by Bird in the pioneering days of the radio-carbon technique. The samples came from the collections excavated in 1946, and were subject to the additional contamination of decades of examination and storage at various institutions where the botanical collections were loaned. On May 21, 1984, the laboratory reported the following uncalibrated dates:

- Beta 9286 (from HP 3, E)— $3730 \pm 300$  B.P.  
or 1780 B.C.;
- Beta 9287 (from HP 3, J)— $3270 \pm 100$  B.P.  
or 1320 B.C.;
- Beta 9288 (from HP 3, F)— $3960 \pm 100$  B.P.  
or 2010 B.C.;
- Beta 9289 (from HP 5, B)— $3610 \pm 280$  B.P.  
or 1660 B.C.

The above dates were received after completion of the manuscript for this volume. Additional commentary on the sample size, laboratory pretreatment, and relationship to the dates obtained by Junius Bird may be found in notes by Robert McK. Bird in the Junius B. Bird Laboratory of South American Archaeology at the AMNH.

## CHAPTER 6. BURIALS

The skeletal remains of at least 33 individuals who lived in preceramic times were excavated at the Huaca Prieta. A sex determination could not be made with the remains of six burials. Of the remainder, 19 are female, and 6 are male. Burial was in small, shallow graves in refuse starting at the beginning of the occupation around 3000 B.C. The buried individuals were generally flexed to fit into a minimal space and none retained any traces of binding or ropes. The graves often contained remains of old sleeping mats and fragments of textiles. Otherwise, with one or two exceptions (burials 903 and 905), no gravegoods were found (Bird, memo, 1959).

Sometime after the first occupation at Huaca Prieta, subterranean houses came into use. Individuals were often buried in their rooms, or recesses in those rooms. The bodies often lay, like the burials in the refuse, on either side with arms and legs flexed, and no particular orientation (memo, 1959).

Three Ceramic Period burials (AMNH catalog nos. 99.1/867, 910, and 911) were found on the north side of the Huaca Prieta and these are reported here. Bird obtained an additional 12 Ceramic Period skeletons from three test pits he dug 100 to 150 m north of the mound. These burials are not described here since they were excavated well away from the Huaca Prieta and do not pertain to preceramic times. They are cataloged with the Huaca Prieta skeletal material at the AMNH.

In 1948 and 1949, Ruby M. Glen washed, hardened, repaired, and numbered the Huaca Prieta skeletal remains at the AMNH. All remains of identifiable, relatively intact skeletons were given a museum catalog number which begins with 99.1 and is followed by a three-digit number. If more than one burial was found in one grave, such as a subterranean house, then each specific individual was usually given the same three-digit number followed by a capital letter. For example, the four burials in House 3 on top of the mound are 99.1/895A, 895B, 895C, and 895D. In the text which follows, the AMNH catalog numbers, omitting the 99.1, will be used as the title for each burial.

Bird made some observation (notes, 1948)

about the relative chronology of the Huaca Prieta burials. The Ceramic Period skeletons are most recent, with 867 (Cupisnique-Sechín) being older than 910 and 911 (both Gallinazo). Among the preceramic burials, the many skeletons from the top of the mound (881 to 895E) are the more recent, and probably equate with 896, the most recent (uppermost) burial in Test Pit 3. The oldest burials in Test Pit 3 are 902, 903, and 904, coming from the lower layers. The burials from Test Pit 2 (905 to 908) are similarly old, equating in age to those of the lower strata of Test Pit 3.

Some general comments about the burials at Huaca Prieta are found in the account of burial 903 written by Bird (letter, 1974), which is printed following the description of burial 903 in this chapter.

During the 1960s Dr. Charles W. Lester, of New York City, studied the Huaca Prieta skeletal material (Lester, 1965, 1967). He examined for evidence of disease, trauma, and deformity, both congenital and clinical. Lester studied the burials from preceramic and Ceramic Period contexts, including the 13 individuals from test pits north of the Huaca Prieta, and 3 individuals from Guañape in the Virú Valley, Peru. None of the preceramic skulls showed cranial deformation, but 10 of the later (Ceramic Period) skulls exhibited a flattening of the occiput involving the occipital and parietal bones. Lester observed some examples of dental pathology, osteoarthritis, fractures, and congenital deformities such as fused vertebrae and ribs. He detected one or two instances (894 and 910) of Paget's disease (*osteitis deformans*) and one bone tumor (895), an osteochondroma in an ulna. He identified a number of examples of exostoses of the external auditory meatus, a subject elaborated by Dr. Ian Tattersall in the following subsection.

The Huaca Prieta skeletal remains were aged and sexed by a number of individuals, Lester among them. Since none left an account of the criteria used to make those evaluations, and since the results were not always in agreement, Tattersall reevaluated the remains and produced table 3, listing the lo-

cality of each burial with its sex, age, and incidence of exostoses (table 3).

THE HUMAN SKELETONS FROM  
HUACA PRIETA, WITH A NOTE ON  
EXOSTOSES OF THE EXTERNAL  
AUDITORY MEATUS

Ian Tattersall

During the excavations at Huaca Prieta, over 30 human skeletons dating from the Pre-ceramic Period were exhumed, as were more than a dozen from later ceramic times. These skeletons are listed in table 3. The table lists the location of discovery of each individual; its AMNH 99.1 catalog number; its sex (based on the subjective evaluation, where possible, of the pelvis and the cranium); and its age at death (based on dental eruption, dental attrition, and degree of closure of the cranial sutures). Immature individuals (below ca. 17 years of age) are not assigned ages. Three age categories are recognized among the adults (as defined in the youngest of them by the presence of fully formed and rooted upper and/or lower third molars, even if not completely erupted): young adult, middle-aged, and aged. It is impossible to be certain what chronological ages these broad categories represent, but it is plausible that the young adults were below 30 years of age at death, and that those individuals classed as aged were over 45.

A notable pathological finding in the crania of the Huaca Prieta people, first noticed by Dr. Charles Lester in the mid-1960s, is the high frequency of occurrence of exostoses of the external auditory canal. These osseous lesions are hard, sessile masses that range from barely perceptible swellings of the bone lining surrounding the external auditory meatus to extensive multinodular structures that completely occlude the canal (fig. 34). Of the 27 adult preceramic crania, nine (33%) show exostosis development to one extent or another; this development is bilateral in all cases where the lesions are at all pronounced. The incidence of exostoses in the Huaca Prieta sample is given in table 3, where the lesions are scored according to their severity. Slight (SL) exostoses range from small longitudinal swellings to single lobular nodules; severe (SE) exostoses consist of multiple nodules that effec-

tively occlude the ear canal. Moderate (M) exostoses are intermediate in development, and typically consist of a number of bony lobes developed from the anterior, posterior, and/or superior walls of the external auditory meatus.

Among the preceramic sample, the occurrence and severity of exostoses of the external acoustic meatus is clearly age-related. None of the immature individuals show the condition, while of the nine of a total of 27 adults who do, five (56%) are classed as aged, three (33%) as middle-aged, and only one (11%) as young. Viewed another way, five of the nine aged individuals (56%) have some exostosis development, at least on one side, while of the 12 middle-aged individuals only three (25%), and of the six young adults only one (17%), are afflicted. It is, however, an interesting anomaly that among the three individuals most severely affected, one (no. 902) is a young adult.

In the preceramic crania there is also a consistent association of exostoses with sex. Although the number of female or probable female burials very substantially outnumbers that of males (by 19 to 7; one individual's [no. 895A] sex is undeterminable), twice as many (6 to 3) males as females show exostoses (although 1 of the 3 individuals affected most is female). In percentage terms, this means that, whereas only 16 percent of the females have lesions of the ear canal, fully 86 percent of the males do. And the single putative adult male individual to lack any exostosis development at all (no. 904), though aged, was categorized with only modest confidence as male.

As the table shows, the burials from the Ceramic Period site show a similar pattern: of 11 adults, four (36%) display exostoses. Of these four individuals, three are aged, and three are male.

The frequency of occurrence of ear exostoses has been shown to vary greatly between populations. For instance, Hrdlička (1935) reported frequencies as low as 0.2 percent among Eskimos (and total absence among many tropical cranial series examined), and as high as 32.2 percent for certain native North American groups. Early Peruvians in general are reported to show high frequencies. Thus in a series of almost 4000 Peruvian

TABLE 3  
Skeletons Recovered at Huaca Prieta

Location	AMNH No. (99.1 cat.)	Sex	Age				Aud. Exost. <sup>a</sup>	
			Imm.	Young Adult	Middle Age	Aged	Left	Right
Preceramic Period								
Top of Mound	881	—	x	—	—	—	—	—
Zone 7	882	?F	—	—	—	x	SL	—
House 1	883	F	—	—	—	x	—	—
	884	F	—	x	—	—	—	—
	885	F	—	—	—	x	—	—
	886	F	—	—	x	—	—	—
	887	M	—	—	x	—	SL	—
	888	F	—	—	x	—	—	—
Top of Mound	889	?F	—	—	x	—	—	—
Zone 7	890	F	—	—	x	—	—	—
House 2								
Top of Mound	891A	—	x	—	—	—	—	—
Zone 3	891B	F	—	—	x	—	—	—
House 1								
Top of Mound	892A	—	x	—	—	—	—	—
Zone 3	892B	F	—	—	x	—	—	—
House 2	893	M	—	—	—	x	SL	M
	894	M	—	—	x	—	SL	—
Top of Mound	895A	?	—	x	—	—	—	—
Zone 3	895B	F	—	x	—	—	—	—
House 3	895C	M	—	—	x	—	M	M
	895D	F	—	x	—	—	—	—
Test Pit 3	896	F	—	—	x	—	—	—
HP 3	897	M	—	—	—	x	SE	SE
	898	—	x	—	—	—	—	—
	899	—	x	—	—	—	—	—
	900	F	—	—	—	x	SL	SL
	901	F	—	—	—	x	M	SE
	902	M	—	x	—	—	SE	M
	903	F	—	—	—	x	—	—
	904	?M	—	—	—	x	—	—
Test Pit 2	905	—	x	—	—	—	—	—
HP 2	906	?F	—	x	—	—	—	—
	907	F	—	—	x	—	—	—
	908	F	—	—	x	—	—	—
Ceramic Period								
	866	M	—	—	x	—	—	—
	867	M	—	—	—	x	SL	M
	868	?M	—	—	—	x	SL	—
	869	F	—	—	—	—	—	—
	870	M	—	x	—	—	—	—
	871	M	—	x	—	—	—	—
	873	F	—	x	—	—	—	—
	874	F	—	x	—	—	—	—
	875	F	—	x	—	—	SL	SL
	876	F	—	x	—	—	—	—
	878	—	x	—	—	—	—	—
	880	M	—	—	—	x	M	M

<sup>a</sup> SL: slight; M: moderate; SE: severe. Imm: immature.

Ceramic Period burials 910 and 911 were found near the wheelbarrow trench of HP 3. Their remains were too fragmentary for the above evaluation.

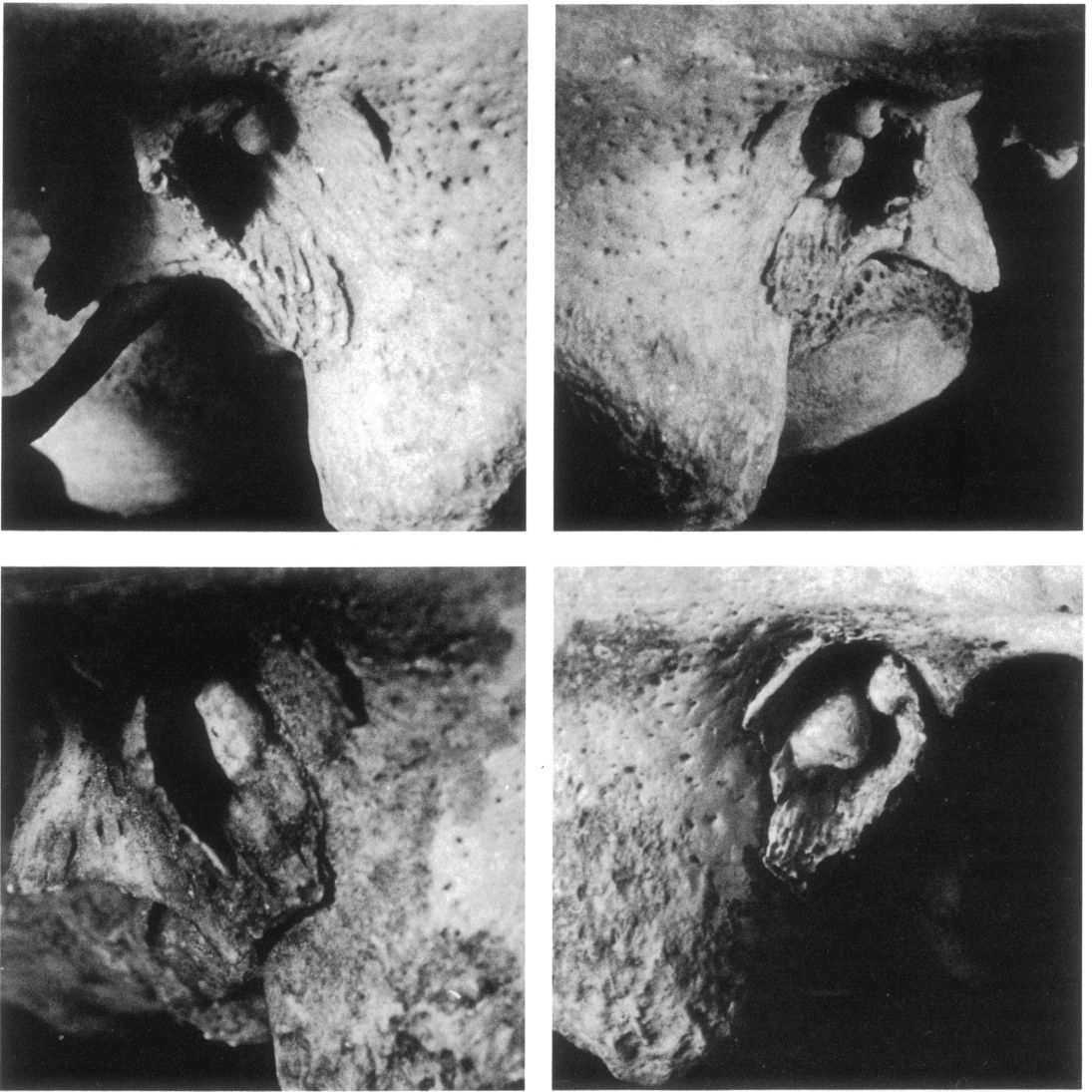


FIG. 34. External auditory meati of two Huaca Prieta individuals, to show developments of exostoses. Top: burial 880 (ceramic period), aged male, left (moderate) and right (moderate) ears. Bottom: burial 897 (Preceramic Period), aged male, left (severe) and right (severe) ears. All approx.  $\times 1.5$ .

skulls, Hrdlička found that 14.3 percent displayed exostoses; and, although he did not make it clear where these crania were collected, it is highly likely that, like Huaca Prieta, they were coastal. More specifically, in 1885 Virchow reported an incidence of 13.4 percent exostoses in a much smaller sample from the coastal Peruvian site of Ancon. But although the possibility certainly exists that

there are distinct populational differences in susceptibility to external auditory exostoses (and that Peruvians may be on the high side), it is impossible to claim this with much confidence because the condition appears to have a very definite primary clinical cause: one rooted in behavior.

Many etiologies have been suggested for ear exostoses since they were first noted in

the literature over two centuries ago. Earlier theories were reviewed by Hrdlička (1935), while more recent developments have been examined by DiBartolomeo (1979). However, in the light of experimental as well as clinical and demographic evidence, otologists today are virtually unanimous in identifying prolonged contact with cold water as the principal cause of aural exostoses. Indeed, the condition is widely known among American (particularly Californian) otologists as "surfer's ear." Interestingly, water at temperatures above 17.5°C does not tend to stimulate these pathological changes, but water at or below this temperature is firmly implicated (Adams, 1951). Near-shore waters beside the Huaca Prieta appear to meet this criterion (Schweigger, 1951, pp. 8–23). The precise mechanism by which prolonged exposure to cold water promotes exostosis growth nonetheless remains uncertain, although irrigation of the ear canal with water at 15°C is known to produce prolonged cutaneous hypermia, whereas this condition disappears almost immediately after exposure to warmer water.

The particular interest of the extremely high rate of 33 percent exostoses among the Huaca Prieta people thus lies in the implication that these individuals underwent habitual prolonged contact with the cold water of the Humboldt Current that washes the shoreline of Peru. Indeed, if the occurrence of exostoses is corrected for the small proportion of males in the total adult cranial sample, the resulting figure of over 50 percent exostoses overall would be the highest reported from anywhere, and would even more strongly suggest a lifestyle involving extensive aquatic activity. This, in turn, highlights Bird's (1948b, p. 302) observation that:

Shellfish, because of the heavy surf, are not very abundant on this coast [near the Huaca Prieta]. Apparently there was once a reef or point of conglomerate rock beyond the present shore line, providing a more favorable situation for their growth. This is indicated not only by the structure of the mound but by the fact that the people secured and ate large, deep-water mussels, which are no longer available in the vicinity. These mussels are seldom found in less than three fathoms of water and need more protection from surf than the situation now offers. The frequency of these shells in the midden shows

that some of the people were excellent swimmers, for at the places where the mussels are still found, only men equipped with modern diving gear gather them.

It is highly plausible, then, that the remarkably elevated incidence of exostoses among the Huaca Prieta population was due to a pattern of sustenance partly dependent on diving for bivalves in the deeper waters off the shoreline. This is not entirely conclusive, however, since Filipo et al. (1982) found a substantial occurrence of exostoses not only in aquatic athletes but also in a small sample of sportsailors with large numbers of sailing hours to their credit. They observed that such sailing, while not actively involving immersion of the head, does typically expose its practitioners to "continuous jets of water with relative perfrigeration due to rapid evaporation by the wind" (p. 331); and it is possible that such conditions might have been duplicated by the net-fishing in heavy surf that the Huaca Prietans are known from other evidence to have practiced. Nonetheless, deep-water swimming and diving may still be the most plausible explanations for the high frequency of exostoses observed in these people.

There remains the question of the distribution by sex of exostoses in the population. Superficially, this distribution certainly appears to suggest that it was the men who overwhelmingly undertook diving for shellfish and, possibly, net-fishing, and that the economic activities of the women must thus have been terrestrially based. However, virtually all studies of the incidence of exostoses in which sex was considered have shown a similar pattern of much higher incidence in men. Lifestyles and economic roles of men versus women in almost all earlier studies were unknown and unconsidered; but in matched groups of male and female competitive swimmers, Filipo et al. (1982) found a vast preponderance of exostoses in males; indeed, the condition was almost absent among the females they studied despite thousands of hours spent in the water. Similarly, Dettman and Reuter (1964) found an incidence of 33 percent exostoses in male and only 12.3 percent in female team swimmers with at least seven years' experience. The cause of this apparent sexual difference in susceptibility to exostosis

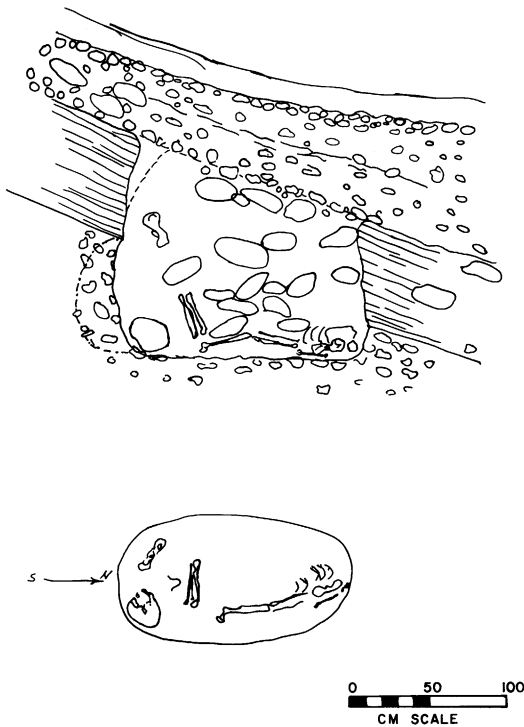


FIG. 35. Burial 867. Top: side view, with cobblestone layer over burial cavity. Bottom, top view.

development is unknown; but pending further study of the question it would seem to be premature to conclude, on the basis of exostosis frequencies alone, that it was solely the males of Huaca Prieta who dived for bivalves and engaged in net-fishing.

### BURIAL DESCRIPTIONS

In the following pages, descriptive data in Junius Bird's field notebooks are used to supply information about the burials excavated in the Huaca Prieta. Thirty-six burials are reported here, of which all are from preceramic times with the exception of three (867, 910, and 911) which were found on the north side of the mound. These three are dealt with first, then the preceramic burials are presented. They are grouped according to the excavation units in which they were found.

The locations of the burials are indicated on the profiles and plans of the North-South Exploratory Trench (fig. 11), Test Pit 2 (fig. 16), and Test Pit 3 (fig. 20) in Chapter 4.

### NORTH-SOUTH TRENCH: 867

Only one burial, 867, was found in this trench. It was located in the trench's eastern face midway between Test Pits 1 and 3. The burial was apparently made after the abandonment of the preceramic village on the top of the mound and prior to the tidal wave which deposited the cobblestone layer (fig. 35). The surface at the time of the burial was approximately that on which the cobbles were deposited. Stones in the grave fill were in jumbled disorder. The skeleton was incomplete and had been disturbed. The bones were not articulated. Nothing suggests a secondary burial. The tomb was originally an open chamber. Either it was robbed prior to the tidal wave and consequent deposition of the cobbles, or water disrupted it (nb. B, pp. 49, 50). A bone artifact was found in the tomb. This "spatula" was carved with a human figure (fig. 36). Bird (letter, 1981) wrote: "[I] am reluctant to equate the grave at the base of H.P. with Cerro Sechín. The little carved bone spatula is somewhat in the C. Sechín style [of] stone carvings without being identical. It might as well be Cupisnique."

Grave Contents: Textile specimens 41.2/3071 to 3079: Two are plain weaves,  $1 \times 1$ ; four are plain weaves  $1 \times 2$ ; one is a plain weave  $1 \times 1$  and 2; one is twining with paired warps; 47 g of scrap weaving. Carved bone artifact 41.2/3080.

### WHEELBARROW TRENCH OF TEST PIT 3: 910 AND 911

910 and 911: Two burials, an adult and a child, were found 150 cm west of the east end of the wheelbarrow trench leading out of Test Pit 3 where it passed Test Pit 1. The burials were in Gallinazo period deposits (notes, 1948). There is no specific excavation data on these two burials.

### TOP OF MOUND: 881 TO 895D

#### Zone 7, by pot-hunter hole

881 to 888: These burials were placed in the interior of subterranean House 1 beside the pot-hunter hole (fig. 37). They were apparently placed in the chamber at different times. Later the roof beams rotted and dirt filtered down over the skeletons, covering them very irregularly—barely a few inches in



FIG. 36. Bone artifact from burial 867. Length 24 cm.

some places and perhaps 2 ft or more in others. In time, most of this dirt hardened, forming a cementlike crust which in places had to

be removed with a pick (memo, 1966; nb. C, back cover).

889 and 890: These two burials were lo-

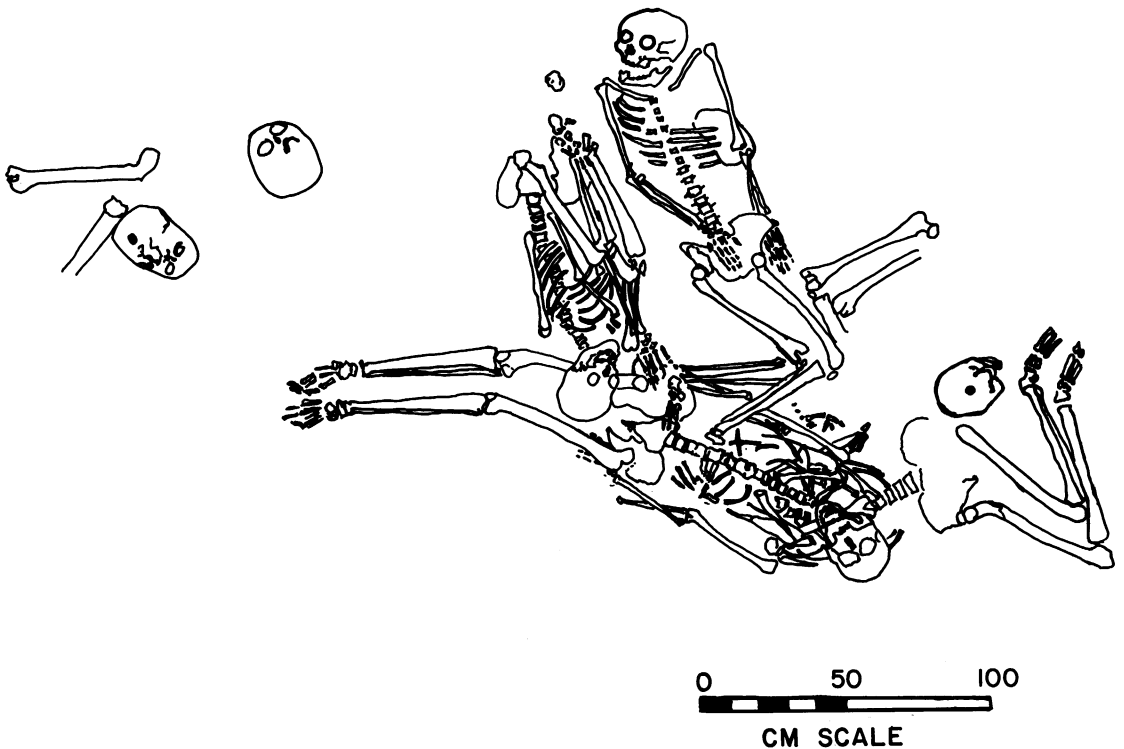


FIG. 37. Burials 881 to 888 from House 1 on top of the mound.

cated in House 2 (Zone 7) by the pot-hunter hole. There are no other excavation data.

Grave Contents: Shell fragment with two perforations (41.2/4654B).

#### Zone 3, near Test Pit 3 and Retaining Wall

891A, 891B, and \*: These burials were found in House 1 of Zone 3 on top of the mound. The skeletons of 891A and 891B are of an infant and an old man, respectively. Bird's fieldnotes refer to 891B as dwarflike, because of its small size (fig. 38). Both burials were found in Room 3 of House 1. The infant was found near the entrance door to Room 3. Burial 891B was flexed, lying on its right side, on the eastern side of the room. Its face pointed west (nb. C, pp. 45, 46). The remains of an additional individual (\*) from House 1 were not preserved and therefore have no AMNH catalog number. That burial was located in Room 1 and was not intact. The skull was crushed, lying face down, and had red paint under it. The right hand and forearm were in a natural position but the other bones

were not. A twined cotton fabric was present (nb. A, p. 19).

892A, 892B, 893, and 894: These four burials (fig. 39) are from House 2 south of Test Pit 3 and immediately south of Retaining Wall 4 (notes, 1948).

895A and 895B to 895D: These burials (fig. 40) were located in subterranean House 3. Burial 895A rested on top of fallen dirt from the roof, which irregularly covered the burials 895B to 895D. Salt crystals were around the skull of 895A and twined textile remnants were between the thigh bones (nb. A, pp. 20, 21). Twined textile fragments were found with 895A (nb. A, p. 20a).

#### TEST PIT 3: 896 TO 904

896: Although found in layer D, this burial dates from the formation of layer C. The grave was a shallow, oval hole (fig. 38). *Junco* matting was found on the right side of the body and partially under one stone. A liquid mixture of ash and refuse dirt had been poured over the burial after the body, matting, and stones were in place. This appears to be de-

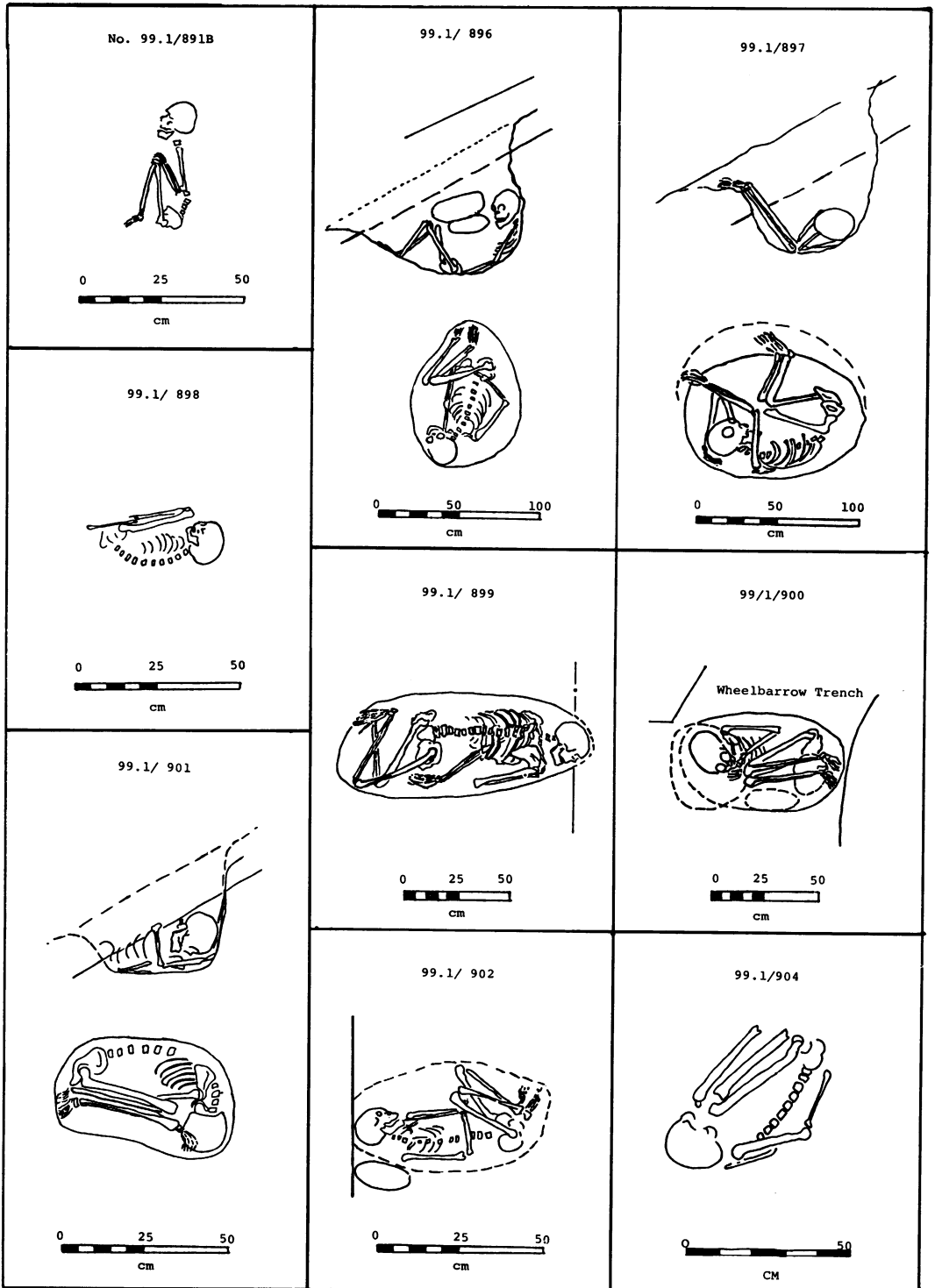


FIG. 38. Burials from Test Pit 3 (HP 3): 891 B, 896, 897, 898, 899, 900, 901, 902, and 904. All views are from top, looking down, except for 896, 897, and 901 which have a side view also illustrated. The orientations (top is north) and scales are not precise.



FIG. 39. Burials 892A to 894 from House 2 on top of the mound.

liberate. Badly rotted twined fabrics lay along the outside of the upper left arm, outside the right knee, in the crotch, and around the waist. The textile around the waist was a thick roll. Another fabric was across the back and down the upper right arm. The textile remains suggest aspects of costume, but are difficult to interpret. The residual scraps may suggest a shawl, belt, and loin covering, but one cannot be certain (nb. B, pp. 51, 52).

Grave Contents: Plain-weave mat (41.2/4250). Textile fragments (41.2/3068 a to c), plain-twined with paired warps. Cord fragment (41.2/3068d).

897: The burial was in an unlined oval pit (fig. 38). It was probably associated with layer F, although the body was located in layer G. The body rested on its left side. The head was on the upper left arm on the west side of the grave. The ankles and feet were higher than any other part of the body. The grave contained a covering of twined *junco* matting. Preserved hair had been roughly trimmed to a length of 5 cm. The contents of the large intestine were very well preserved (see subsection on coprolites and intestinal contents in Chapter 13).

The burial contained some evidence of clothing. About the waist was a loosely twisted cord or bundle of fine two-ply cotton yarns which probably served as a belt. A twined cotton fabric lay over the pubic area in front but did not pass through the crotch. If used as a pubic cover, it simply hung in front and the person was otherwise naked. Some textile items, one pointed pebble (probably a net-weight perforator), gourd fragments, and a basalt flake were found in the grave fill but probably were not associated with the burial. As with burial 896, a mixture of ash and dirt had been mixed with water and poured on the body. Was this evidence of ritual?

Grave Contents: A plain-twined textile with paired warps (41.1/9614) with terminal selva. A plain-twined textile with paired warps (41.1/9615 a to d) with primary selva.

898: This child burial was in layer H and was probably placed there during the formation of layer G. The body was in a shallow, unlined pit (fig. 38). It lay on the right side with the head to the east. The bottom of the pit was lined with willow twigs and grama grass. The skeleton showed signs of mutilation. The right leg was broken and the right

foot was missing. Only a femur, wedged between the right leg bones, remains of the left leg. The left and right arms were missing. Salt crystallization had deteriorated the bones, but there were some traces of skin. The ribs were all in position. A wad of twined matting accompanied the body. Moisture and fly pupae with the body imply the burial was primary. The condition of the burial is difficult to explain (nb. B, pp. 57, 58).

899: This burial was in layer H but was probably made during the formation of the lower half of layer G. It was difficult to trace the outline of the grave because it was placed in a layer with a high concentration of firestones and then filled in with the same (fig. 38). The body lay with its head to the east, with the face pointing south. The head rested on the left side and the trunk was turned to rest on its chest with the left arm extended toward the knees. The right arm was flexed to fit into the shallow grave pit. A piece of *junco* matting was placed over the body. A fragment of woven cloth passed between the femurs and rested where the buttock had been. Some fabric was at the waist, possibly used as a belt. Over and possibly about the neck were four strands of finely made cotton cords (nb. B, p. 59).

Grave Contents: Twined mats (41.2/4273 and 4274). Plain-woven textile (41.2/2541 a to c). Two cords (41.2/2542 and 2543).

900: The burial was found in the layer J but was probably made during the formation of the I layer. The body was folded into a small bundle with the knees to the chest (fig. 38). The upper arms were at the sides of the chest with the left hand over the sternum. The right hand was under the right knee. The body was covered with twined cotton fabric that was old and frayed when placed in the grave. The corners of the fabric were loosely tied with braided *junco* rope used to hold the knees to the body (nb. B, p. 61).

Grave Contents: Plain-twined textile with paired warps (41.2/2544 a to f). A plain-twined textile with paired warps and stripes of brown and tan cotton (41.2/2545 a to g). A large (133 cm incomplete length) twined textile with paired warps and stripes of brown and tan cotton (41.2/2546 a to f). Braided cord with knot (41.2/2547), illustrated in Chapter 12.

901: This burial was in an unlined pit in

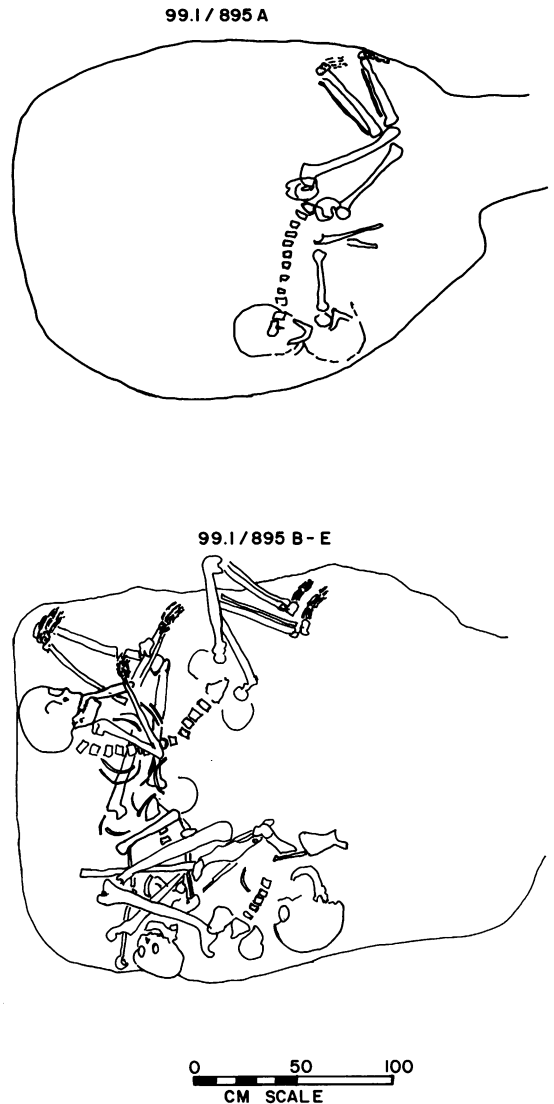


FIG. 40. Burials from House 3 on top of the mound. Top: 895A. Bottom: 895 B to D.

layer G. It was probably associated with the lower half of layer F. The body rested on its left side, face down, knees to chest, with the right arm crossing the chest (fig. 38). The right hand was under the face. Like burials 986 and 987, a liquid mixture of dirt had been poured over the body. A piece of twined *junco* matting lay over the head. Another lay over the legs. A piece of twined cotton fabric was at the left side of the head. Another lay along the upper and lower leg bones (nb. B, p. 55).

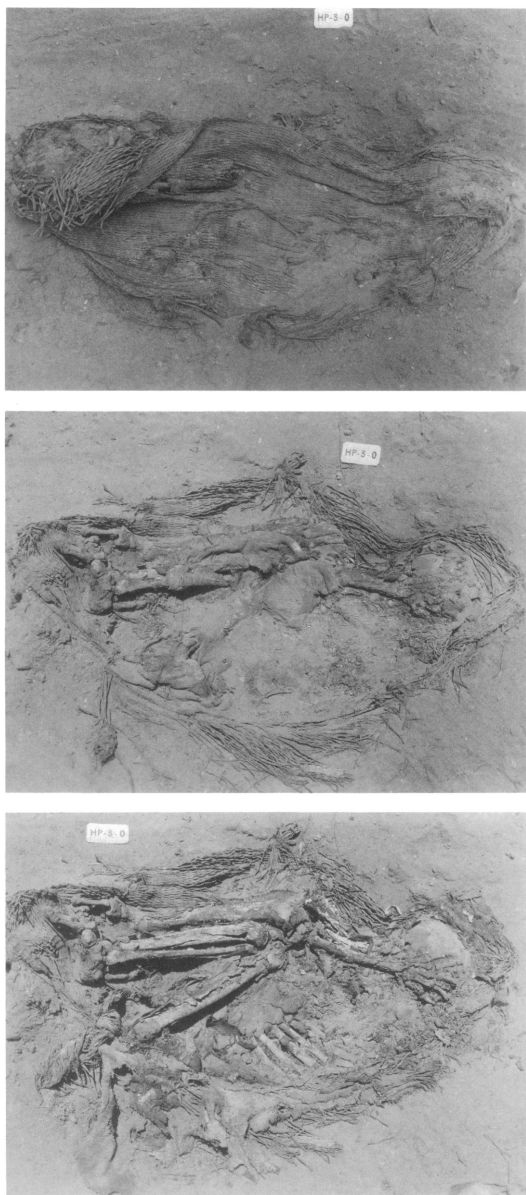


FIG. 41. Three views of the excavation of burial 903 from layer O of Test Pit 3 (HP 3). Top: burial with woven mat wrapping. Middle: burial exposed with textiles. Bottom: skeleton exposed.

902: This burial was in a shallow, unlined pit without distinct form (fig. 38). The surface at the time of the burial was probably within the lower half of layer O, and the burial is probably closely contemporary with burial 903. The body rested on its left side with the

left shoulder forward. The left hand was under the chin. The right forearm was across the stomach. The knees were drawn up to the chest. There were traces of fabric under the ear, pelvis, ribs, shoulders, and neck. In the dirt above the skeleton there were stones and five porpoise vertebrae. They may not be associated with the burial (nb. B, p. 69).

903: The grave was in a shallow, unlined pit. The surface at the time of the burial was about the middle of layer O. The left hand was over the left ear (fig. 41). The right hand rested in the left side of the mouth. Both knees were to the chest. The bones were split with salt crystallization and in part decomposed. The skin of a foot was preserved, and sandals, had any been present, would have been preserved. Within the pelvic cavity there was a mass of excrement and undigested matter. It was apparently a mixture of plant remains and fish (?) bones. In the mouth there was a small wad of slightly chewed plant material, leaves, a stem, and at least one small flower identified by workmen as “*turi*” which they claim to be good for toothaches or kidneys.

The body was encircled with woven *junco* mat (cotton yarn weft). Above the mat at the center of the grave was a small piece of twined *totoro* matting, and on this lay an old, worn, twisted *junco* cord pouch of a single-hitch construction containing a gourd bottle (?), pieces of gourd vine stem, two gourd seeds, leaves similar to willow, small “*turi*” flowers, and two pieces of *junco* tuber. The gourd bottle was not fully ripe and was in very poor condition.

Under the matting, the remains of at least six fabrics were found. One was a small pouch of cotton, woven in the form of a cylinder and holding two gourd containers. They are listed below (nb. B, pp. 63–65, 67, 68).

Grave Contents: Two pyroengraved gourds (41.2/2554 and 2555). A cylindrical plain-weave bag (41.2/2548 a to c) described and illustrated in Chapter 11. Plain-twined textile with paired warps (41.2/2549). A twined textile, with split pairs and some paired warps and dyed warp stripes (41.2/2550). A condor-type textile (41.2/2551) described and illustrated in Chapter 10. A looped pouch not positively associated with the burial (41.2/



FIG. 42. Pyroengraved gourds from burial 903. Left: gourd 41.2/2555. Right: gourd 41.2/2554.

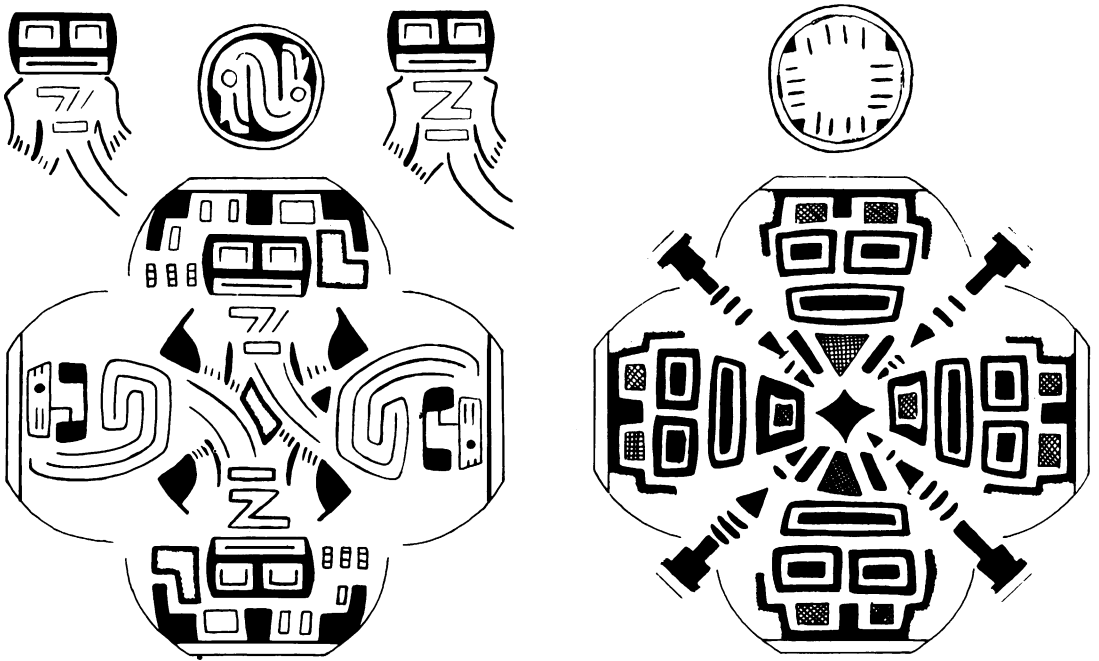


FIG. 43. Drawing of designs on pyroengraved gourds. Left: 41.2/2555. Right: 41.2/2554. (By Miguel Covarrubias)

2552). A looped bag (41.2/2553) (fig. 143). A woven mat (41.2/4307) described in Chapter 8.

Bird's Description of Burial 903 and Grave Contents: The engraved gourds (figs. 42–44) were described by Bird in two publications (1962, pp. 158–159; 1963a, pp. 29, 30, plate II). A lengthy account of burial 903, its associated goods, and the recovery and preservation of the engraved gourds was described by Bird (letter, 1974) in a letter to D. W. Lathrap. Bird's description follows.

They (the gourd containers) were found with skeleton 99.1/903, apparently a female adult: one of three separate burials found in layer O in the excavation HP 3 on the northeasterly side of the Huaca Prieta, the lee side. Like other burials encountered at various layers in this cut, the grave was an unlined, shallow pit, of minimal size and depth, scratched in what had been the sloping surface of the refuse at that time. Like other burials the body was flexed, arranged to take up as little space as possible, knees up, lying on its right side, left hand over left ear, right crowded in to cheek, no cords or rope binding the body. My impression, from the way the bodies were buried in the refuse, without any unity of orientation or position was that they had been tossed or placed in the pits before rigor mortis set in, while the bodies were still flexible. With the exception of the shell of an immature gourd in a later burial there was no sign of food offerings nor any water containers with them. Some had pieces of matting under and over them and this was so with the lady of the gourds. All had some residual traces or pieces of twined fabrics in contact or close proximity to the bodies generally in poorer preservation than rag scraps in the adjacent refuse. The poor preservation was probably due to the decomposition of flesh and the shallowness of the graves.

I had hoped to learn how their fabrics had been used by noting position on the bodies but there was no consistent relationship such as the loin cloths—capes—head cloths, etc. one can find in later burials.

In all cases, and with 99.1/903, preservation of tissues, hair and bones was poor, something one might attribute to their age. The damage to bones in this and the other burials was due to salt crystal formation in the marrow and other cavities.

Even the skulls were fragmented and I have seen the brain chambers filled with snow white crystals. (There is salt all through the HP refuse as there is in all the ground in proximity to the sea. The constant onshore winds carry fine mist inland, the

water particles evaporating, the salt precipitating to the ground.)

There was nothing with the lady of the gourds except the gourds and the pouch they were in to set her apart from the others seen. The matting on and over the body was woven of junco reed, the spaced warp of twisted fibers, the weft of successive lengths of junco pressed together. Where the construction started the warps were tied about a bundle of the reeds; where it stopped, adjacent warp ends were brought together and tied. The Met [Metropolitan Museum] has an astonishingly identical mat from pre-dynastic Egypt.

All yarns in the associated fabrics were like the contemporary yarns in the refuse and with the other burials. Construction techniques and details were the same as in use locally at the time. She did have one of the rare small rectangular fabrics, twined, of brown and white or tawny cotton in which figures were created by what, for want of any other designation, we call "the condor technique," the condor-figured fragment being the first one we "translated."

As mentioned, the pouch was the only one of its kind found. It lay partly over the right leg just above the knee and was exposed by removal of the overlying mat. As I brushed the dust from it I realized that it contained something bulky and that the pouch differed in construction from any others we had seen. As it now lies flat, it measures 12 cm wide by 20.5 cm long—incomplete by perhaps another centimeter. It had been made by taking a group of 23 brown and white, two ply, cotton warps, approximately 3.25 m long and spiralling the group about two parallel sticks, reeds or cords spaced so their circumference amounted to 12 cm. The weft was then inserted, probably with a bodkin, to create a tubular fabric in which a barred warp stripe spirals from the starting point, terminating in a strap where the end of the original warp unit is handled singly. The yarn order is: 4 white, 4 brown, 4 white alternating with 3 brown, 4 brown, 4 white. Woven in 1 × 1 plain weave, a barred stripe is created.

After weaving was completed stitching across one end of the cylinder converted it into a pouch with a strap at the other end to secure it with.

At the time the burial was uncovered I realized that the pouch was unusual and, because of its fragile condition was in a quandry how to preserve it and its contents. One could easily have exposed the contents by breaking the brittle and powdery yarns yet I hated to do that. Finally I decided that the contents, whatever they were, could be tipped out through the rotted bottom where it lay onto a piece of cardboard and, when ready, the contents were canted out onto a sheet of paper. The gourds,

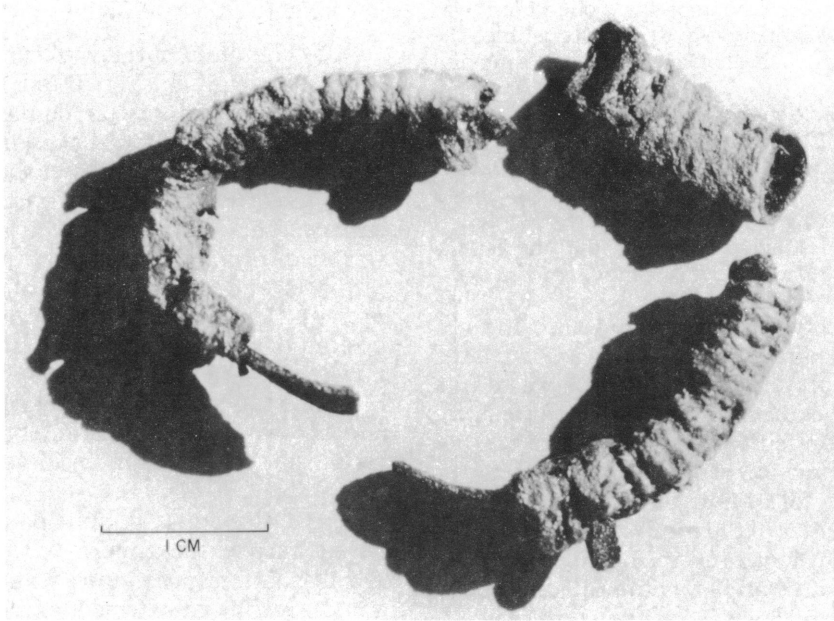


FIG. 44. Handle of pyroengraved gourd 41.2/2555.

collapsed into fragments, were the only items in the pouch, no plant remains at all nor any substance or powder. Had there been coca leaves vestiges, if not entire leaves, it would have been evident.

The gourds were powdery and extremely delicate and, as I have said elsewhere, scarcely stronger than the ash of a good cigar. The carving was visible and, as no similar worked gourd fragments had appeared among the thousands of pieces excavated, they had to be preserved.

First there was the question of what they might have contained. Had they ever held lime some traces would have been visible. There was none nor any pigment or visible material resting on the inner surfaces. As far as I could tell, they were empty when placed in the pouch.

The fragments, a few at a time, were shifted to a piece of wire screening and this was suspended in a thin cellulose acetate solution i.e., Duco cement in acetone. After brief soaking the screen was lifted out and as the acetone evaporated a feather was used to move each piece to prevent it sticking to the screen as it dried. Several brief dips followed until the fragments were stiff enough for the next step which was to line each with bits of rice paper moistened with the Duco solution. When these were firm, pieces were joined by bridging the breaks

with more rice paper. As more pieces were joined additional layers of rice paper were applied.

At this stage, to further strengthen the gourd substance, I used a hypodermic syringe with fine needle to inject drops of cellulose acetate solution through the rice paper lining. This gave me the jim-jams as I feared that the gourd surface might soften into a paste which could easily have happened but all went well. No effort was made to clean the outer surface until we were home and could work under magnification. There was rotted gourd powder, and dust from decomposed cotton yarn but this could be swabbed off by successively softening small areas with acetone letting each harden thoroughly before working on the next.

The whole business took a lot of time and I have wished since that we had kept an accurate record of it. I never did attempt to remount the yarn-wrapped rings or flanges on the under side of the lids to hold them in place when on the containers. (The flanges were attached by yarns passing through four pairs of holes in the lids.) Warping had modified the openings at the tops of the gourds and it was clear that the flanges would not fit them. The enclosed drawing shows how they were arranged.

Miguel Covarrubias was in New York when I was working on the gourds and he was intrigued and published his drawing of the best preserved.

I had plotted the carving on the second but it was his quick and perceptive eye that unscrambled the markings across the bottom—into the arms and legs.

As to possible connection with the early ceramic art of coastal Ecuador, you may be right but remember that when the frontal view of any face is geometricized by various artists there are bound to be some which will resemble one another. If you can find a figure matching the one on the second gourd it will be much more convincing.

904: The burial pit was cut into the decomposed conglomerate and was just large enough for the small body, which was on its side with the knees and arms flexed (fig. 38). The face pointed to the west. There was no trace of fabrics or artifacts. This burial antedated the formation of layer T, possibly when the center of the mound was to the west of its current location (nb. B, pp. 70, 71).

\*: An infant burial was found 5 cm below the bottom of layer T by the south wall. It was placed in a hollow 10 cm by 30 cm and contained some traces of *junco*. The skeletal remains could not be saved, and therefore no AMNH catalog number was assigned.

#### TEST PIT 3: BONES AND FRAGMENTS NOT PART OF ANY BURIAL

The following fragments were checked against skeletons found in or near the same layers and do not appear to relate to them. The practice of interment in the community debris from the beginning of the occupation meant that almost any shifting of the debris for any sort of construction (walls, storage pits, houses) could disturb earlier burials and scatter parts of the skeletons. Nothing about the fragmentary bones suggests cannibalism. No fragments are charred or burned (memo, 1959, pp. 73, 74).

Layer G: two crania fragments  
 Layer J2: one adult cranium fragment  
 Layer L3: one child's rib; one eroded long-bone (?) splinter  
 Layer M: one adult cranium fragment  
 Layer N: four crania fragments, possibly from one skull; one eroded cranium fragment; two adult vertebrae, one adult clavicle, seven rib fragments, possibly from two individuals.

#### TEST PIT 2: 905 TO 908

905: This child burial was located in a clay-lined storage pit in layers B to E (fig. 45). The upper 75 cm of the pit contained loosely packed refuse with stone flakes, *lucuma* seeds, gourd fragments, and mussel shells. Beneath that there was a mixture of earth with a salt surface. The poorly preserved skeleton was wrapped in *junco* matting and rested on the pit bottom. Some fragments of fabrics were present. Some other items were also on the bottom of the pit: one worn basalt flake, five unworked basalt flakes, two unfinished cobble sinkers (with partially pecked cord holes), and one worn chunk of whalebone. It is uncertain if these were intentional gravegoods (nb. B, pp. 23–24).

Grave Contents: A split-pair and transposed-warp textile, condor-type (41.2/2589). A split-pair transposed-warp textile (41.2/2590 a to d). A split-pair twined textile (41.2/2591 a to i). A net with mesh size of 3.2 cm (41.2/2592). Yarn scraps of cotton (41.2/2593).

906: This burial is associated with the formation of layer F and is located in layer G1 (fig. 45). The body was placed in a very shallow hollow. Chunks of coral-like rock over the body crushed the skull. The skeleton lay slightly on its right side with the face up. The knees were drawn up to the right side and the left arm was flexed, with the elbow extending out from the side. The burial was associated with 2 strands of *junco* cord near the neck. A wad of reeds was beneath the body. Twined fabric was underneath the left forearm, and under and over the pelvis and lower legs (nb. B, pp. 23, 24).

The AMNH catalog records the remains of two, individuals, 906A and 906B. The skeletal remains stored at the museum do not clarify whether or not 906 represents two different burials, since there are very few postcranial fragments marked 906B. There is, however, a skull labeled 906B. There is no skull marked 906A, but there are a considerable number of postcranial remains labeled 906A. Bird's fieldnotes do not suggest two burials at the location of grave 906.

Grave Contents: Eight chunks of decomposed fabric with split-pair twining and transposed warps (41.2/2609A).

907: This burial is located in layer G1 and

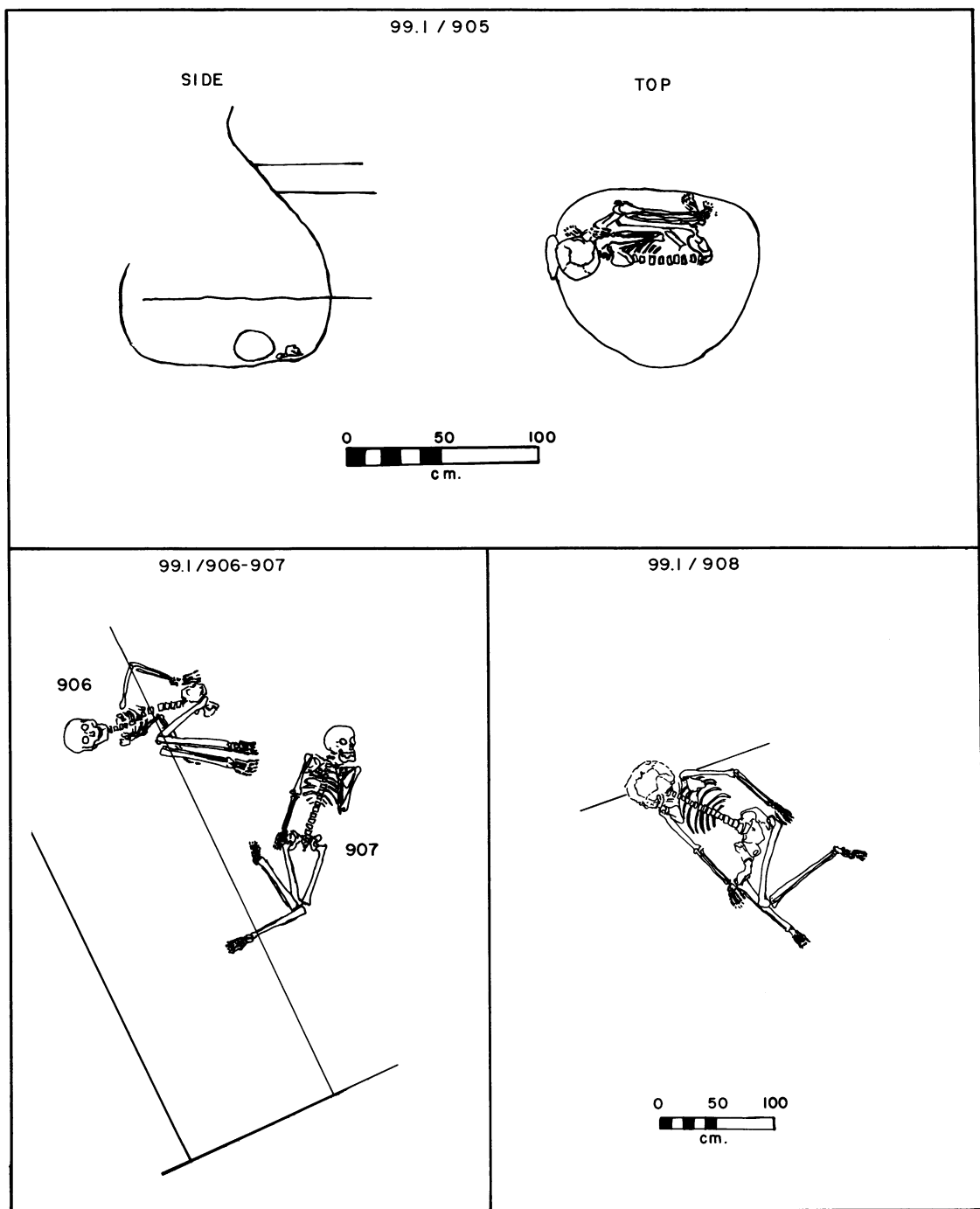


FIG. 45. Test Pit 2 (HP 2) burials: 905, 906, 907, and 908.

is probably associated with the formation of layer F (fig. 45). The skeleton was located on

its chest, with the face toward the right shoulder. The upper right arm was at the side with

the forearm doubled and the hand to the shoulder blade. The left arm was extended along the left side. The left leg was extended up and back, the toes being the highest part. Some twined fabric extended from the skull along the back and about the hips (nb. B, pp. 23, 24).

908: This burial was in the south wall of the excavation and was extracted from layer G2 without removing the overburden (fig. 45). An examination of the strata indicated that the burial was not over 40 cm deep. The skeleton lay on its face with the buttocks higher than the shoulders. The left femur was upright. The right arm was extended. The left hand was beside the left leg. There was a mass

of fiber cord with a trace of twined fabric about the hips. Some brown dust near the body may have indicated other textiles (nb. B, p. 25).

Grave Contents: Chunks of poorly preserved fabric with plain twining and transposed warps (41.2/2609B).

\*: Poorly preserved child's remains were found in layer G in the exploratory trench on the south side of the test pit. The bones, badly crushed by picks, were not preserved and therefore the burial has no AMNH catalog number. The body lay on its right side with the head to the south. The legs were extended (nb. B, pp. 14, 25).

## CHAPTER 7. LITHIC ARTIFACTS

The lithic artifacts found in the deposits of the Huaca Prieta were mainly unworked stone flakes and crudely flaked cobblestone cores. Bird wrote (1948b, p. 299) about these unworked cobbles that "such simple objects, generally classed as choppers or hand axes, occur from Canada to Tierra del Fuego, associated with completely unrelated cultures of varied antiquity. By themselves, they seem of little help in checking the relationship of groups of people, or of periods." Bird classified the artifacts into the following main categories:

- I. Cores or Tools
- II. Cores
- III. Flakes and Flake Tools
- IV. Percussion-Flaked Tools
- V. Pointed Tools
- VI. Perforated Sinkers
- VII. Hammerstones
- VIII. Smooth Cobble Paint Grinders
- IX. Smooth Pebbles and Cobbles
- X. Miscellaneous

The generally simple nature of the stone artifacts at the Huaca Prieta led Bird to comment (1948a, p. 58) that "if only the stone artifacts had survived, one would be forced to think of these people as exceedingly primitive culturally." One clear example of the simplicity of the stone tools is the total absence of pressure flaking in their manufacture. The preceramic inhabitants of Huaca Prieta had lost the ability to use pressure flaking, or had never known it, and therefore created no finely worked stone knives, blades, spear or arrow points. Bird wished to make the point that the Huaca Prieta people were not very primitive, because they were agriculturalists with complex textile technology.

### CLASSIFICATION OF THE LITHIC COLLECTION

Bird began the classification of the lithic implements from the Huaca Prieta while he was still in the field (fig. 46). These categories were reexamined at various times at the American Museum of Natural History in New York. They were never significantly altered, although some minor changes were

made. Bird established ten basic categories, most with a number of subdivisions, to him the "most practical groupings." They were used to classify the stone artifacts from the preceramic deposits of the mound as well as from the ceramic-period excavations to the north of the mound.

The lithic artifacts from Test Pit 2 were studied in greater detail than those from Test Pit 3, possibly because they were the first large collection excavated. (Test Pit 1 produced very few lithic artifacts.) Moreover, the analysis of the implements from Test Pit 2 would provide the basic typology by which all other lithic artifacts would be classified. Therefore, more measurement and weight data were taken with Test Pit 2 artifacts than with those from other excavations. The dimensions and weights in the following descriptions are based on the Test Pit 2 collection of over 5000 artifacts. There is no reason to think that similar categories of artifacts from Test Pit 3 vary significantly in their sizes or weights.

The implements from Test Pit 2 are given the AMNH catalog numbers 41.2/130 to 302. Those from Test Pit 3 are 41.2/303 to 491. Lithic tools of the same type from the same layer were often given the same number.

### TYOLOGY AND EXPLANATION OF STONE ARTIFACTS

The following typology is taken from Bird's field and museum charts, which enumerate the number of artifacts per layer. These charts are reproduced in the following subsection. The explanations of each category are taken from the Record Notebook (nb., record) and from a manuscript prepared by Bird entitled "Tentative Catalogue and Some Notes on Artifacts—Huaca Prieta Tests 2 and 3" (notes, 1949?).

I. CORES OR TOOLS: unilaterally flaked cobblestones: These artifacts are primarily cores, but it is possible some are crude choppers (fig. 47).

Subdivision 1 contains cobbles flaked on one end or side. They appear to have been flaked without the intention of producing a

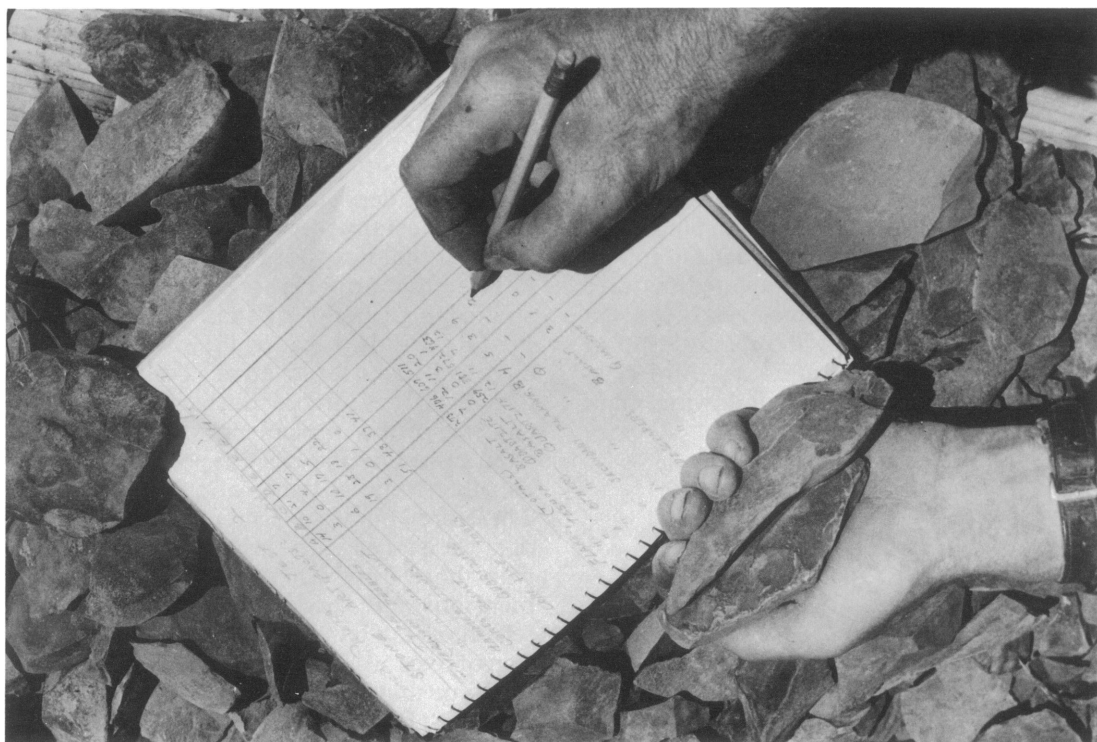


FIG. 46. Classifying the lithic implements in 1947 at the Huaca Prieta.

roughly rounded flaked edge. They are apt to be somewhat square and not well suited for use as a chopper. Examples weighed from 203 to 1968 g.

Subdivision 2 consists of artifacts which are flaked on most of one margin. That is, most of the cobble surface is removed from one side. The flaking is not always strictly unilateral. The thickest artifact is 7.5 cm and weighs 615 g; the thinnest weighs 82 g.

**II. CORES:** This category is established with considerable confidence that the artifacts are cores. They vary greatly in size and the number of flakes removed. The term "bilateral" is used here in a loose sense, and there does not seem to have been an effort to systematically remove flakes from alternate sides.

Subdivision 1 consists of rough, bilateral flaking on one side or edge of the cobble.

Subdivision 2 is closely related to 1 except that more of the original cobble surface is removed. During their production, most of these artifacts must have briefly looked like

the cobbles of subdivision 1. Almost all subdivision 2 artifacts retain the original cobble surface only on one side. An average weight for this type of specimen is around 250 g.

Subdivision 3 of the cores are artifacts with a prepared striking platform. One might debate just how "prepared" it is. It sometimes appears that any surface from which a flake was removed was used as a striking platform for the removal of other flakes.

**III. FLAKES AND FLAKE TOOLS:** This is the largest single category of implements, comprising approximately four-fifths of the stone artifacts.

Subdivision 1 is composed of unworked flakes. They are separated according to stone type. The great majority are of basalt while a small number are of greenstone or quartzite.

Bird originally classified these flakes according to the degree that their margin was formed by the juncture of the fracture with the outer surface of the cobble. Less than one-tenth were teshoa or "primary" flakes, with

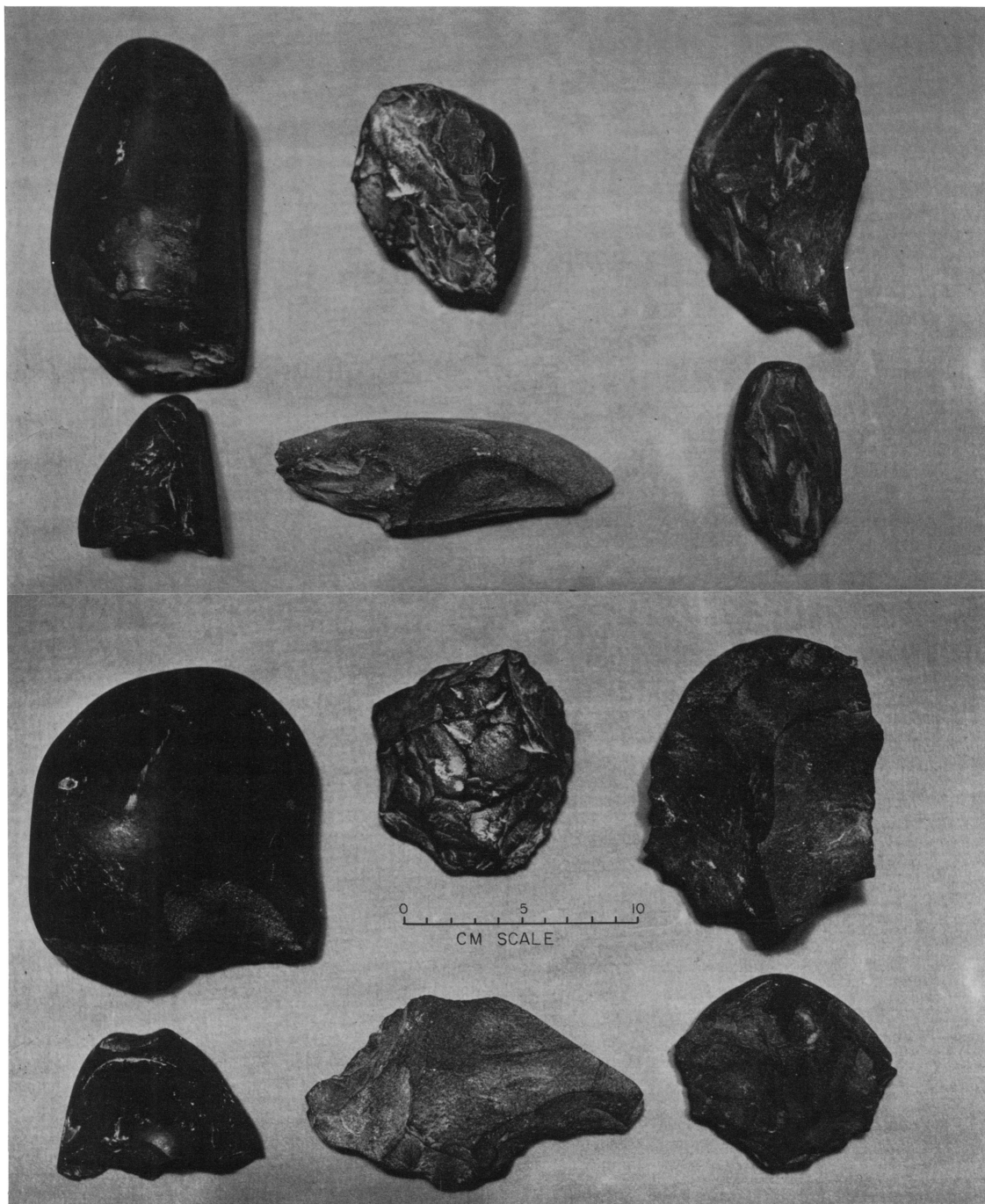


FIG. 47. Cores and/or core tools.

the cutting edge completely formed by the intersection of the split surface with the cob-

ble cortex (Eyman, 1968). Bird's "secondary" category had more than one-half the outer

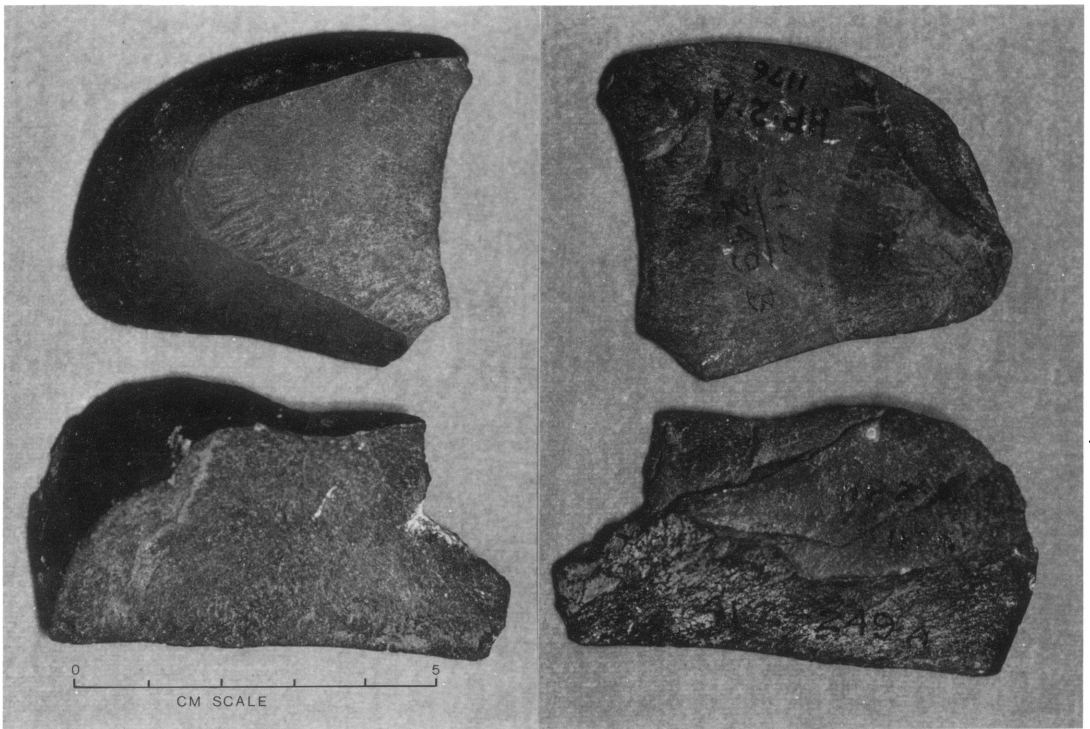


FIG. 48. Flakes with edges worn from use. Left: dorsal. Right: reverse.

edge formed by the juncture of the fracture with the cortex. About a quarter of the unworked flakes were "secondary." The "tertiary" category had less than one-half of the edges formed by the fracture-cortex juncture. "Tertiary" flakes composed somewhat more than a quarter of the general category. The final "interior" category of basalt flakes were implements completely free of any cortex or cobble surface. They, too, formed more than a quarter of the general category. This analysis of the primary, secondary, tertiary, and interior types of cutting edge revealed no significant variations in the layers of Test Pits 2 and 3, and therefore was not transferred onto the charts presenting the artifact types by layers.

Subdivision 2 consists of flakes whose edges are worn from use, demonstrated by a slight smoothing or at least an elimination of sharpness (fig. 48). The wear pattern on the flakes suggests use as a saw, not as a scraper.

Subdivision 3 flakes have their edges nicked

(fig. 49). This includes any flakes with the slightest vestige of the type of nicking which might result from use. It is doubtful that the small nicks on the flake edges were intentionally created. In nearly all cases minute flakes appear on both sides of the edge. Nicked edges occurred on primary, secondary, tertiary, and interior flakes (see subdivision 1 above).

Subdivision 4 is composed of flakes with coarse or irregular unilateral chipping (fig. 49). The flaking is too coarse to be classified with the probable sidescrapers of subdivision 5. These artifacts may be fragmentary or poor examples of the implements of Category IV, percussion-flaked tools.

Subdivision 5 contains carefully made tools with unilateral chipping (fig. 50). These artifacts are probably side scrapers, most of which are finely chipped on a single edge. Very few double-edge examples were recovered.

Bird considered establishing a subdivision

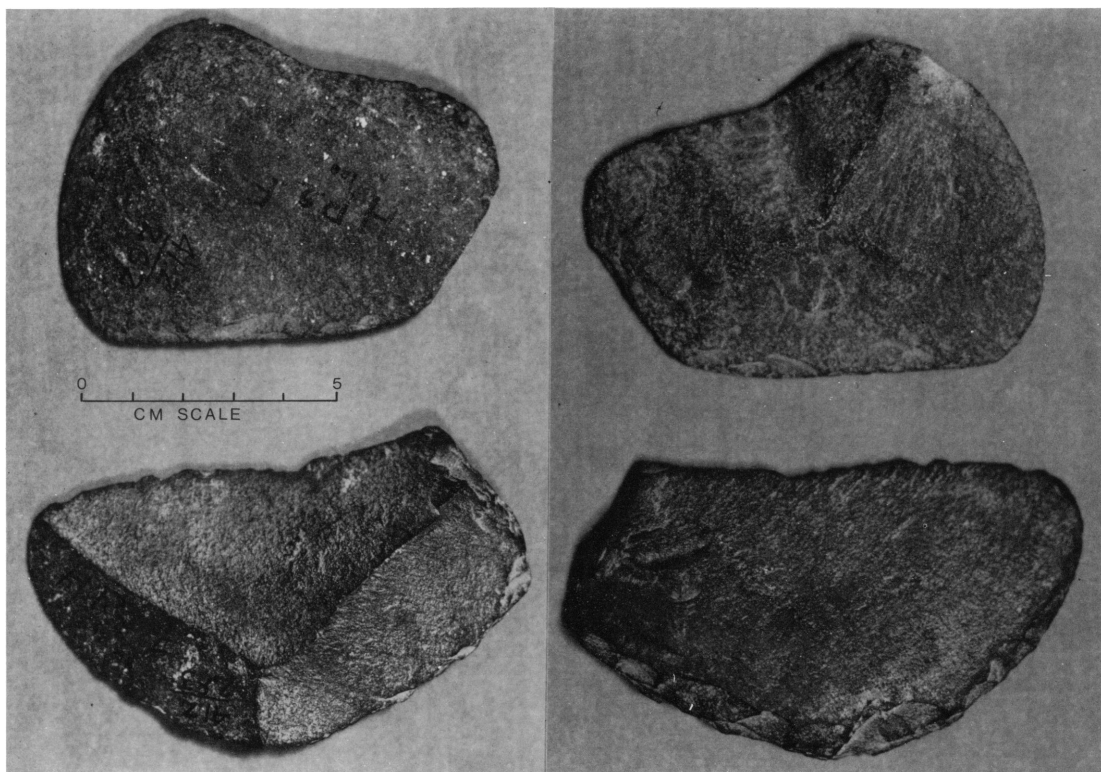


FIG. 49. Flakes. Top: with nicked edges. Bottom: with chipped edges.

of teshoa (primary) flakes with coarse or irregular unilateral chipping. These artifacts were encountered in subdivisions 3, 4, and 5 above. The few artifacts of this kind (seven specimens identified in layers A to G in Test Pit 2) all had the unilateral chipping on the thicker margin or near the point of fracture of the teshoa flake.

Subdivision 6 includes flakes with battered edges. This rough, irregular, unilateral chipping resulted from an unknown use. They do not appear to be side scrapers or cutting tools. One hypothesis is that they are digging implements.

**IV. PERCUSSION-FLAKED TOOLS:** These implements are made from large teshoa flakes and cobble sections. When a cobblestone is used, it is split lengthwise and part of its curved edge or margin is roughly dressed by percussion flaking with hammer blows against the original cobble surface. Sometimes a split

cobble may be identified as a teshoa flake and it is difficult to differentiate the two. The average weight taken from a sample of 20 specimens was 413.7 g.

Subdivision 1 of this category consists of tools with unilateral percussion flaking on part of the margin. These specimens are unbroken.

Subdivision 2 consists of poorly made and fragmentary specimens of the same.

Subdivisions 1 and 2 are classified according to stone type: basalt or quartzite. As with flakes and flake tools, basalt is the preferred stone in the preceramic deposits.

**V. POINTED TOOLS:** These implements are made by percussion flaking (fig. 51). They appear to have been fashioned from flakes, or sections of cobbles, and may have had a function similar to some of the hammerstones (Category VII) with pointed ends. Bird believed that such pointed artifacts were used

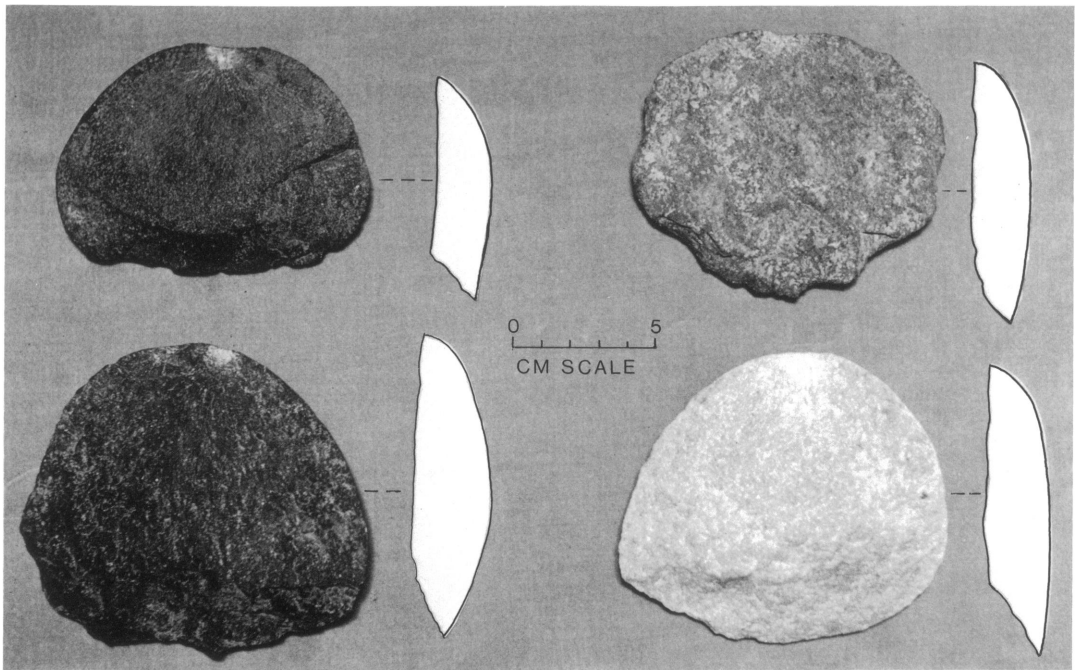


FIG. 50. Flakes with unilateral chipping—possible side scrapers.

for pecking holes in stone sinkers for use with fishnets. Some of these artifacts could also have been used to smooth or ream the hole created by the pecking. The subdivisions 1 to 7 are as follows:

1. Unilateral flaking on two edges
2. Unilateral flaking with edges reversed
3. Unilateral flaking on one edge
4. Bilateral flaking on one edge
5. Bilateral flaking on two edges
6. Questionable examples of 1 to 5
7. Pointed shape natural, showing signs of use

Eight reasonably good specimens from layers B to H (Test Pit 2) have wear suggesting use both as smoothing and pecking implements. Twelve of these artifacts have no obvious wear from use.

**VI. PERFORATED NET SINKERS:** These artifacts are relatively thin cobbles with holes in them for attaching to nets (fig. 51). One such perforated artifact was found associated with a fishnet and gourd floats in layer G of Test Pit 3. Naturally suitable stones for sinkers are not too common in the vicinity of the Huaca Prieta, and sometimes cobbles were broken

to form an object narrow or thin enough to peck the necessary hole. A few sinkers apparently had a natural hole. Making the hole involved pecking with a pointed tool from both sides and then reaming the opening. This operation may have required two separate tools, one for pecking and one for reaming, although it is conceivable that the reaming could have been done by a pointed pecking tool, if suitable.

These perforated artifacts weigh from 135 to 297 g. The hole in them averages about 10 mm at its narrowest point. The specimens are rarely more than 2.5 cm thick. Unfinished (subdivision 2) perforated sinkers are defined as those in which the hole was begun, but not completed. No completed examples were found in Test Pit 2. The five unfinished examples found there show that the makers created the hole by pecking on both faces of the stone.

**VII. HAMMERSTONES:** These artifacts are cobbles which have been used for pounding, pecking, or grinding (fig. 52). No flakes have been removed from them.

Subdivision 1 consists of small hammerstones, possibly used for making sinker holes.

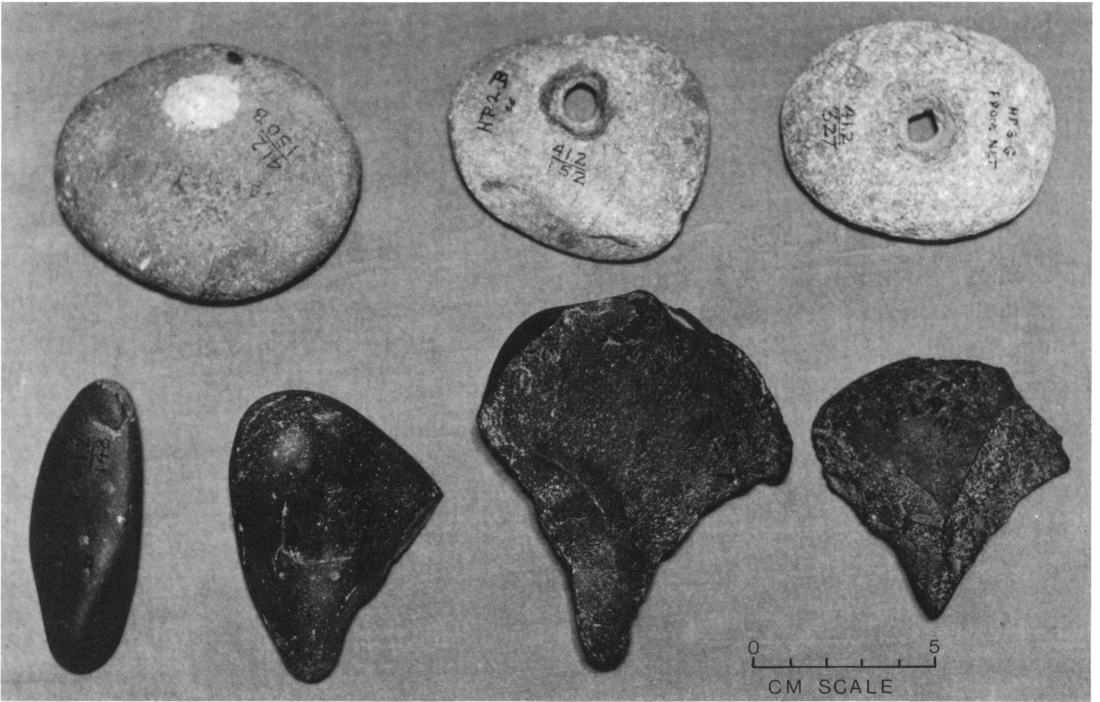


FIG. 51. Lithic objects. Top (left to right): net sinker with unfinished perforation, two net sinkers with perforations. Bottom: implements for perforating and reaming.

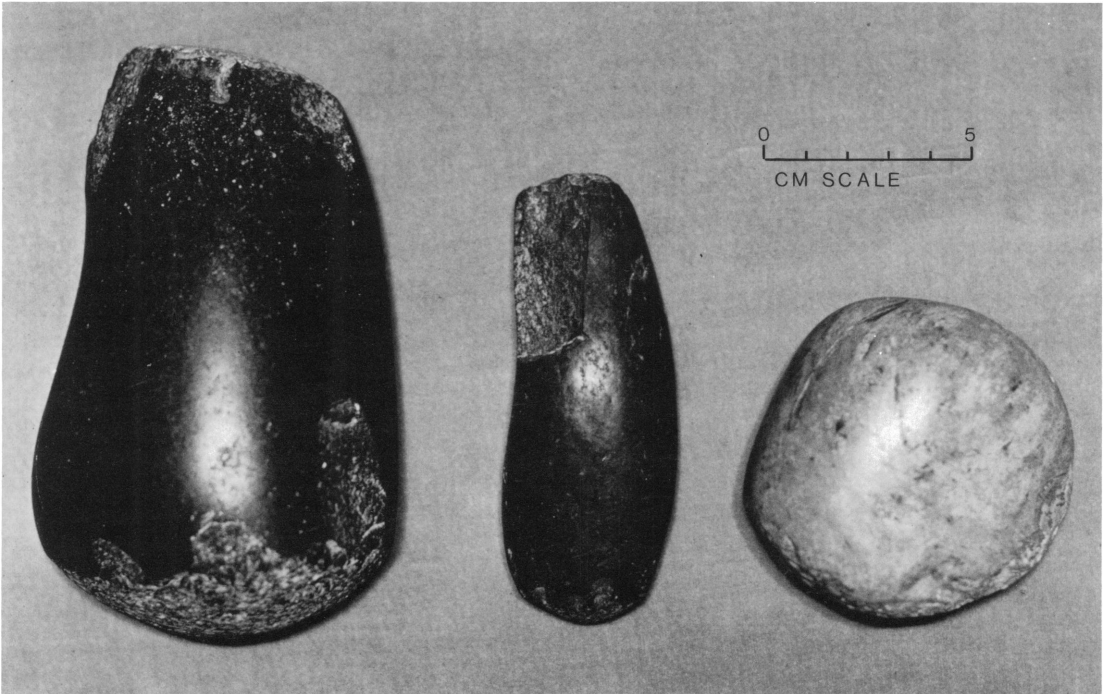


FIG. 52. Hammerstones.

TABLE 4  
Lithic Artifacts—Test Pit 2

Artifact Categories & Subdivisions	Layers										Subtotal			Additional Artifacts			Total # %
	A	B	C	D	E	F	G	H			#	%	A1	Trenches	Side Uncer- tain		
											#	%					
<b>I. Cores or Tools</b>																	
1. Flaked on 1 end	2	1	1	3		1	2	1			11					15	
2. Flaked on most of margin	2	3	1	4	1	4	8	1			24					26	
Subtotal	4	4	2	7	1	5	10	2			35	0.7			41	76	
<b>II. Cores</b>																	
1. Bilateral flaking, 1 edge	1	1	2	6	4	5	12	6			37					37	
2. Bilateral flaking, most of margin	1	7	3	8	5	13	3				40					98	
3. Flaking on prepared (?) platform	1	1	1		3	5	2	2			15					15	
4. Fragments of 1, 2, 3 & 4	4	9	2	6	13	13	18				65		1			66	
Subtotal	7	18	8	20	25	36	35	8			157	3.1	1		58	216	
<b>III. Flakes and Flake Tools</b>																	
<b>1. Unworked flakes</b>																	
a. Basalt	137	173	210	824	770	990	266	285			3655		15	87		3757	
b. Greenstone	7	1		8	5	7	6	12			46		6	1		53	
c. Quartzite	5	11	8	44	40	28	32	40			208			6		214	
2. Edges worn from use	7	6		12	4	9	3				36		3			39	
3. Edges with nicks	1		3	8	15	37	12	5			81			4		85	
4. Edges with coarse chipping	1		3	8	6	1	4	2			25			1		26	
5. Edges finely chipped	1	2	2	12	10	16	6	3			52			1		53	
6. Edges battered																	
Subtotal	159	193	226	916	850	1088	326	350			4103	81.8	24	100		4227	
<b>7. Naturally formed flakes</b>																	
Rough spalls/cobble sections	4		1	11	8	17	6				1					1	
<b>IV. Percussion-Flaked Tools</b>																	
<b>1. Unbroken</b>																	
a. Basalt	1	3	6	3	4	4	2	1			20		4	2	11	37	
b. Quartzite		1	2								3					3	

TABLE 4—(Continued)

Artifact Categories & Subdivisions	Layers											Subtotal			Additional Artifacts			Total # %	
	A	B	C	D	E	F	G	H	#	%	A1	Side Trenches	Posi- tion Uncer- tain	#	%				
2. Poorly made or fragmentary																			
a. Basalt	3			2	3	3	2	3	16							1	17		
b. Quartzite				2					2						3		5		
Subtotal	3	1	4	12	6	7	4	4	41	0.8	7	3	11	62	1.2				
V. Pointed Tools																			
1. Unilateral flaking, 2 edges	1	1	1	7	2	1		1	14								14		
2. Unilateral flaking, reversed				1					1								1		
3. Unilateral flaking, 1 edge				1		4			5								5		
4. Bilateral flaking, 1 edge						2			2								2		
5. Bilateral flaking, 2 edges			3	1					4								4		
6. Uncertain examples, 1 to 5			2		3	2	1		8								8		
7. Accidental, or naturally pointed			1	1	1				3								3		
Subtotal	1	7	5	10	5	8		1	37	0.7				37	0.7				
VI. Perforated Sinkers																			
1. Finished		1							1								1		
2. Unfinished	2	1		1			1		5								5		
Subtotal	2	2		1			1		6	0.1				6	0.1				
VII. Hammerstones																			
1. Small		2	3	4	1	1	1	1	13								13		
2. Large, use on 1 end			4	15	9	1	1	4	34							4	38		
3. Large, use on 2 ends					6	4	3		13		1						14		
4. Fragments of 1 to 3	1	1	3	34	4	9	1	2	54			1	28				83		
5. Use on sides																			
Subtotal	3	10	53	20	15	6	7	114	2.3	1	1	32	148	2.8					
VIII. Smooth Cobble Paint Grinders	2	1	15	8	14	2	1	43	0.9					44	0.8				
IX. Smooth Pebbles and Cobbles	12	18	75	95	172	80	25	447	9.5					478	9.0				
X. Miscellaneous (see text)				1				2	3	0.1				3	0.1				

Artifacts from layers—total = 5016, all artifacts—total = 5297.

TABLE 5  
Lithic Artifacts—Test Pit 3

Artifact Categories & Subdivisions	Combinations		I			II			III				
	Layers	A B	C	D	E	F	F <sub>3</sub> G <sub>4</sub>	G	H	H <sub>2</sub> I <sub>2</sub>	I	J	
<b>I. Cores or Tools</b>													
1. Flaked on 1 end		4		1	1		3	3		4		8	
2. Flaked on most of margin				3			2			2		3	
	Subtotal	4		4	1	2	3	3		6		11	
<b>II. Cores</b>													
1. Bilateral flaking, 1 edge												1	
2. Bilateral flaking, most of margin												3	
3. Flaking on prepared (?) platform												3	
4. Fragments of 1, 2, 3 & 4		1		3	1		4		1	2		2	
	Subtotal	1		3	1		4		1	2		9	
<b>III. Flakes and Flake Tools</b>													
1. Unworked flakes													
a. Basalt		126		170	167	31	40	3	45	50	18	12	56
b. Greenstone		28		44	27	2	9		4	4	3	6	16
c. Quartzite		14		42	72	22	13		4	27		2	3
2. Edges worn from use		2		2	5		5		1			1	2
3. Edges with nicks		1					1			1			1
4. Edges with coarse chipping		3		2	3	2							
5. Edges finely chipped						1	1						1
6. Edges battered										1		1	
	Subtotal	174		260	274	58	69	3	54	83	21	22	79
<b>IV. Percussion-Flaked Tools</b>													
1. Unbroken													
a. Basalt					1						1		1
b. Quartzite					1				1				
2. Poorly made or fragmentary													
a. Basalt		2		1	2		2	1	4	2			
b. Quartzite				1	2					1			
	Subtotal	2		2	6		2	1	5	3	1		1
<b>V. Pointed Tools</b>													
1. Unilateral flaking, 2 edges													
2. Unilateral flaking, reversed													
3. Unilateral flaking, 1 edge													
4. Bilateral flaking, 1 edge													
5. Bilateral flaking, 2 edges													
6. Uncertain examples, 1 to 5													
7. Accidental, or naturally pointed													
	Subtotal												
<b>VI. Perforated Sinkers</b>													
1. Finished									1				
2. Unfinished									1	1			
	Subtotal								2	1			

TABLE 5

IV			V		VI							Sub-total	Uncertain Position	Total	
K	L	M	N	O	P	Q	R	S	S-T	T	U			#	%
	2	1	1	5	4	4	9	5	2		1	58	6	64	
		2		2		1		1		1		17	4	21	
	2	3	1	7	4	5	9	6	2	1	1	75	10	85 1.9	
	2	4	1	1			7	1				17	1	18	
		3			1	1	1					9	1	10	
	2	3		5	1	1	5	2				22	3	25	
		6	2	6	1	5	4	5		1		44	3	47	
	4	16	3	12	3	7	17	8		1		92	8	100 2.2	
40	45	150	112	308	47	110	95	613	41	258	5	2542		2542	
5	1	22	14	23	3	9	12	207	28	70	4	541		541	
	5	2		14		12	9	26	2	11		280		280	
4	1	4	7	7	2	1	1	8	1			54		54	
		1	5	1			1	1		1		14		14	
1	1	2	5	6		1	4	5		1		36		36	
	1	2		6	1	3	1	1				18		18	
								1		3		6		6	
50	54	183	143	365	53	136	123	872	72	344	9	3491		3491 76.2	
		1	1	2								7	4	11	
												2	1	3	
	1	8	5	1			1	2	1	1		34		34	
						1		1				6		6	
	1	9	6	3		1	1	3	1	1		49	5	54 1.2	
				1								1		1	
				1		2						3		3	
				2	1							3		3	
				4	1	2						7		7 0.2	
												2		2	
						1						2		2	
						1						4		4 0.1	

TABLE 5—(Continued)

Artifact Categories & Subdivisions	Combinations		I			II			III				
	Layers	A	B	C	D	E	F	F <sub>3</sub> G <sub>4</sub>	G	H	H <sub>2</sub> I <sub>2</sub>	I	J
<b>VII. Hammerstones</b>													
1. Small							1						
2. Large, use on 1 end							1						1
3. Large, use on 2 ends		1		1	2				1	1		1	5
4. Fragments of 1 to 3													
5. Use on sides				1			1						
	Subtotal	1		2	2		3		1	1		1	6
<b>VIII. Smooth Cobble Paint Grinders</b>													
				1						1		1	2
<b>IX. Smooth Pebbles and Cobbles</b>													
		89		128	67	39	82	1	8	36	1	22	80
<b>X. Miscellaneous (see text)</b>													
							1		2		1	1	2

Artifacts from layers, total = 4547, all artifacts, total = 4580.

They are originally elongated pebbles and range in weight from 45 to 252 g. An average weight is about 125 g. Wear patterns consistently occur on the narrowest ends. A few show use on both ends, but this is probably a factor dependent on the shape of the pebble, since only a few of them have two suitably tapered ends. The lengths range from 6.5 to 13.5 cm.

Subdivision 2 consists of large hammerstones used on one end. Like subdivision 3, these artifacts may weigh from 200 to about 1300 g. Some of these may have served as paint grinders. These specimens retain scratches and smears of red paint.

Subdivision 3 is composed of large hammerstones with wear on two ends. They are similar in size or weight to the hammerstones

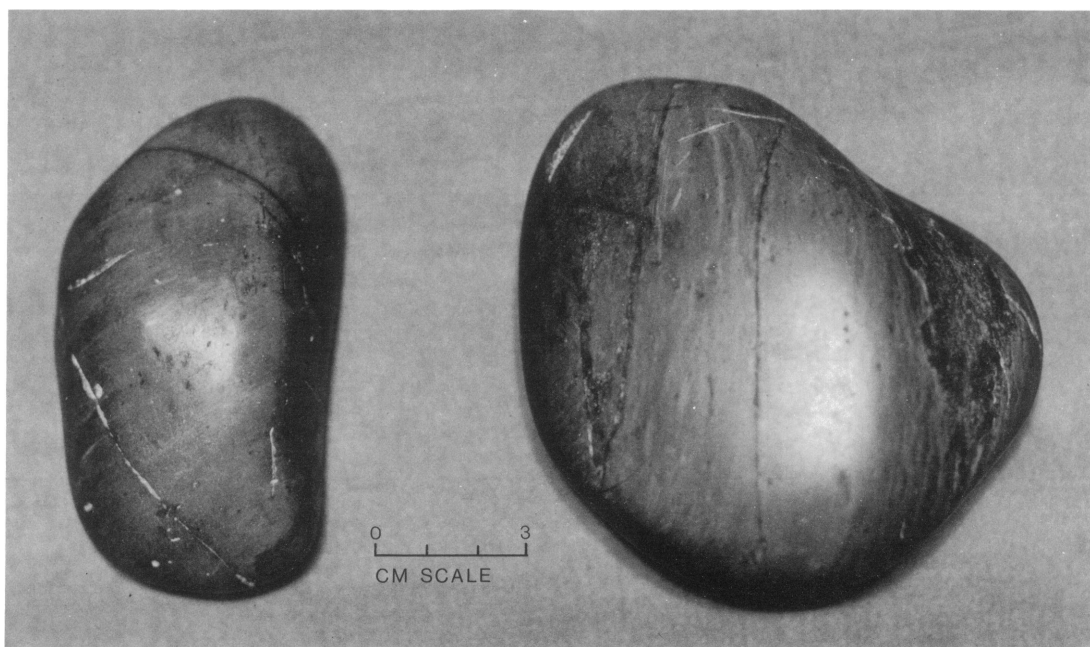


FIG. 53. Cobble grinders with red pigment.

TABLE 5

IV			V		VI						Sub- total	Uncer- tain Position	Total		
K	L	M	N	O	P	Q	R	S	S-T	T			U	#	%
		1				1						2	2	4	
	4					1		2				6	1	7	
		1							3			19	6	25	
								1				2	1	3	
												2		2	
	4	2				1		4	3			31	10	41	0.9
		1		1	1		3	1	1			13		13	0.3
1	37	4	12	41	6	21	15	28	9	12	38	777		777	17.0
									1			8		8	0.2

in subdivision 2, which have wear on one end.

Subdivision 4 consists of fragments, large and small, of hammerstones.

Subdivision 5 is the two specimens of small hammerstones found in Test Pit 3 which have wear on their sides (edges) rather than on the ends.

**VIII. SMOOTH, UNWORKED COBBLESTONE PAINT GRINDERS:** These are naturally polished stones similar to those of category IX but

generally larger (fig. 53). They are identifiable because they retain red pigment on the side or portion used.

**IX. SMOOTH, UNWORKED COBBLESTONES:** These objects are naturally polished pebbles and cobbles similar to some that can be found on the nearby beach. Some of these may not be artifacts. For some unknown reason they were carried from the beach to the mound. Some may be paint grinders (see preceding category) but show no evidence of pigment).

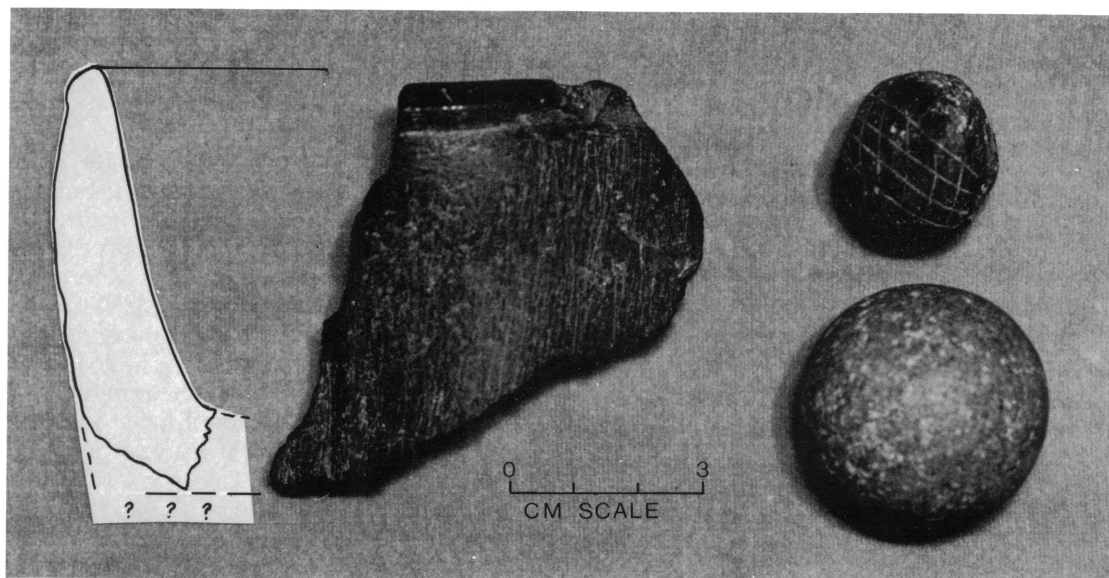


FIG. 54. Polished lithic objects. Left: fragment of stone bowl (41.2/302c). Right top: incised stone sphere (41.2/302a). Right bottom: spherical stone (41.2/302b).

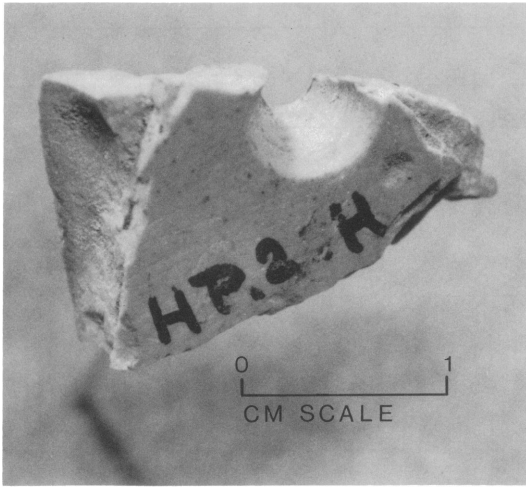


FIG. 55. Polished stone fragment with drilled hole (41.2/301).

**X. MISCELLANEOUS:** This category consists of unique stone specimens. In Test Pit 2 a small grinding or abrading tool made from a small, elongated pebble was found in layer D, and a spherical stone (41.2/302b), 3.8 cm in diameter, was found in layer H. In Test Pit 3, an incised stone sphere (41.2/302a), 2.7 cm in diameter, was found between layers S and T (fig. 54). A stone fragment polished on one side (41.2/301) with a hole drilled in it was found in layer H (fig. 55).

The possible function of all these objects is uncertain. Several examples of stones with cords attached were found. They may be a type of sinker (see Chapter 12). A cylindrical pestlelike stone, possibly for grinding, was found in the excavation unit H2I2. Finally, a fragment from a stone bowl (41.2/302c) was found in layer J (fig. 54). Because nothing like it was found in other preceramic levels, Bird speculated that it was an intrusive object not typical of the site (tape, 1973a).

**FIRESTONES:** All of the trenches and test pits dug by Bird produced cobbles which had been burned. These objects were particularly dense in the north side of Test Pit 3 from layers C to P. Bird usually referred to these burned stones as firestones, and felt that they had been used for cooking. In general, they could be any cobble which showed signs of having been in a fire (cracks and/or soot). The stones

could have been used in a number of ways: the hot rocks could be placed in gourds to heat liquids, or they could be buried in a pit with food as at *pachamancas* in the highlands of Peru.

**NATURALLY FORMED FLAKES AND ROUGH SPALLS:** Bird classified a number of lithic objects as naturally or artificially created. They are not man-made artifacts, and have not been included on the accompanying tables. More than 2500 such stones were examined from the bottom layers (S, T, and U) and sterile substructure of Test Pit 3. Other artifactlike flakes, or rough spalls, were found scattered through layers of Test Pit 2 (48 specimens) and Test Pit 3 (69 specimens).

#### TABLES OF LITHIC IMPLEMENTS

Bird classified the stone tools according to minimal excavation units. That is, if a layer were subdivided into units 1, 2, and 3, the number of artifacts in each unit was tabulated separately. For purposes of simplification, these detailed accounts have been grouped according to individual layers in tables 4 and 5 published here. Percentages for the main artifact categories have been added to the charts, since Bird expressed the need for percentage data when preparing his north Chilean lithic charts for a Spanish translation in the 1970s. A comprehensive evaluation of the percentages of artifact categories by layer could be tabulated from the information on the tables published here.

Bird observed no significant changes in the lithic assemblages from the top to the bottom of the excavated layers of the prehistoric deposits, and one of the purposes of presenting the charts of implements by layer is to demonstrate a rather remarkable conservatism in the number and types of stone tools used over a period of nearly 1500 years during the late coastal preceramic. It might be notable that the greatest concentrations of lithic artifacts are in Test Pit 2, and in the layers below N in Test Pit 3. There is also a considerable concentration in layers A, C, and D in Test Pit 3. These concentrations may be related to subsistence patterns, a subject discussed in Chapter 15.

Bird also noted (tape a, 1973) that the stone

tools from the Ceramic Period excavations to the north of the mound were very similar to the implements from the preceramic midden. One notable difference was that a higher percentage of Ceramic Period implements were of quartzite, whereas the preceramic

tools were predominantly of basalt. Both materials were available in abundance on the nearby beach, and the growing preference for quartzite could be observed as simple, cultural preference since it was no better, nor more abundant, than basalt.

## CHAPTER 8. BASKETRY AND MATTING

Although baskets and mats are twined and woven, Bird thought that they should be discussed separately from textiles. A principal distinction between the Huaca Prieta textiles, and the mats and basketry, is that whereas the textiles have spun yarns, the mats and baskets are almost always made of reeds and rushes. However, in a few exceptional cases, wefts of cotton are found in both mats and baskets. Table 6 enumerates the specimens.

All the mats and baskets were cleaned, prepared for storage, and analyzed. A file card for each specimen recorded information about its warp count, weft space, construction technique, dimensions, location, associations, etc. This analysis is in the Junius Bird Laboratory of South American Archaeology at the American Museum of Natural History. A portion of the text which follows is based on those files.

Even small fragments of baskets look different from mats, and it is not hard to differentiate the two. Only in the case of two small twill-weave specimens does the possibility of confusion exist. The sedge material which was made into baskets and mats has never been identified with accuracy. The baskets may be of a slightly different material than the mats.

### BASKETRY

Approximately 272 fragments of preceramic baskets were recovered at the Huaca Prieta. All came from Test Pit 3, layers D through Q. The lack of basketry in Test Pit 2 is probably explained by the poorer preservation of organic materials in that excavation. Basket fragments from the same layer were classified into groups representing individual baskets. Approximately 52 different baskets are represented.

In the AMNH catalog system, baskets consisting of one or more fragments were given the numbers 41.2/4186 to 41.2/4238. The basket descriptions which follow are adapted mainly from Bird's fieldnotes (nb. B, pp. 81-89). A later laboratory analysis revised the counts of specimens. Information in the museum catalog supplements the descriptions.

### DESCRIPTIONS AND TECHNIQUES

The following descriptions, based on Bird's fieldnotes, are presented in order of the specific techniques used in basket construction. Bottom construction will be discussed first, followed by techniques of creating the sides. This is followed by descriptions of rims. Finally, baskets with patterns are discussed, and some comments on chronology are presented. The crossed elements are referred to as warp, or spokes; the coiled elements are weft. The layered coils are sometimes referred to as rows or, more accurately, as turns.

**BOTTOM CONSTRUCTION:** There are 20 partial or complete basket bottoms in the collection. Two different techniques may be observed in their construction. Eight start with four crossed bunches of spokes. Of these eight, four have base rings. The other type of bottom involves twining from the center. A number of specimens lack the very center of the bottom and could not be classified with certainty.

4187: Layer E. This basket is about two-

**TABLE 6**  
**Distribution, Number of Baskets and Mats—**  
**Test Pit 3**

Layer	Baskets		Mats
	Fragments	Baskets	
C	0	0	2
D	16	2 or 3	4
E	19	3	9
F	2	3	4
G	86	13	10
H	20	2	7
H <sub>2</sub> I <sub>2</sub>	15	2	4
I	11	3	2
J	54	9	16
K	12	5	0
L	3	1	0
M	8	1	4
O	3	1	4
Q	1	1	2
— <sup>a</sup>	22	7	8
Totals	272	52	76

<sup>a</sup> Wheelbarrow trench and position uncertain.

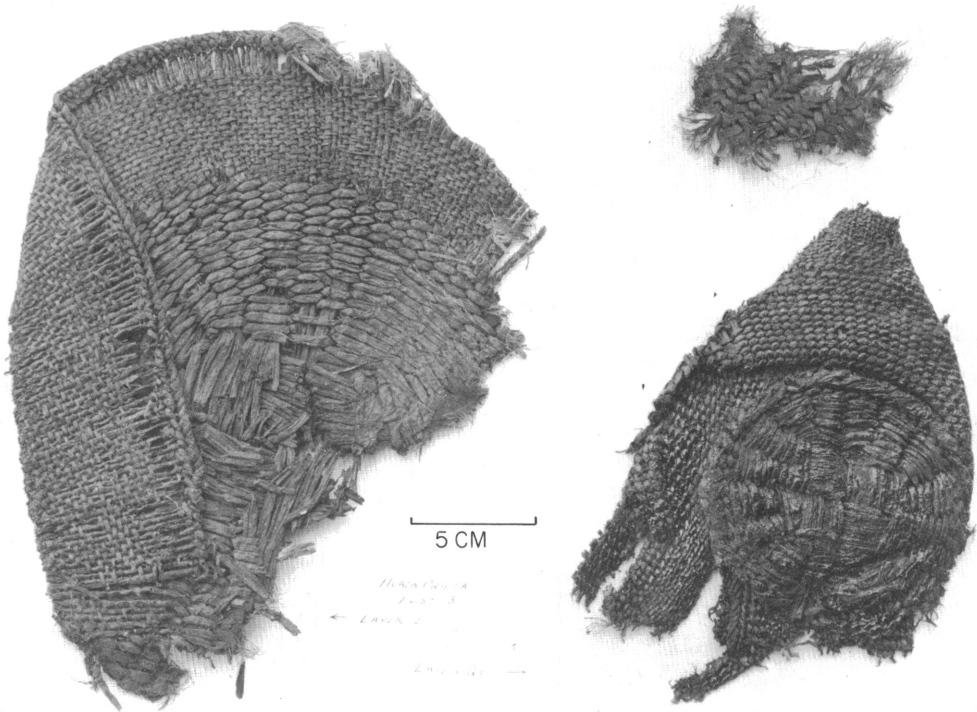


FIG. 56. Left: basket 4187. Right top: twill fragment 4309. Right bottom: basket 4222. (John Collier)

thirds complete and entirely twined (fig. 56). The bottom starts with four crossed warp bundles. The initial weft is twined around bundles, then split into pairs, subdividing each quadrant into 2 sets. After 4 turns of the twined pairs, they are subdivided again into 4 sets. After 8 more rows of twining, these subdivide again into 8 sets. With 4 more rows of twining, the warp are then completely separated for the side wall construction. Apparently there are 40 warp in each of the 4 original bundles, subdividing first into sets of 20, then into 4 groups of 10, then into 8 groups of 5. The side construction uses a finer *junco* for the weft than in the bottom. Whether there is an odd or even number of spoke pairs is immaterial. The twining must be about either 1 or 3 spokes at a point in each successive turn in order to split the pairs.

4215: Layer K. One bottom section comprises this basket. It has four warp bundles that divide twice, forming 16 sets (fig. 57). They, in turn, each divide into sets of 3 where

they reach the ring base. Each of these subdivides once again to form approximately 100 groups for the warps of the side of the basket. The ring base has an inside diameter of 12 cm. It is made of a coil of *junco* strands lashed with *junco* wrapping. The strands show in the interior of the basket, 2 at a time, as they pass over 4 groups of warp.

**SIDE CONSTRUCTION:** Twenty-eight of the baskets have sides of alternate rows of twining and weaving (see descriptions of specimens 4186, 4188, 4192, 4211, 4214). In all except two (see descriptions of 4191 and 4227), the rows alternate in a 1 to 1 ratio. Ten of the baskets have sides which are entirely twined (descriptions 4199 and 4200). Only one side fragment (description 4198) has a twill weave.

4186: Layer D. Sixteen fragments compose two or three baskets. All are S-twined. One fragment shows typical bottom construction, with groups of radiating elements covered with untwisted, twined weft pairs. Another

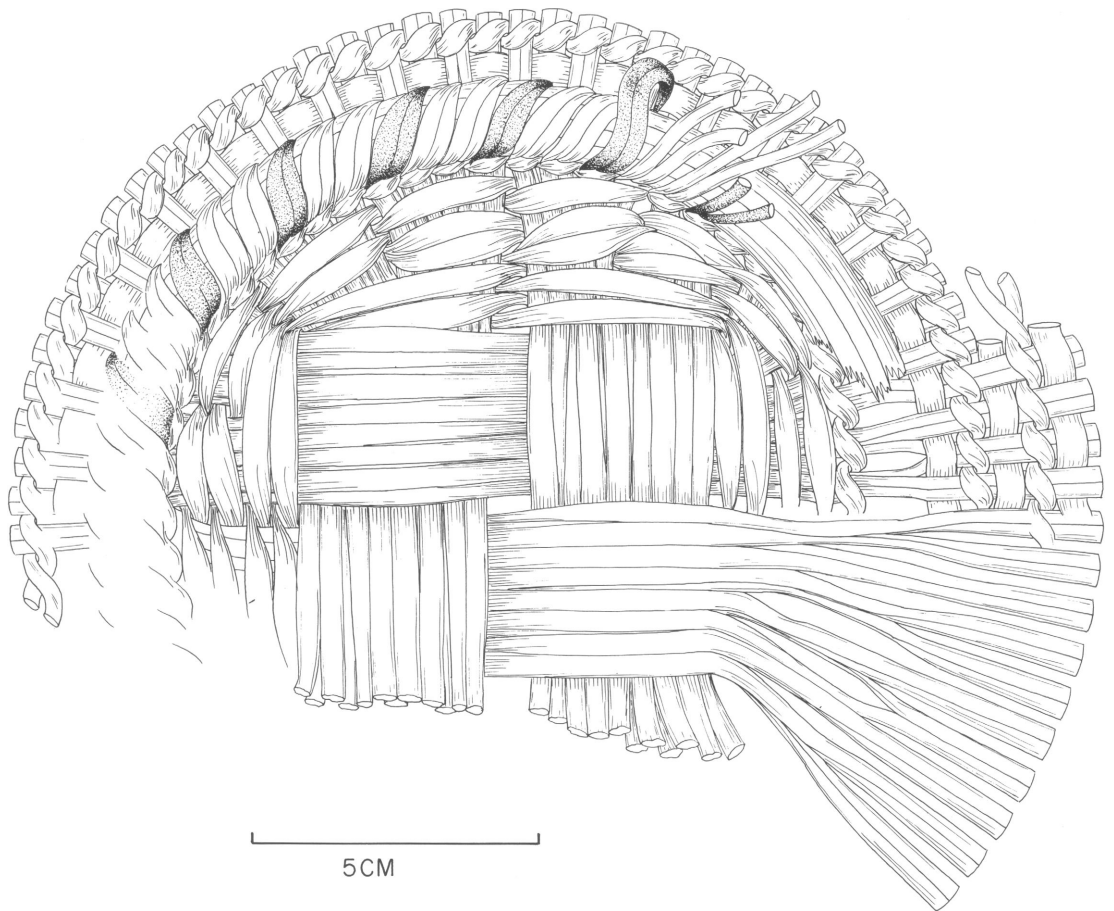


FIG. 57. Bottom section of basket 4215. Four warp bundles at basket bottom subdivide to form sides. The ring is a wrapped coil.

piece shows the juncture of bottom and side construction, with the compact twined bottom weft changing to alternating rows of twining and weaving. The spokes continue up the side in radiating pairs. The woven elements are laid in as though the twined elements were absent—that is, alternate over and under. If the twined elements were removed, there would be a simple, plain weave construction over paired warps. The other fragments show this same arrangement.

4223: Layer D, Side Trench CDE. Two fragments from the side of the same basket have alternating rows of weaving and twining. In both twined and woven rows the spokes are used in pairs, moving in each successive

row for one space. All weft lie firmly together, with the spokes exposed in pairs only as they cross the woven elements. At these points they fork and are paired again at each twining turn. Untwisted *junco* rush is used.

4188: Layer E. There are 16 fragments from one basket. One bottom fragment shows grouped warp with compact twined weft. Ten fragments show side construction as alternating rows of twining and weaving. One fragment shows the juncture of the bottom and side, with the side construction ending in three consecutive rows of compact twining. Four edge pieces show the edge finish beginning after a single twined row.

4192: Layer G. Thirty-five fragments are

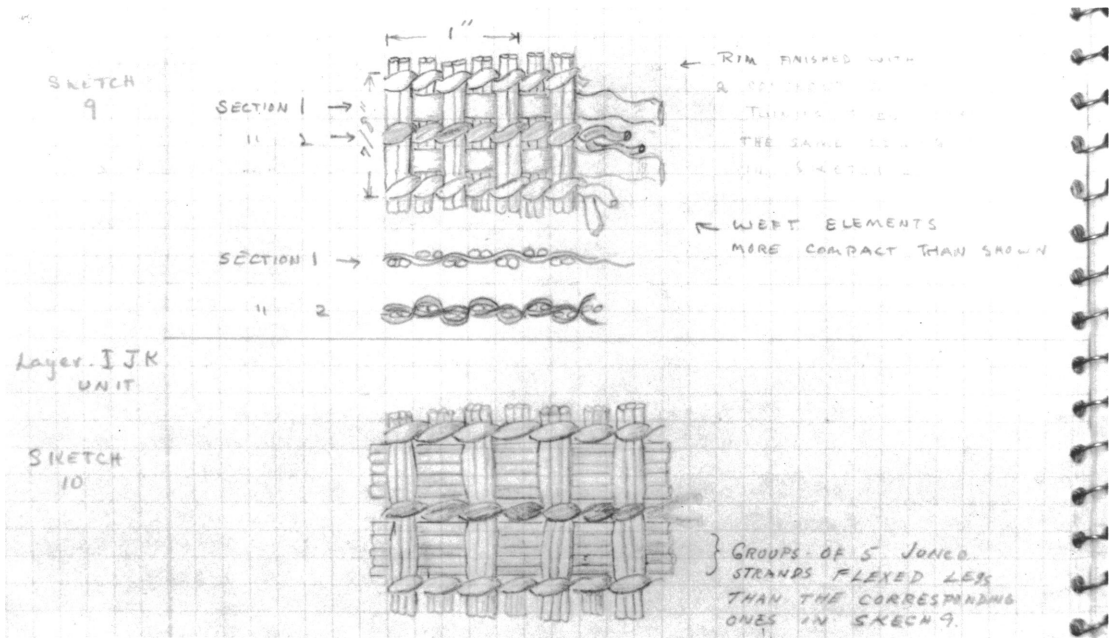


FIG. 58. Drawings from Bird's field notebook B, p. 86. Top: side of basket 4214, a variant of alternating twined and single woven weft rows. Bottom: side of basket 4227 with one row of twining alternating with five rows of weaving.

part of the largest basket found at Huaca Prieta. There are two bottom fragments, four with bottom and side juncture; the remainder are sides. The largest fragment is 30 by 41 cm. The radius of the bottom is 11 cm. The warp are crossed in four sets at the bottom, subdivided, and continued up the sides with alternating twined and woven wefts. The height is approximately 30.5 cm. The rim finish is missing. A ring made of *junco* strands, about 2.5 cm thick, is lashed to the bottom to form a base for the basket. See figure 57 of specimen 4215 for a similar ring base.

4211: Layer J. Five sections compose about one-half of a basket with a bottom construction of four bundles. The sides are alternating twined and single-woven weft rows. A low, raised ring supports the base. It was made by twining four strands of *junco* simultaneously, but with only one of the four passing through to the interior at a time. The rim finish is like 4233 (fig. 60) and has three consecutive rows of twining below it. The diameter of the bottom is 16.5 cm and the height of the side is 18 cm.

4214: Layer J. Three repaired rim fragments probably come from the same basket (fig. 58). One has a side construction not previously described.

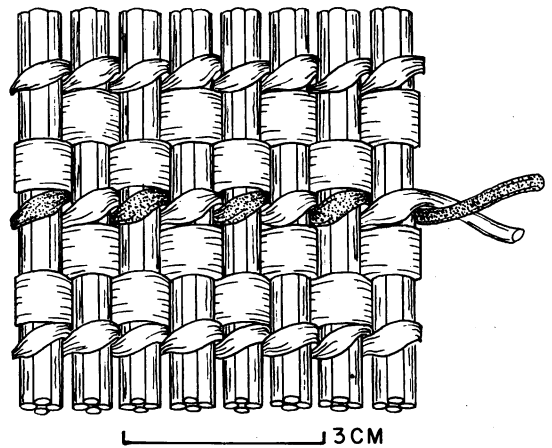


FIG. 59. Side construction of basket 4191. One row of twining alternates with two woven weft rows.

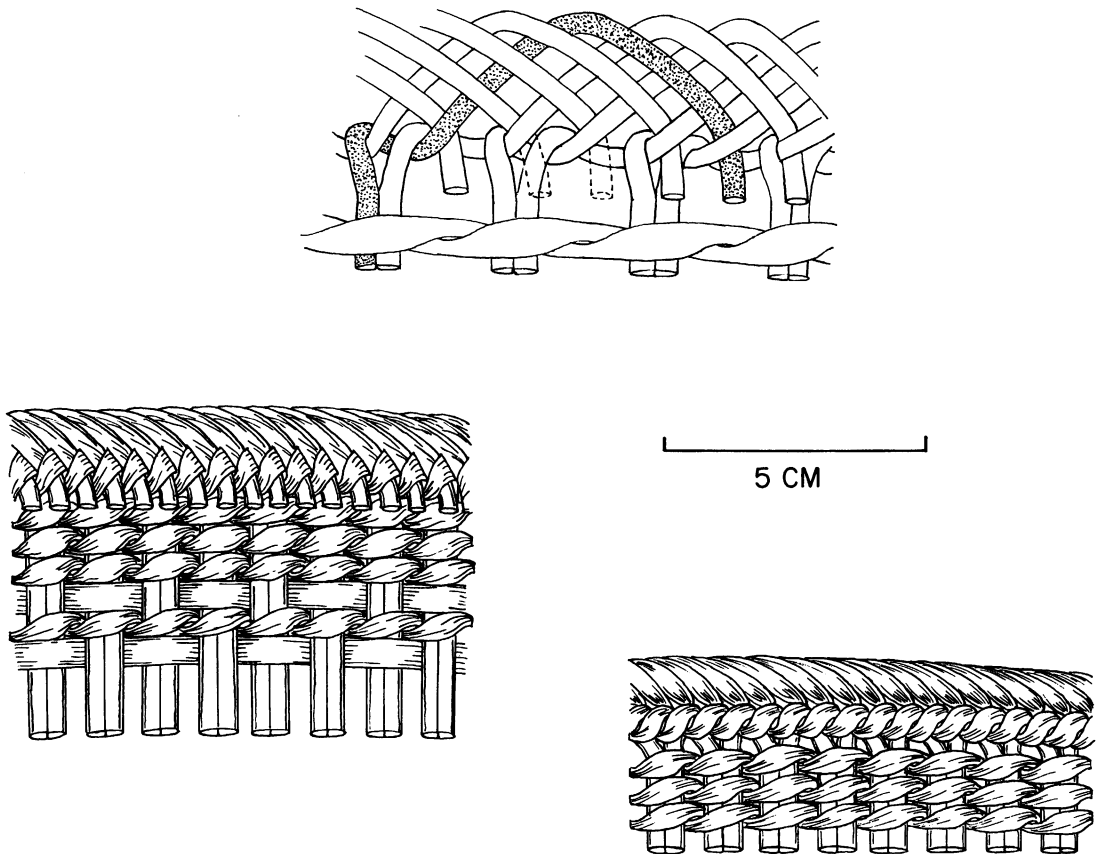


FIG. 60. Rim drawing of basket 4233. Top: exploded view. Bottom left: interior. Bottom right: exterior.

4191: Layer G. Twenty-eight fragments were found, probably all from one basket. The width of 8 paired warp is about 5 cm. The sides are constructed with weft elements more compact than those presented (fig. 59). This was probably a large basket. The bottom fragment shows grouped warp elements covered with compact twining. The groups halve as the compact twining continues.

4227: Layer J, Side Trench IJK. Three side sections have one row of twining alternating with five rows of weaving (see fig. 58).

4199: Layer G. Ten side fragments form this group which may include at least three baskets. Five of the picks are of split-pair twining. Single strands of *junco* compose the weft twining elements. One of these shows a rim that was finished by simply bending each warp end into a loop, slipping the adjacent

warp end through this loop, and pulling it tight. Bird requested a basketmaker, Alice Grey, to create a Huaca Prieta preceramic basket. She used this rim type in her model (see section on rim construction below).

4220: Layer M. This basket comprises eight fragments. Two are bottom sections; the remainder are sides. The ring, made like no. 4211, has an inside bottom diameter of 10.5 cm. The warp begins as four bundles on the bottom, subdividing into 16 sets, and then 48. The final division results in approximately 192 warp. The sides are composed of compact, mainly twined weft, 6 to each 2.5 cm. The height of the side is 9.5 cm. This was a stiff, solid basket.

4198: Layer G. This small side fragment apparently has a straight twill weave—over 2, under 2—for both warp and weft.

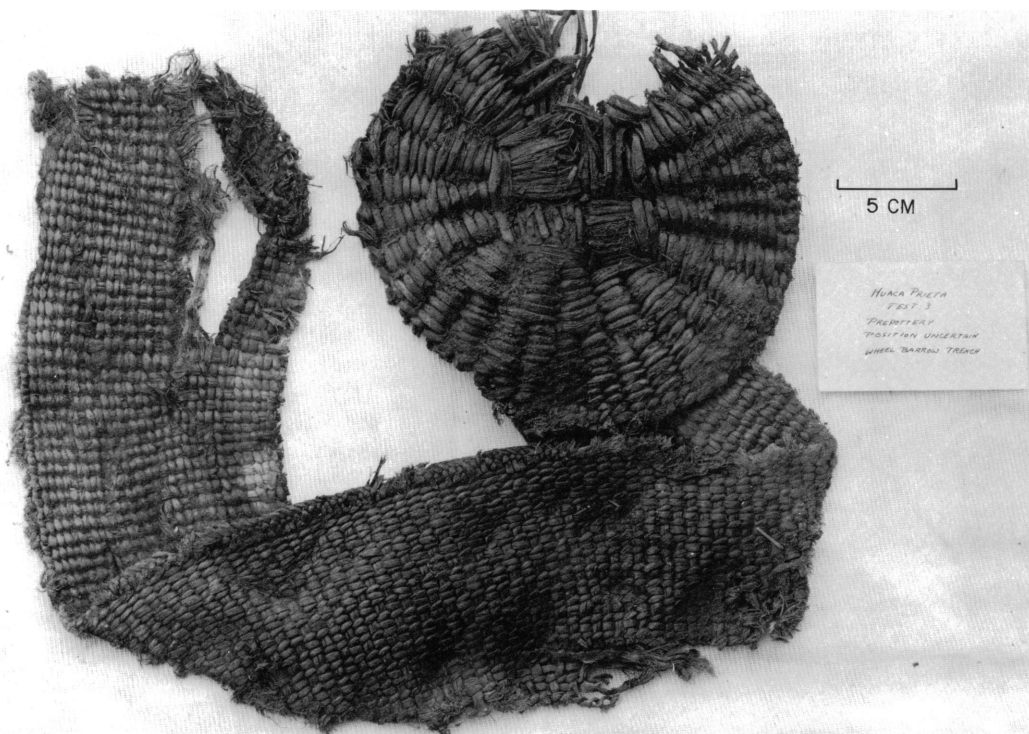


FIG. 61. Basket 4233 with side of alternating single rows of twining and weaving. (John Collier)

**RIM CONSTRUCTION:** Eleven rims are present in the collection. Several are made as in specimen 4233 (see description below). In one case, as in specimen 4199 (described above), the spokes are simply bent into a loop. The adjacent warp ends were slipped through the loop and it was tightened. Several rims could not be analyzed because of their poor condition.

**4233: Position Uncertain.** Three fragments comprise this basket (figs. 60, 61). A disjointed bottom made with four crossed bundles is 19 cm in diameter. The side of the basket is made with alternate rows of twining and weaving ending with three rows of compact twining below the rim. Seventy-one cm of the top circumference of the basket remain, but only 19 cm of the rim remain.

**BASKETS WITH PATTERNS AND COTTON WEFT:** In two cases, cotton wefts are used to create a pattern in the side of the basket. In specimen 4221 (layer O), a bird motif is present; a diagonal pattern band is produced in specimen 4222 (layer Q).

**4221: Layer O,** associated with burial 99.1/903. In the side of this basket cotton and *junco* wefts work in opposition to create a bird motif (fig. 62). The wefts are compactly twined with 180 and 360° twining twists achieving the color distribution creating the pattern (see Chapter 10 subsection on 360-degree twists in weft rows). The design is two mirror-image pairs of joined birds in profile, all facing the same direction. Three side sections comprise this basket. The largest fragment is 22 cm wide and 7 cm high. The other two fragments do not change these maximum dimensions. Three side sections compose this twined-patterned specimen. The spokes are of *junco*. The cotton wefts are S-spun, Z-doubled yarn, probably dyed blue.

**4222: Layer Q.** This specimen is a nearly complete basket with a ring base (see fig. 56). Its base diameter is 10.2 cm and the side is 8 cm high. The bottom begins as four warp bundles. The twining starts with 3 turns of 2 pairs about entire bundles, then 7 turns where the groups are halved into 16 groups; then

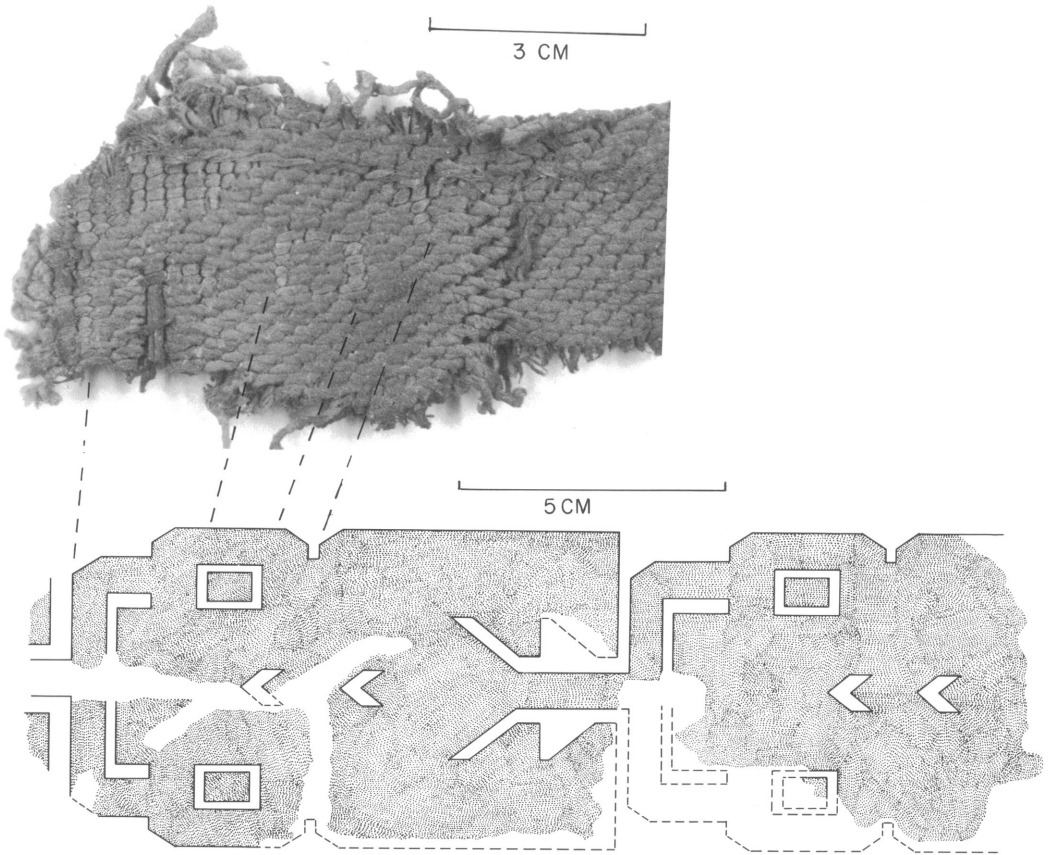


FIG. 62. Bottom: Drawing of design on basket 4211. Two pairs of mirror-image joined birds are depicted. Photographic detail—bird head created with blue cotton weft yarns.

one turn dividing these into 48 groups which pass over the ring. The base is like no. 4211. Outside the ring base there are 10 turns of twining about paired warp; then there are 4 rows of split pair twining. Above this is a band 2 cm wide where finer *junco* and then S-spun, Z-doubled cotton is used to create a diagonal-pattern band. Above this the warp elements are again united in pairs with 2 rows of twining against the rim.

#### CHRONOLOGY AND STRATIGRAPHIC OBSERVATIONS

Since the number of basket specimens is limited, the following comments on the distribution of traits is tentative. It can be observed that the only two basket specimens

with cotton wefts and patterns come from lower layers of the pit (4221 from layer O and 4222 from layer Q). Bottoms which start with four warp bundles are present in top and bottom layers, but twined bottoms are present only from layer G up. Other traits such as split-pair twining and alternating single woven and twined weft rows are present from the top to the bottom of the excavation. The two examples of multiple woven rows alternating with single twined rows occur in layers J and G (specimens 4227 and 4191).

#### MATTING

Matting was found in most of the preceramic layers (C to Q) of Test Pit 3. The AMNH catalog lists 76 specimens, 41.2/4246 to 41.2/

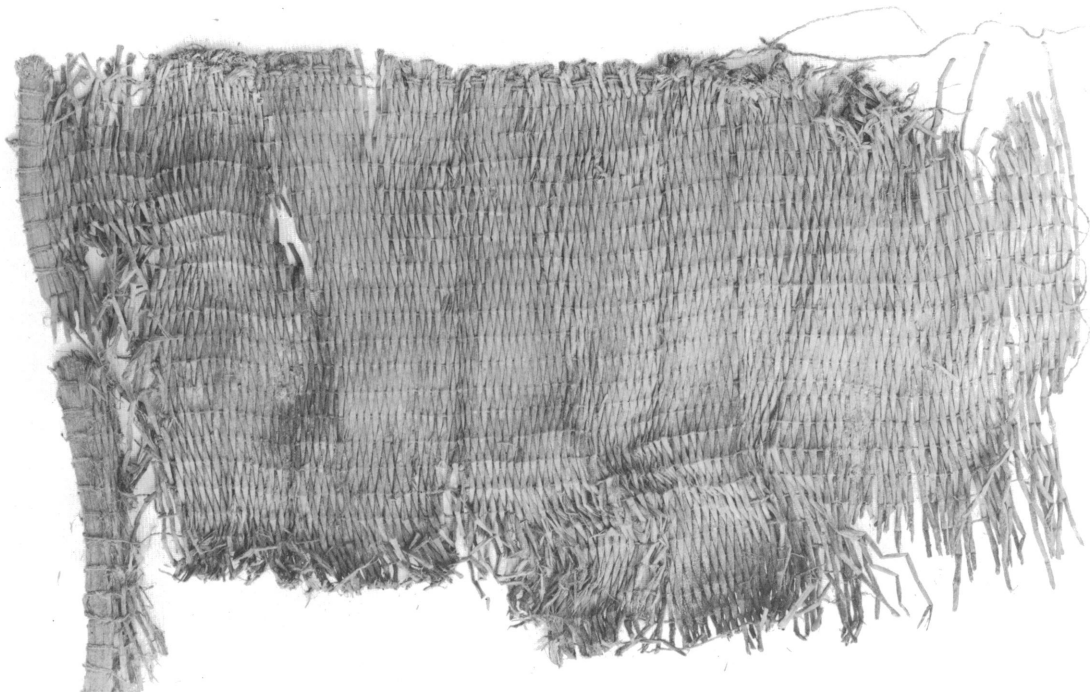


FIG. 63. Mat 4307 associated with burial 99.1/903. This is the only woven mat with wefts of sedge materials.

4321. Seven of the mats are woven; the remainder are twined. None of the specimens encompass the complete length or width. The warps of the mats are always made of stalks of sedges, sometimes triangular in cross section, locally known as *junco* or *tatora*. In the twined mats the wefts are always twisted stalks of the same sedge material. In the woven mats the wefts are usually of cotton or a bastlike fiber.

Most (5) of the plain-woven mats (4228, 4249, 4250, 4252, 4253) were found in the two upper layers (D and E) of Test Pit 3. Two come from lower layers: 4289 (layer J) and 4307 (layer O). Specimen 4307 (fig. 63) is associated with burial 99.1/903, and is the only woven mat with wefts of sedge materials. One small fragment, 4309 (layer Q), might not be a mat (see fig. 56). It has a twill weave of 2 over and 2 under. The warp counts (per 2.5 cm) of the woven mats vary from 7.5 to 12. Mat 4307 has the greatest number. The weft spaces vary from 1.2 to 2.8 cm.

The twined mats comprise sixty-nine spec-

imens (fig. 64). All are plain twined except two (4266 in layer G and 4776 in layer H) which are twined in the split-pair manner. All have the Z twining twist. The warp counts (per 2.5 cm) of the twined mats vary from about 3 to 6, with most having 4 or 5. The spaces between the wefts vary from 1.5 to 22 cm; most are between 5 and 16 cm. It may be notable that weft spaces greater than 11 cm are rare (one questionable example) in and below layer J. They are somewhat more common (11 examples) above layer J.

Since most of the mats are fragmentary, there is limited evidence of side selvage and end finish construction. Plain woven mats 4250, 4253, and 4307 have twined rows over 2 or 4 warps to form the end finishes. The end finish on one twined mat (4254) has a *junco* stalk placed through warp end loops. The side selvages of twined mats are created with simple turns of the weft (4271, 4295, 4301) or weft advances along the edge (4256, 4265, 4266, 4273, 4291, 4292, 4293, 4305). Overhand knots are commonly used to fix



FIG. 64. Two plain-twined mats. Left: mat fragment 41.2/4292 with weft advance. Right: mat 41.2/4302.

the weft before advancing, and before starting the next weft row. Two examples of cow hitches (4250 and 4270), used for primary selvages (4250 and 4270), are present. The side selvage of 4307 may be unique (fig. 63). A weft with a knot on the end is pulled through a bunch of stalks. It encircles the bunch twice before starting the weave.

Bird noted that the 5000-year-old tradition of twining mats at the Huaca Prieta still continued in 1947. Raul Villegas, whose house was at the base of the mound, made twined rush mats with the same techniques used in preceramic times. The only difference was that Villegas used wefts of unraveled hemp rope instead of sedge materials.

## CHAPTER 9. HUACA PRIETA TEXTILES

### Junius Bird

*Background comment by Milica Dimitrijevic Skinner, 1984.*

Junius Bird began writing this chapter in November of 1962. His unfinished manuscript ends with the subsection on twining—warp striping. He probably would have revised this text for publication, particularly its final part which was still in handwritten form. I was asked by the Junius B. Bird Committee at the AMNH to edit this text for accuracy and to complete it. In addition, I was also asked to write and arrange for publication the remaining massive amount of information (texts, tables, illustrations) on the Huaca Prieta textiles. All this was to be accomplished within a limited time so that the publication of this monograph would not be delayed. Having assisted Bird in practically all aspects of the textile project, I was aware that it would be impossible to prepare all the available material within the time allotted. Therefore I had to establish priorities. After completing this chapter, I wrote at length about the twined transposed-warp textiles (Chapter 10), which I consider the single most important fabrics for both technical and aesthetic reasons. In Chapter 11 I have supplied information about the woven, netted, and looped fabrics (other textile tech-

In dealing with the fabrics, yarns, cordage, and fibers, I believe greater clarity will be achieved if we first simply describe what was found, holding any comment on chronology to a minimum. To inject all the statistics on how features of fabrics occur stratigraphically in the descriptive text would only create confusion. Readers refer to such reports for differing reasons. Those concerned with textile technology are not necessarily interested in what happened in the course of time. Similarly, those whose interests are in cultural changes and stability may not be willing to digest the technical data. The two aspects warrant separate sections.

#### FIBERS

Our information on the fibers used in the preceramic period at the Chicama and Virú valley sites derives from varied evidence. The fabrics are naturally the most important source of data but there are, in addition, non-fabric items: pieces of yarn and cordage, dis-

carded fiber, cotton seeds and bolls, and a large and varied assortment of plant material. Statistically this amounts to 4256 fabrics and pieces of fabrics of all types, 2112 small fabric fragments, 4.22 kg of scraps of fabrics too incomplete or poorly preserved to class with the preceding, 942 nonfabric items and pieces of yarn and cordage, and a considerable quantity of wisps and masses of fiber. The weight of the latter is less than the amount of fabric scrap but was not recorded, as much retains salt-encrusted dirt. This, however, does not prevent identification and all such listed items have been examined with a microscope. In the case of the fabrics, all warp, weft, and other yarns have been checked. The results can be considered reasonably accurate. If there are errors of gross identification, we know where they might occur and their nature. Equally important, we know what is not present.

My task has been eased by Dr. John Hyslop whose editorial skills and encouragement have been indispensable.

In this and following chapters, references are made to the Code (Textile Code). It is introduced and printed in Appendix 1. The tables on fabrics in this and following chapters give tabulations of traits present in textiles, not necessarily scores of specimens. Thus any one specimen might produce more than one score for any given feature such as yarn structure, or twining techniques. This report publishes the analyses of the preceramic textiles from the Huaca Prieta. The ceramic-associated textiles from near the mound, and collections from Virú, are analyzed but unpublished. Those data are available at the AMNH.

Bird begins his text by noting that chronological (distribution) data would be dealt with elsewhere. Chapter 15 summarizes chronological data, but some information in the text here, and in the accompanying tables, is basic to an understanding of the chronological distribution of textile traits.

From all the material it is evident that throughout the long period of occupation, cotton was the primary fiber. An unidentified

bast served as a supplementary or secondary fiber used in specific ways to be described later. It is noteworthy that only these two fibers occur in the woven and twined fabrics and that there were no examples of fabrics in either of these techniques made entirely of bast. The very rare, small pieces of looped and netted items entirely of bast appear to be repair areas, for the common use of pure bast yarn or cord with such fabrics was for repairs. It is not uncommon to find that replaced or repaired sections have survived in somewhat better condition than the adjoining material and one could easily be misled into thinking that such sections by themselves represent pure bast products.

#### RUSHES

For cordage and some nonfabric items, rushes or sedges of several species were used. These plants will not yield a fiber, so cordage was, and still is, made by simply twisting the stalks together. The most common sedge in the area today, known as *junco* (*Scirpus* sp.; *Cyperus* sp.), attains a length of 2 to 3 m. It is round in cross section and today it is still a minor article of local commerce collected for hat and basket makers.

A less common sedge, *junco de tres filas*, grows to similar size. In the archaeological material it is impossible to distinguish with any certainty large stalks of this three-sided *junco* from small stalks of the normally much larger three-sided *tatora* rush (*Scirpus totora*). The latter was used for mats and probably for some cordage.

A fourth rush or sedge, locally known as *pisa* (*Elcocharis* sp.), is much smaller and finer than any of the others. A little of this was found as unutilized, untwisted material and is readily identifiable. We have not positively identified it among the cordage. Exact identification of any of the rush as they occur in cordage is often impossible, for partial decomposition of old and worn cord and rope has often reduced the stalks to a fibrous mass. Their appearance leads one to believe that the stalks were shredded or reduced to fiber before being twisted. This is an erroneous conclusion, for tests with both fresh and dried stalks have failed to yield any usable fiber.

Evidently nothing, beyond possibly slight crushing, seems to have been done to the plants before use and the fibrous appearance can be attributed to time, and possibly in some cases to use.

In contrast to the widespread and great use of wool in later periods in Peru, no evidence of wool was found at these preceramic sites. Not only is the fiber lacking, but there are no camelid bones in the refuse. We can only conclude that the lower Chicama and Virú valleys were outside the natural habitats of the South American camelids, guanaco, vicuña, and the ancestors of the llama and alpaca. The absence of wool among the products of a people long accustomed to fabric production suggests that the habitats were also beyond the area of contact and trade [for this material], whatever that may have been at the time.

#### HAIR

In northern Chile, in certain prehistoric periods, human hair was rather commonly used for cordage and occasionally for single element fabrics. The only examples found in the Chicama Valley are two pieces of cord associated with pottery of the Gallinazo or Virú period, long after the preceramic stage. Either the inhabitants of the Huaca Prieta had more than enough other fiber at hand for their needs, or the habit of cropping their hair, attested by discarded trimmings in the trash, left them in short supply.

#### COTTON

The cotton from the Huaca Prieta has been subjected to more intensive examination than any other prehistoric cotton to date. Interest in it stems in part from a proposed explanation of the origin of the New World cottons, their relationship to each other, and to cotton in other areas of the world. Data and a summary statement have been published by Sir Joseph Hutchinson (1959, pp. 25-27, 30-32), and Dr. S. G. Stephens (1975). For our immediate purpose we are most concerned with the physical characteristics which relate to yarn production.

Those who have examined the Huaca Prieta cotton fibers, seeds, and plant parts agree

that various features indicate a closer relationship to *G. barbadense*, the native cultivated cotton of Peru, than to any other alternative species, and that the Huaca Prieta cotton should be classed as this species.

Measurement of the cotton fiber length is rendered somewhat difficult by the problem of handling ancient fibers. The longest fibers in an unusually well-preserved sample had a mean length of 26 mm; the general average, or effective length, was about 22 mm.

Another check of fiber length reported an effective length of about 18 mm. In comparison with the general range of modern cotton these fibers are classed as "short, coarse, and immature."

With immature fibers the fiber walls have not completed the full normal growth. For various reasons growth ceases and bolls open before this point is reached. Some immature cotton can always be found in any crop; the amount or percentage present may vary from year to year, depending on fluctuations in moisture, temperature, mildew, and other factors such as plant nutrients in the soil. In the Chicama Valley, where climatic conditions are very uniform and precipitation, other than dew, is not a normal factor in plant growth, the most likely variable is in the time and length of the period of summer water flow. If there were no irrigation in the period with which we are concerned, the cotton, whether wild or cultivated, may normally have suffered from lack of water in the later stages of growth.

The use of immature fibers in machine spinning can result in neps or tangled lumps of fibers on the yarn surface. Some manufacturers, by using a definite admixture of immature and mature fiber have succeeded in producing a fine diameter, relatively inexpensive yarn. The alternative, to use a fine quality, long staple, higher priced fiber, though preferable, must be weighed against the function, nature, and price of the final product.

In the modern machine production of coarser yarns, a mixture as high as 50 percent of immature fiber apparently influences neither fiber bundle nor yarn strength. With hand-spun yarns the admixture can probably be higher without appreciably affecting strength. In the relatively coarse yarns of the

type with which we are dealing, the use of immature fibers probably has little effect on the final products, at least in no way we can now measure or evaluate.

A more important feature of the old cotton, from a cultural standpoint, is the fact that some of it is brown in color. As dyeing procedures were not well understood, the natural brown and tan cotton provided a simple means of varying the appearance of fabrics and may well have been a factor in the initial development of patterning. Unfortunately, the condition of the fabrics does not permit cleaning to a point where the presence or absence of the brown can be recorded with complete accuracy. The oldest positively identified examples are well down in the Huaca Prieta deposit (41.2/2551-layer O, HP 3). In the HP 3 series of fabrics the ratio of recorded brown and tan to white or creamy cotton is 1 to 18.4. With this ratio of occurrence we cannot say with certainty that no brown or tan was present earlier, for only 11 rather poorly preserved fabrics lay below the oldest example of the brown cotton.

The cotton specialists who have examined a sample series of the cotton observed a creamy or fawn tone where items were clean enough to judge. Other samples, after thorough washing, appear to be white. As it is impossible to subject the entire collection to the same treatment, we cannot state with any certainty whether the cotton was generally white or if a light creamy tone was the common characteristic.

#### BAST

The identification of the fiber we have classed as a bast poses a problem. We cannot determine with certainty if it is all from the same plant source, and must assume that this is so simply because of its general uniformity of appearance. In some of the coarse, all-bast yarns or cords, the fiber bundles are not well-separated; yet, when these are broken down, the product has the same appearance as the rest.

When well-washed, the bast fiber is white and the filaments are smaller in diameter than the associated cotton fibers. Staple length is difficult to determine. By untwisting the

coarser yarns, fibers or fiber bundles measuring up to 48 cm in length have been recovered. This is probably an incomplete length, because the longest measure was traced from a cut or broken yarn end.

While excavation was in progress, inquiries were made about fiber sources. The local inhabitants were aware of only one fiber other than cotton, a hard fiber rather than a bast, which is obtained from the leaves of *Fourcroya (occidentalis?)*, locally called *penca*. We were told that the plant is available in the Chicama Valley only at a small hill a few miles from the Huaca Prieta up the south side of the valley. If it occurs elsewhere in the valley, it is certainly not one of the common plants. No one now makes any effort to gather the *penca* and prepare the fiber, yet articles made from it and bundles of prepared fiber from graves of the Central Coast bear witness that it was employed elsewhere in Peru in the past. The leaves, from which fibers up to 50 cm long can be stripped, are narrow, sharply pointed, tough and durable. They should survive indefinitely in dry midden refuse; yet not a single example was found in the Huaca Prieta debris. It follows then that either the plant was introduced into the Chicama Valley after the Preceramic Period or that, if indigenous, it was very rare or nonexistent within the economic habitat of the Huaca Prietans.

A review of information on the various types of bast fibers and their preparation shows that it is important that the plants be gathered at specific stages of growth. The retting procedures for freeing the fibers by first soaking them in water are generally similar, though they vary in time required and other details. Variations in harvesting and retting have a marked effect on the strength, quality, and nature of the fibers. Anyone concerned with the identification of archaeological basts must bear this in mind. All plants which might be potential sources of fiber should be collected at different stages of growth and systematic experiments made with the retting. Even then, the close microscopic similarity of some bast fibers may make exact identification impossible.

Throughout the preceramic debris one finds seed pod covers of a milkweed. These are of two distinct sizes and probably represent two

species. About 600 pod covers were found, the majority the smaller form. None contained or were associated with the seeds. Both types of milkweed are reported to occur on long, supple, climbing vines (*Asclepias* sp.) which are employed in lashing poles when framing simple houses or shelters. Although none was found growing in the lower Chicama Valley, they were immediately recognized by the local people who refer to them as *chivo* or *amarra judea*, without distinguishing between the two types. One informant stated that the plants are a nuisance to have on one's property and that they are deliberately destroyed.

As the stems of some of the milkweeds have been important sources of bast fibers, especially in North America, it was thought that the *chivo* might have provided the bast used in fabrics. Samples of the large pod variety of the vines were obtained from the upper Lambayeque Valley at the time the pods were mature but had not opened. The sample vines are 18 to 20 m long and have a layer of bast fiber under the bark. Unfortunately, the specimens had not been dried before packing and were heavily mildewed when examined. Attempts at retting produced only weak fibers, a result which might be attributed to this damage. In general appearance, this modern *chivo* fiber resembles the old. However, the fibers from the small pod variety should be checked and compared before rendering a final decision.

The relative quantities of cotton and bast fibers used in the Preceramic Period are not accurately shown by the figures on occurrence. For instance, a fabric may have only a few yarns in which bast occurs and a hundred or more of pure cotton. The specimen is, however, recorded as having bast, without reference to the ratio of bast to cotton.

Other pieces may be made with paired two-ply warps, one of each pair being half bast, half cotton. If this holds the full width of the fabric, the fiber composition of the warps is then 25 percent bast, which is normally the maximum use of bast in any twined fabric. More often than not the 25 percent bast warp pairs occur only in part of the fabric, so the average is actually lower.

A similar situation exists in the weft yarns

in those rare instances where some bast is found. In twining, where two-ply yarns are used in each weft row, one of the two may have a bast-cotton blend in one element. This, as noted, is rare; there are no instances in which all of the weft strands in any one piece have this composition.

If we consider both weft and warp yarn fiber composition in specimens where bast occurs, the maximum use of bast is, on the average, something under 25 percent of the total fiber used. This must be kept in mind when considering the following record (table 7) of the occurrence of bast in preceramic fabrics from both the Chicama and Virú valleys.

The inclusion of the single-element constructions, looping and netting, does not modify the overall picture, because the use of bast in these is also limited. As in twining and weaving, the occurrence of bast is on a partial-use basis as explained in the discussion of these techniques.

The differences in the fabric counts, as shown in table 7, are due to the inclusion of fabrics in which warp composition is preserved in end finishes and where there is uncertainty about weft structure in the body of the fabric.

In assessing the overall occurrence of cotton as compared to bast we can, as pointed out, state with assurance that the percentage of bast cannot average over 25 percent of the total fiber in those pieces in which it is present. By using this maximum figure and the percentage record for the overall occurrence of bast, we find that the amount of bast fiber present will not exceed 6.9 percent of the total fiber employed. The true ratio is probably considerably less.

## YARN PRODUCTION AND STRUCTURE

### FIBER PREPARATION

As cotton fibers are seed hairs, the first step in preparation for spinning is separation of fibers from the seeds. Modern native hand spinners in the Americas do this by pulling the fibers from seed after seed with their fingers. An alternative method is to place small quantities of unseeded cotton on a smooth hard surface and roll it with a small-diameter

TABLE 7  
Percentage of Occurrence of Cotton Versus Bast  
by Technique

Techniques	Pure Cotton, Percent	Part Bast, Percent	Fabric Count <sup>a</sup>
Twining, warp	41.9	58.1	1928
Twining, weft	93.8	6.2	1835
Weaving, warp	77.3	22.7	132
Weaving, weft	97.7	3.3	131
Combinations, warp <sup>b</sup>	50.0	50.0	8
Combinations, weft	100.0	—	8
Looping	94.9	5.1	254
Netting	98.0	2.0	398
Average	72.5	27.5	

<sup>a</sup> Number of fabrics examined.

<sup>b</sup> Combined twining and weaving.

round stick. The practice, unknown in Peruvian territory, is so limited in South America that it might have been introduced by Portuguese who must have known of its occurrence in Africa. Whatever the record, those Peruvians who continue to spin cotton yarn remove seed and incidental trash, leaf parts, and boll parts, by hand. Consequently, the fibers are probably less tangled and damaged than by any other system. I assume that this was the method used from the beginning of occupation at the Huaca Prieta. Certainly the work was done at the site, for seeds from which the lint has been completely removed are found scattered through the refuse in all levels.

For the benefit of those unfamiliar with cotton yarn production, it should be emphasized that the mere removal of seeds does not complete the preparation of cotton for spinning. Yarns cannot be produced from plant or animal fibers unless the fibers are so arranged that as a few are drawn from the mass they will pull others into position and overlap as they are twisted together. There must be a friction between the fibers, and they must fall into roughly parallel order as they receive the spinning twist. The factors governing friction are a combination of the nature of fiber surfaces, the lengths of the fibers, and the degree to which they are compacted together and oriented before twisting. If the finished product is to be fine and of uniform diameter,

greater care is required in fiber preparation and the tension or pull applied to the fiber must be uniform and carefully controlled.

In commercial cotton yarn production after seed removal a process called carding starts the alignment and compaction of fibers, eliminates extraneous trash and forms the fibers into an untwisted strand or roving. The roving is then stretched or drawn, subdivided into smaller rovings each further attenuated by drafting, restretching, and compaction, before the spinning twist is imparted. The size of the finished yarn is determined in large part at the drafting stage.

The mechanics of commercial production are, of course, designed to handle great quantities of fiber for continuous high-speed yarn production. However, the principles are those recognized thousands of years ago by hand spinners who solved the problem in various ways. The most common procedure, still used in Peru and various other parts of the world, is to place a mass<sup>1</sup> of clean cotton fiber on a flat surface and beat it with a pair of thin, supple rods held one in each hand. The rods are normally natural-growth shoots, stripped of bark so they are smooth, 30 or more inches long. The beating brings the fibers into closer contact with each other and as the mass is flattened it is folded-drawn, beaten and re-folded, and worked into the shape the spinner prefers. This may be a rectangular batt which is then rolled into a cylinder, or it may be much longer and narrower, resembling a large, flattened roving, from which the strand is drawn. In the latter case the spinner will drape this about the left arm, with one end caught between thumb and forefinger to apply pressure and control as the fibers are pulled out or drafted for spinning.

In regard to the ancient practices, we have no information on this step in yarn production; no recognizable implements for the work have been found.

Among the remains from later periods, specifically Central Coast finds dating from A.D. 1200 to 1500, one finds cotton prepared for spinning in the form of compact cones

and as large, loose rovings or elongated masses of fiber like those used by some modern spinners. No distaff is required with this system. None of the wads or masses of cotton fiber found in preceramic debris resembles either of the latter forms. They share no common characteristic, so we cannot identify them as prepared fiber.

#### SPINNING AND SPINDLES

Spinning in the Preceramic Period was evidently accomplished without benefit of specially prepared spindles. Among the 5608 scraps and fragments of wood, twigs, etc. encountered, not a single piece could be identified with any certainty as a spindle shaft or section of one. Nor were any spindle whorls found. Whorls, all of pottery and well-made, appear first in the Chicama and Virú valleys in the Chavín-Cupisnique debris. If similar whorls were used in the initial Ceramic Period, none has been found. One does not necessarily require carefully prepared whorls to produce coarse yarn. Witness the occasional improvisations among modern spinners: a small potato, a piece of orange peel or anything at hand that can be speared on the end of a crude shaft will serve. Such equipment is a sorry substitute for the beautifully made, carefully balanced spindles used for so many centuries prior to the Spanish conquest.

The absence of any recognizable spindles in the early debris poses a riddle. Perhaps the answer was observed in the town of Cartavio, up the Chicama Valley from the Huaca Prieta. This town was the nearest source of the coca leaves sought by the workmen; while there for a fresh supply, a woman was observed walking along the street spinning cotton yarn. The only unusual feature was the equipment she used and the manner in which it was handled. A mass of prepared cotton was loosely tied to the end of a light, unworked stick about 2 ft long. This served as a distaff, was held between the left arm and the body, while the left hand drew out and drafted the fibers. Twist was imparted by an unworked shoot of a local shrub, the *callaca*, which was turned by the fingers of the right hand. There was no whorl and at no time did the spindle hang free or rotate by itself. Completed yarn was wrapped around the shaft,

<sup>1</sup> One Peruvian spinner observed in 1966 used 61 g of cotton which appeared to be about the average amount that she prepared at one time.

but after the spun section had been reeled no hitch was made about the upper or thin end of the shaft, such as one sees on free-swinging drop spindles. Unfortunately, no camera was at hand, and the equipment was not purchased, as it should have been. I was assured that this was not an unusual performance, but I did not encounter the incident again.

The yarn produced in this manner appeared to be of a weight and quality comparable to the preceramic yarns. We cannot, of course, claim that they were made in the same fashion, but one thing is certain: unless observed in use, it would be impossible to prove that the broken section of *callaca* shrub had ever served as a spindle. Similar pieces of the same woody shrub were present in the preceramic refuse and several short sections of either this material or something comparable were found with yarn wrapped on them (specimen 41.2/4332a—see Chapter 12 subsection on braided, wrapped and coiled fiber).

#### YARN STRUCTURE

Relatively little single-ply yarn was used in the Preceramic Period; two-ply yarn was the common product (tables 8 and 9). Three-ply yarn is restricted to some fishnets, cordage, and repair yarns; redoubled two-ply, to a few twined fabrics and to cordage.

In tabulating spinning and doubling twist directions, the system developed by Miss Louisa Bellinger of the Textile Museum in Washington, D.C., has been followed. This very simple method is based on the slant direction of the lay of the fibers and the doubling or redoubling twist slants, as the yarns or cords are seen in a vertical direction. It is a very practical and useful device, a type of shorthand which greatly simplifies the work of tabulating yarn structure data (see Code XVII). What's more, if freakish or complex yarn structures are encountered, understandable symbols can be easily devised. The alternative is the terms S and Z twists, which quickly become cumbersome and confusing.

As remarked, the preceramic cotton is normally spun S and doubled Z. Bast is used in a peculiar way from the standpoint of normal yarn structure. It is normally spun Z, opposite to the direction of cotton. Where a two-ply

yarn is entirely of bast, the doubling twist is counter to the spinning twist—the correct procedure for a more substantial yarn.

Pure bast yarns were seldom used except as coarse repair yarns. The commonest use of the bast is in two-ply yarns in which one finds an S-spun cotton strand doubled with a Z-spun bast strand. The doubling twist is Z, the normal direction used where both strands are S-spun cotton. This is definitely a peculiar yarn, for the doubling twist tends to tighten the twist of the bast element.

Another use of bast is in yarns in which a second fiber is blended with bast fiber either before or during spinning. In these the blended fiber is normally spun S in the same direction as the common twist for pure cotton. Two-ply yarns in which both elements are of blended fiber do occur; but the common practice was to ply one pure cotton strand with one of blended fibers.

These observations on the occurrence and handling of bast raise various questions. Why are there no fabrics of pure bast? Why are there no fabrics in which there are no pure bast areas? Why should the bast be normally spun counter to the direction of the cotton when plied with cotton, and the reverse when all bast cord or yarn was made? Why was it combined with cotton in the manner described?

None of these questions can be answered with certainty. If one were able to reproduce some of the old fabrics, using the same bast and pure cotton fibers, wear tests would establish any marked difference between the two fibers. Possibly the spaced, twined wefts in the twined fabrics would not hold their positions as well with bast as with cotton, but the factors involved in the twined constructions would not apply to woven articles. Perhaps the preparation of the bast and the relative quantities of cotton and bast which were available at the time have some bearing on the problems. The characteristics and properties of the bast fiber probably play a part, for there is a great difference between the spinning of long and short staple fibers.

It is not inconceivable that the pure bast elements were spun by rolling the fibers between the palm of the hand and the thigh. Such spinning of long staple bast and hard



TABLE 8—(Continued)

Layers	Blended																									
	Cotton (1)								Cotton and Bast (2)				Cotton and Bast Both Strands (4)					Bast (5)								
	\	A	B	C	D	E	F	\+//	\	H	A	D	E	\+//	\	I	\+//	V	D	B	D	V	D	Totals		
<b>Test Pit 2 (HP 2)</b>																										
A																										
B																										
C																										
D																										
E																										
F																										
G																										
H																										
Totals																										
<b>Test Pits 2 and 3 Combined (HP 2 and 3)</b>																										
Grand Totals	3	359	10	1885	79	4	5	7	28	4	909	2	18	285	4	6	3	3611								
Percentage	0.08	10.0	0.28	52.5	2.2	0.1	0.1	0.2	0.8	0.1	25.3	0.06	0.5	7.9	0.1	0.2	0.08									

<sup>a</sup> There was one example each of a few other yarn structures in Test Pit 3: cotton M in layer H; cotton P in layer D; bast E in layer G; bast C in layer K; and unlisted O in layer H.

TABLE 9  
Twining—Weft Yarn Structure (Code XVII)

Layers	Cotton (1)					Blended			Totals
	\	V	^	∨	∩	Cotton, and		Cotton & Bast, Both Strands (4)	
						Cotton & Bast (3)			
B	D	E	J	M	V	\+//	V		
	D	F	D						
Test Pit 3 (HP 3)									
I C		51					2		53
D	1	292					20	1	314
E		128					6	1	135
II F		77					3	1	81
G	2	182				1	28	5	218
III H	1	204	1				10	8	224
H <sub>2</sub> I <sub>2</sub>		79				1	2	5	87
I		121	1				1	1	124
J		132	2				1	2	137
IV K		28							28
L		48	3						51
M		94	76					1	171
V N		10	22						32
O		14	18						32
VI P									
Q									
R									
W.T. Lots 1-5		74	1				7	2	84
Sample 2 Middle		96		1	1		7		105
Position Uncertain		74	2				5	1	82
Totals	4	1704	126	1	1	2	92	28	1958
Test Pit 2 (HP 2)									
A		1	4						5
B		1	4						5
C									0
D			1						1
E			1						1
F			1						1
G			5						5
H			1						1
Totals		2	17						19
Test Pits 2 and 3 Combined (HP 2 and 3)									
Grand Totals	4	1706	143	1	1	2	92	28	1977
Percentage	0.2	86.3	7.2	0.05	0.05	0.1	4.7	1.4	

fibers to produce two-ply cord is widespread in South America and in other parts of the world. A single stroke of the hand imparts the spinning twist to both strands, while a reverse motion doubles the two together with the opposite twist. A random check of such cord from the Amazon Basin, Mexico, and New Guinea shows all to be S-spun and Z-doubled, exactly like the pure bast cords of Huaca Prieta.

We have found no records of thigh-spun, single-ply yarn, but anyone capable of making the two-ply yarn or cord in this manner could also produce a single, spun in either direction. Although we cannot prove that the preceramic bast singles were spun in this fashion, there is reason to suspect that they were. One finds that fiber ends are often tightly wrapped about the outside of the yarn at some of the points where new fiber has been added during spinning. Experiments with comparable fiber suggest several possibilities and demonstrate that the same type of wrapping can be produced by rolling the point of juncture of new fiber and the untwisted yarn end between the thumb and forefinger as spin twist is imparted. If done dry, the wrapping tends to loosen or unroll. With wet or moist fiber, or with moisture on the fingers, it remains in position and is compacted further by thigh spinning. The effect achieved appears identical with the ancient products and could not be matched by other handling of the fiber and spinning.

In making such yarn, the spin twist can be in either direction. There obviously was a preference in spinning twist direction, for 86.7 percent (of 1233 examples) of all preceramic bast used in single-ply fabrics is Z-spun. On the whole the angle of twist is slight and, as it was used in yarns where bast was plied Z with cotton, some of the initial twist is lost during doubling. One frequently finds sections where so little twist remains that it can be difficult to recognize spin direction until the bast has been traced for some centimeters.

In marked contrast, 90.5 percent (of 124 examples) of the two-ply yarn and cord made entirely of bast is spun S then doubled Z. As this is apparently standard for modern two-ply, thigh-spun and doubled products, we can

assume it was also thigh-spun and doubled. Yarn or cord of this type is commonly used in repairing twined fabrics, never as warp or weft.

As already remarked, yarns blended of cotton and bast fibers are normally spun the same as pure cotton and opposite to the normal twist for pure bast singles. The most logical explanation for the production of the blended fiber yarn may be simply that the spinners were thrifty and that the fiber demand taxed the available supply. In preparing the bast it is very probable that there was a residue of variably short length fiber unsuited to their normal bast spinning systems. Perhaps the scrap fiber posed a problem in carding or preparation, or perhaps a satisfactory yarn could not be made from it alone. If the material was not to be wasted, some alternative had to be employed and blending with cotton seems to have been the answer. In doing this, the bast was used to supplement the cotton rather than the reverse, as the spinning twist record shows.

In order to check the length of the bast fibers used in this fashion, some blended fiber yarn was untwisted and the fiber lengths measured. Staple length ranged from 1.5 to 12 cm, with the majority less than the mean. Undoubtedly longer pieces occur in the blends, but as the separation of fiber results in the destruction of the specimen, one is reluctant to check thoroughly. In some sections of yarns classed as blended, the cotton appears to surround or cover a bast core. This conceivably might have been deliberately created, but proof is uncertain. The probable explanation is that the effect results from the use of dissimilar fibers of differing lengths.

The angles of spinning and doubling twists have not been recorded systematically throughout, as this requires more time and effort than could be justified by the results. Instead, a random check was made of hank samples of differing age. Samples of S cotton singles show spin twist to range from extremes of 28 to 42°, measuring from the line of the yarn. In two hanks of Z cotton yarns, the range is 43 to 49°. Doubling twists of the cotton yarns range in degrees from 30 to 55; in twined fabrics, 35 to 60; in woven fabrics, 44 to 55 in netting and 38 to 54 in looping.

## FABRIC TECHNIQUES (GENERAL)

If we list the subdivision of the entire collection of fully analyzed fabrics from all stages of the Preceramic Period represented in the Huaca Prieta, the percentages of occurrence are given in table 10.

A similar list with other figures based on a field count was previously published (Bennett and Bird, 1949 and 1960, p. 268). We compiled the figures given here after cleaning and examining the fabrics in detail. The differences in the figures result in part from the identification of 947 fragments as sections of other fabrics. Thus, in the final count, if five fragments belonged originally to a single piece, they are scored as one, but in the field count they are scored as five. Other differences result from a decision to lump small fragments together; some of these are probably parts of larger pieces in the collection. The occurrence within different units of the deposit are listed in table 10; Chapter 15 contains comments on chronology.

### TWINING

Twined fabrics constitute 71.3 percent of the gross preceramic textile production. The term *twining* indicates that the weft yarns twine or turn about the warps, instead of interlacing or interweaving. To accomplish this, a minimum of two weft yarns are needed in each weft passage or row, and the two are twisted together between each warp or group of warps. The twists are normally 180°, which means that each yarn appears, in turn, on each side of the fabric. If, for example, one is red, the other white, the weft rows appear as a succession of red and white dashes. If the weft elements turn a full 360°, the weft will show as a red line on one side and as a white line on the other.

Twining is obviously an ancient and widespread system of fabric production. The technique is achieved solely by finger manipulation, without any mechanical, time, or labor-saving devices, and until one of the simple heddle systems of warp control was devised, it was a more efficient technique than weaving. This statement does not imply that it necessarily preceded weaving everywhere, for any group who produced twined textiles

could, and probably did, experiment with weaving. However, the rate of production in weaving, when the warps are finger-manipulated one at a time to create a path for the weft, is inevitably slow and unsatisfactory.

In dealing with the preceramic twining we have set up several categories based primarily on the handling of the warps. These groups are: plain twining, split-pair twining, twining with transposed warps, and twining with floated, supplementary warps (table 11). Any of the preceding may occur in combination or to some degree with weaving. As dictionaries, even those limited to textile terms, either ignore twining or treat it erroneously or inadequately, it is necessary to explain the terms we use.

Plain Twining (fig. 65): The simple form in which the warps are parallel and maintain the same order throughout, with the weft twists in successive weft rows always placed in the same relationship to the warps. Subdivisions of plain twining are based on minor modifications. The warps may be handled singly, in pairs, or in other combinations. Textural effects may be accomplished by grouping several warps at planned intervals. By varying warp color or material, warp stripes result. Weft spacing may be uniform or may be varied by having some weft rows compacted together. Change in weft color, where the wefts are spaced, does not result in pronounced or clear stripe effects. All these distinctions will be recognized among the following terms: plain twining with spaced wefts, plain twining with compact wefts, plain twining with spaced and compact weft bands, plain twining with single warps,<sup>2</sup> plain twining with paired warps, plain twining with varied warps,<sup>3</sup> and plain twining with warp stripes.

Split-Pair Twining (fig. 66): The warp is set up and handled in pairs, but in alternate weft rows the weft separates the preceding warp pairs. The result is that the warps follow a slight zigzag course. In this system it is difficult to compact the wefts so they will completely hide the warps. If differing colors or

<sup>2</sup> This does not define the warp yarn but means that only one warp of either single or two-or-more-ply is held by each weft turn.

<sup>3</sup> Where the variation in the number of warps is sufficient, textural ribbing results.

TABLE 10  
General Fabric Techniques (Code II)

Layers	2 Looping	4 Netting	10 Twining	12 Weaving	14 Twining and Weaving	15 Twining and Looping	Totals
Test Pit 3 (HP 3)							
I C	12	11	53	4			80
D	34	36	308	10	1		389
E	26	42	137	10			215
II F	12	19	87	10	1		129
G	22	38	191	15	1		267
III H	43	16	214	11	1		285
H <sub>2</sub> I <sub>2</sub>	9	15	82	4	1		112
I	14	14	129	9	1		167
J	28	47	153	18			246
IV K	4	8	30	5			47
L	3	12	51	2			68
M	6	25	138	7	1		177
V N	1	12	26	2			41
O	5	22	32	1			60
VI P	1	7		1			9
Q							0
R	1	1					2
W.T. Lots 1-5	8	6	77	5			96
Sample 2 Middle	16	32	97			1	146
Position Uncertain	12	10	82	8			112
<b>Totals</b>	<b>257</b>	<b>373</b>	<b>1887</b>	<b>122</b>	<b>7</b>	<b>1</b>	<b>2648</b>
Percentage	9.7	14.1	71.3	4.6	0.3	0.004	
Test Pit 2 (HP 2)							
A		14	4	2			20
B		3	4				7
C							0
D		1	1				2
E		1	1				2
F			1				1
G	1	5	5				11
H		1	1				2
<b>Totals</b>	<b>1</b>	<b>25</b>	<b>17</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>45</b>
Percentage	2.2	55.6	37.8	4.4	0	0	
Test Pits 2 and 3 Combined (HP 2 and 3)							
<b>Grand Totals</b>	<b>258</b>	<b>398</b>	<b>1904</b>	<b>124</b>	<b>7</b>	<b>1</b>	<b>2692</b>
Percentage	9.6	14.8	70.7	4.6	0.3	0.04	

materials are used to produce warp stripes, the margins of the stripes are slightly zig-zagged and are not so sharply defined as in plain twining. Technically, split-pair twining

has one advantage over plain twining: the weft rows will not slip along the warp when the fabric is subjected to wear and stress. In plain twining, with spaced wefts, it is the ten-

TABLE 11  
Twining Techniques (Code XI)

Layers	Un-listed	Plain Twining			Split-Pair Twining			Split-Pair & Plain Twining			Transposed-Warp Twining						Totals
		1	2	14	3	4	5	7	8	10	11	12	13	13	6		
Test Pit 3 (HP 3)																	
I C			43			2	3	4							1	53	
D	3	1	257		7	23	4	4	1	1	2				9	308	
E			112	1	4	13	1	1	1	2				3	137		
II F			78		1	4	1	1	1					1	87		
G	1	1	166		5	4	3	3	3	7				2	191		
III H			171		8	17	6	6	3	7			2	1	214		
H <sub>2</sub> L <sub>2</sub>	1		58		1	3	11	4	1	4	2	1			82		
I			99		3	3	12	2	2	8	1	1			129		
J	1		100	2	2		28	6	6	8	4			1	153		
IV K			10				9	9	1	1	9	1			30		
L	1		13		2		16	5	5	1	13				51		
M	2		2				70	2	27		35				138		
V N							9	1	5	2	11				26		
O	2		3				19	1	3	2	2				32		
VI P															0		
Q															0		
R															0		
W.T. Lots 1-5			69				5	5	3	3					77		
Sample 2 Middle			69		6	11	5	5	1	3				2	97		
Position Uncertain	1		56			1	14	4	1	3	2				82		
Totals	6	7	1306	2	1	39	84	217	25	47	50	79	5	19	1887		
Percentage	0.3	0.4	69.3	0.1	0.05	2.1	4.5	11.5	1.3	2.5	2.6	4.2	0.3	1.0			
Test Pit 2 (HP 2)																	
A		1	1							2					4		
B								2				2			4		
C															0		
D															1		

TABLE 11—(Continued)

Layers	Un-listed	Plain Twining			Split-Pair Twining	Split-Pair & Plain Twining	Transposed-Warp Twining				Totals				
		1	2	3			4	5	7	8		Trans-Warp Alone	With Plain	With Split & Plain	Plain Twining & Warp Floats
E						1									1
F						1									1
G						2							3		5
H	1														1
Totals	1	1	1	1	7	7	2	2	5				5		17
Percentage	5.9	5.9	5.9	5.9	41.2	41.2	11.8	11.8	29.4				29.4		
<b>Test Pits 2 and 3 Combined (HP 2 and 3)</b>															
Grand Totals	7	8	1307	2	1	39	84	224	25	49	50	84	5	19	1904
Percentage	0.4	0.4	68.6	0.1	0.05	2.0	4.4	11.8	1.3	2.6	2.6	4.4	0.3	1.0	

sion of the weft twists which alone holds the wefts in position. As this tension is lost through wear or breakage, the weft rows will shift and may even become compacted in some areas, leaving corresponding sections of the warp exposed and loose.

Transposed-Warp Constructions (see Code XII): There are a number of subcategories of varying complexity. The only feature which unifies the group is that certain or all warps are moved from the regular order in which they start, and may be shifted left or right to create textural effects, patterns, or figures.

In all cases the movement in one direction is countered by a shift in the opposite direction of the adjacent warp or warps so that they cross in arriving at the positions fixed in the next weft row. Thus, the term transposed warp is logical, applicable to all variations of the procedure regardless of the effect achieved. The transposition of warps may consist of a shift of one or more warp positions to the left or right. The warps may be also carried further from their original alignment through several successive weft spaces, and are considered as completed only when the warp is back in the original alignment or order. The latter specification will not necessarily apply to twined fabrics made with warp sustained at only one end (see section on warping system below).

Twining with Floated Supplementary or Alternating Warps (fig. 67): Extra warps at specific points or longitudinal areas are interchanged with their alternates to create patterns or effects. When not carried as floats on the surface, the warps involved are substituted for their alternates in the weft passages, and at such places the alternates float. Except for this feature the structure is otherwise identical with plain twining.

Twining Combined with Weaving: This is a category that encompasses any of the preceding forms. In some, a woven structure utilizes a portion of the warp length beyond which the balance of the warp length is twined. In others, the wefts are twined for only part of their length; then the two elements in each row are separated and are interwoven in opposing sheds with the remainder, or some section, of the warp. Such pieces are segregated as a unit in the list of techniques only because of their relative rarity. They are im-

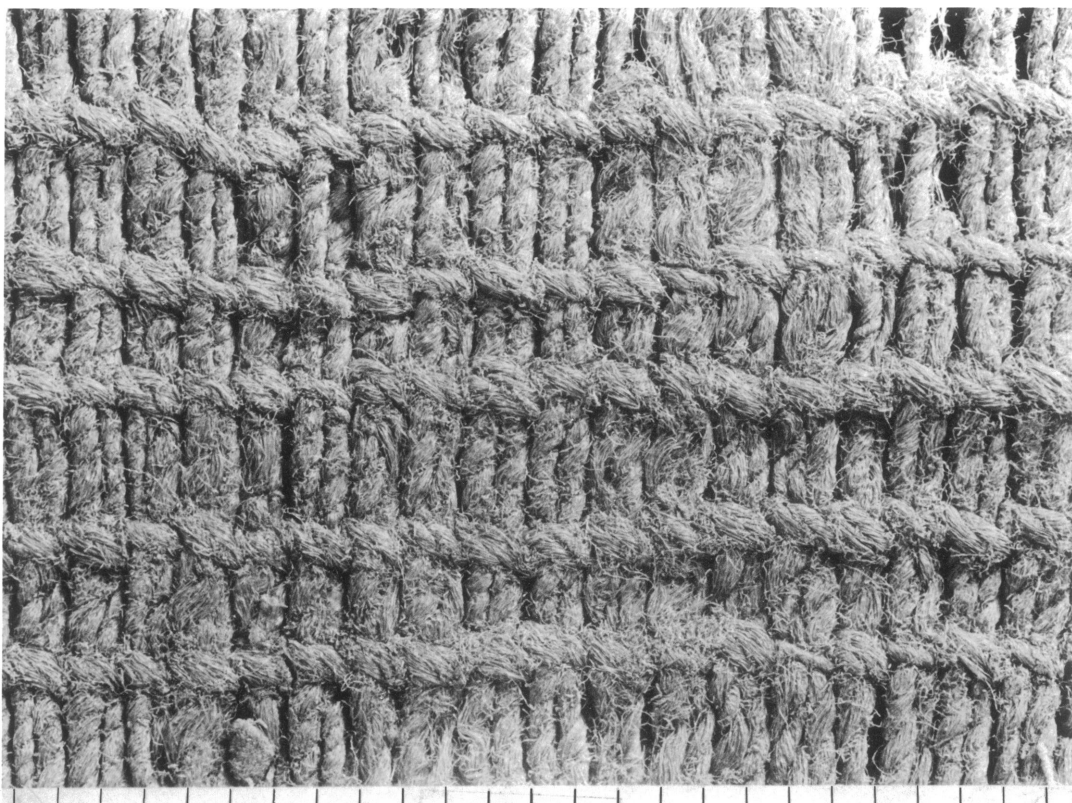


FIG. 65. Plain twining with paired warps. 41.1/9984, HP 3—H.

portant and of special interest because they help to explain the weaving procedure of their time.

#### MAJOR TRADITIONAL TRAITS

The different categories of twined products share varied technical features. Some are obviously traditional, utilized with minor deviations in all of the twining. Others may be innovations or may mark the personal preference of the makers and, as such, are significant in the regional chronological record.

Generalizing, we can sum up the major traditional traits found in the Chicama and Virú valleys as follows:

1. Warp handling: dominantly by pairs
2. Warping system: warps sustained at both ends by turning about two parallel cords or by alternate turns about one cord after passing two parallel rods (see fig. 70)

3. Weft yarn: same diameter or weight as warp
4. Weft handling: single passage wefts, secured or knotted at both ends
5. Weft handling: uniformly spaced wefts in body of fabric
6. Weft handling: compact bands at warp end selvages
7. Twining twist direction Z
8. Lack of noticeable areas of terminal construction.

Some of the terms used in the list, or the topics referred to, will be unfamiliar to those who deal with woven textiles. The terminology applicable to the techniques of weaving is inadequate to cover all the variations in twined constructions, so some improvisation is necessary. As one becomes more familiar with the numerous ramifications of twining, one is even reluctant to class the makers as

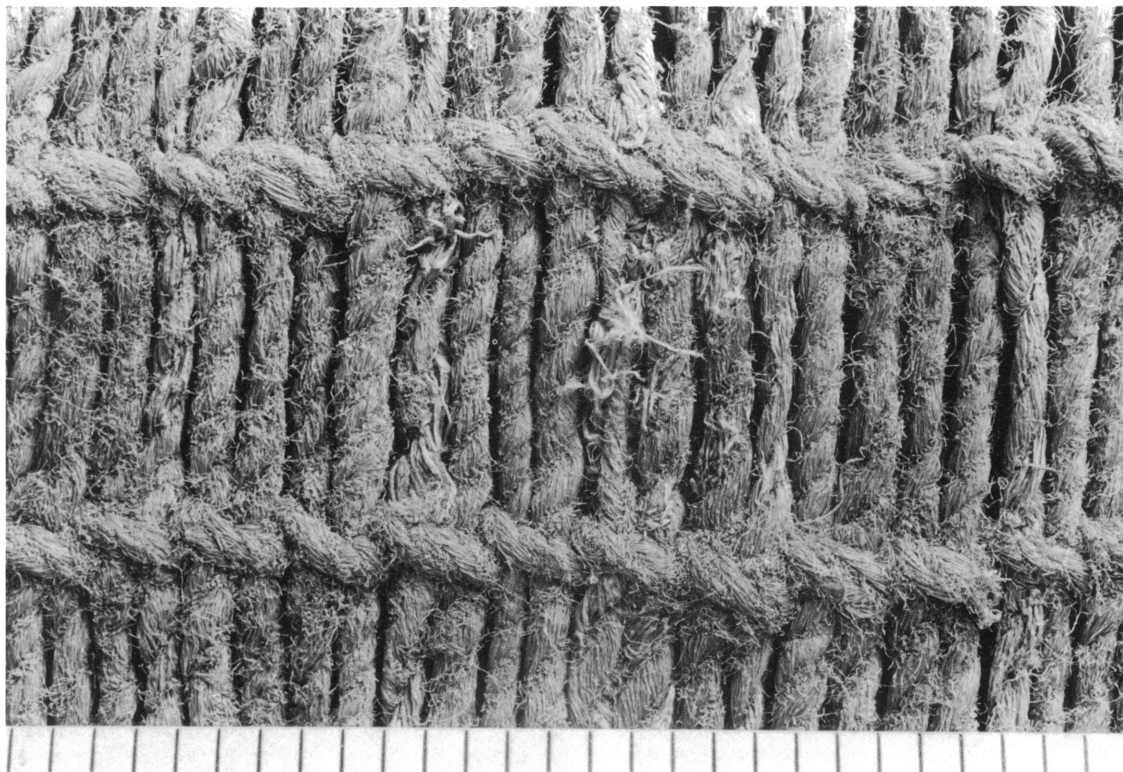


FIG. 66. Split-pair twining. 41.1/9820, HP 3—G.

weavers. A fisherman making a fishnet cannot be called a weaver and would be the first to deny the classification. In the same sense, the producer of twined fabrics stands apart from the weaver. It is a separate field of endeavor. As weaving has long since almost completely replaced it, we must depend largely on our own interpretation and deductions when studying these ancient products. The preceding list is based on such experience and will be clarified as we proceed. The order of topics will be followed, but where the subjects are complex or variable, the explanation will have to be supplemented by separate sections that record what was found.

1. Warp Handling: Among 1904 twined fabrics from the Huaca Prieta, in only eight have the warps been handled singly, i.e., twined separately (fig. 68). In two other specimens part of the warps are twined by pairs, part singly. All the rest, 99.47 percent of the total, have paired warps, but in 85 of this lot

there are some warp groups in which more than two yarns are used to create a ribbed effect (fig. 69). In only one fabric the warps are in groups of three, and in this example single-ply are combined with two-ply yarns so that the bulk of each group of yarns is not appreciably larger than a pair of two-ply yarns. In addition to the preceding fully analyzed specimens, there are 1593 small, twined fragments, all with paired warps.

The emphasis on, or preference for, paired warps has a reasonable explanation. Handling the warps one at a time exactly doubles the work of inserting the weft. Pairs of warps within the individual turns of the weft will lie flat, but when more than two are used they will bunch together. Thus the use of pairs is economical, not only in the work required to place the wefts, but in the amount of yarn necessary to achieve a desired fabric width. The addition of a third warp in each group will not increase the loom width by one third

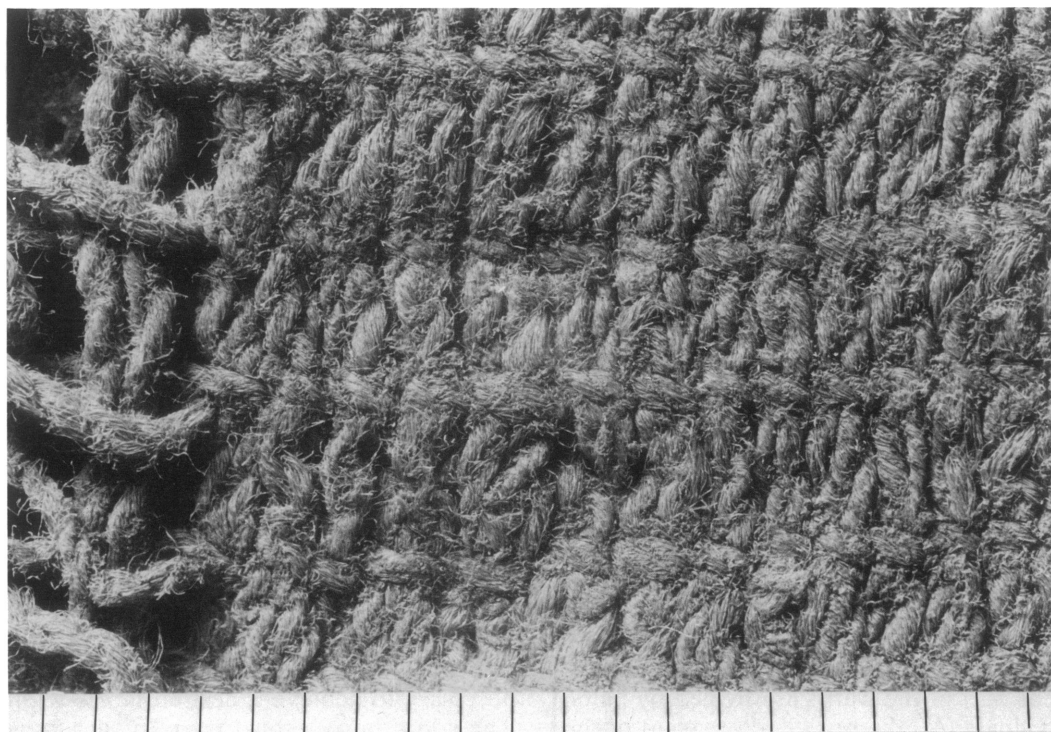
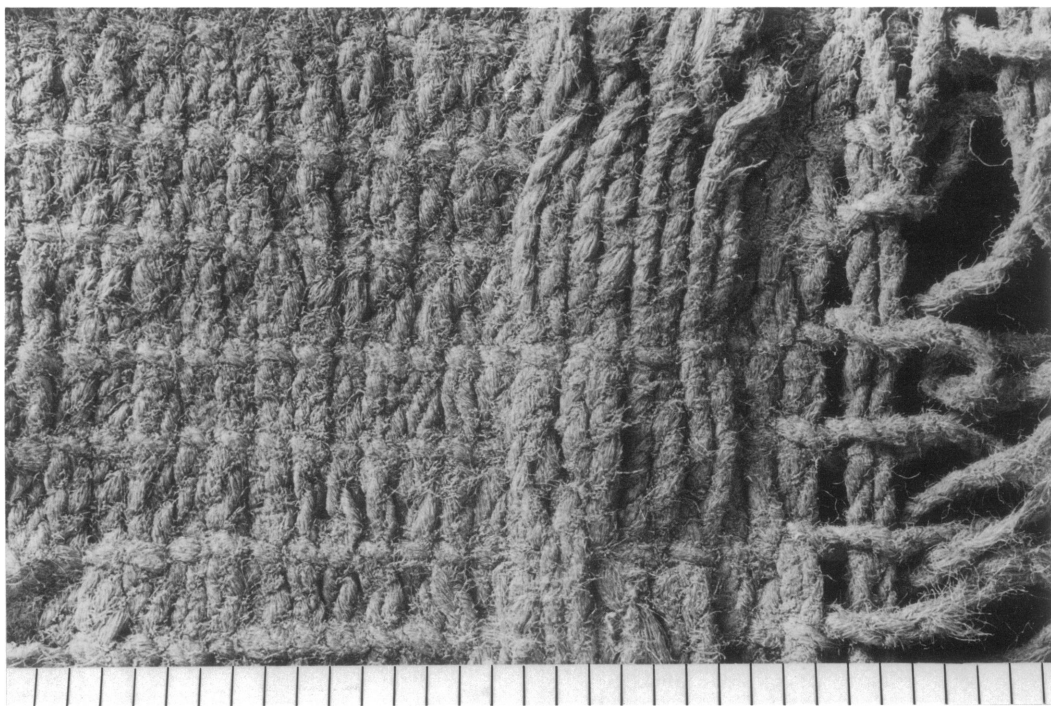


FIG. 67. Top: Twining with supplementary single-face warp floats. (41.1/9941, HP 3—FG). Bottom: Reverse face of fabric 41.1/9941 with no warp floats visible.

and, in fact, may not increase the width at all.

The simple advantages of pairing must have been self-evident at a very early stage in the history of twining, judging from the occurrence of paired warps elsewhere in the world. In turn, this system made possible the use of split-pair ordering and the development of transposed warp structures, which is time-consuming to accomplish if warps are handled singly.

2. **Warping System:** It is evident that all of the twined and woven fabrics were made with the warps sustained at both ends. There is nothing to suggest the use of free hanging, suspended warps as was the practice in North America. The evidence for sustained warps is based on the study of complete pieces, pieces retaining portions of individual end fragments at both ends, and on the analysis of transposed warp structures. In setting up the warp, continuous yarns, normally handled in pairs, were passed back and forth between whatever supported the warp. Sometimes two pairs of yarns were warped simultaneously. In the rare examples with warp twined singly, warping was apparently accomplished with only one yarn, judging from two end fragments (see Warp-End Finishes, Code XXV, Column 67). The Code is in Appendix 1.

Although we did not find any looms, recognizable loom parts, or unfinished fabrics which might offer a clue to loom attachments, we believe that we have deduced the basic loom form and the warping system. This approximated the model shown in figure 70 and may have been identical with the Toba loom, figure 71. It is a warping system which survives in scattered localities, principally in South America as far north as the Boruca of Costa Rica, with only rare occurrences north of this area (see fig. 72). Its most important feature is a single cord attached to a frame or to upright stakes supporting two rods set parallel above and below the cord.

The probable size of such looms can be judged from the fabrics. Twined products range in width from 8 to 132.5 cm. The latter figure is from an incomplete fragment missing one selvage. Woven pieces range from 0.7 to 49 cm in width. Warp length, presumably twice the frame length, at least for the larger

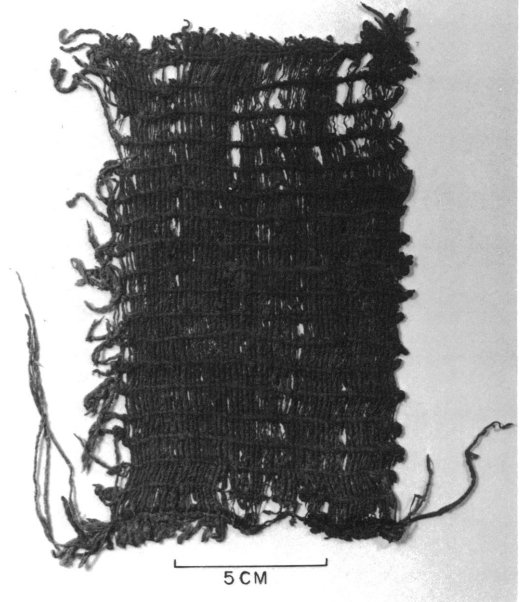


FIG. 68. Plain twining with single warps. 41.2/1207, HP 3—H2I2. Complete length is 17 cm.

specimens, ranges from 10 to 141.5 cm for twining, again from an incomplete length (lacking end selvages). Woven fabrics range in length from 13 to 139 cm.

In warping such looms the first move is to attach the end of the warp yarn or yarns to the cord. The yarn is then passed about the rods and, returning to the cord, is turned about it and carried back over the rods in the reverse direction. It is again reversed at the cord and so travels back and forth until the desired warp width is attained.

In setting up the warp in this fashion, if the yarn is carried up over the top bar from the starting point and the terminal end is secured to the cord as it travels up from the bottom, there will be an odd number of total warps. If the end is carried back up over the top bar and down to the cord, the total of warps will be an even number. A check of seven specimens of complete width all have an odd number of warp passages, so the first procedure may have been the rule. Boruca products have the same feature.

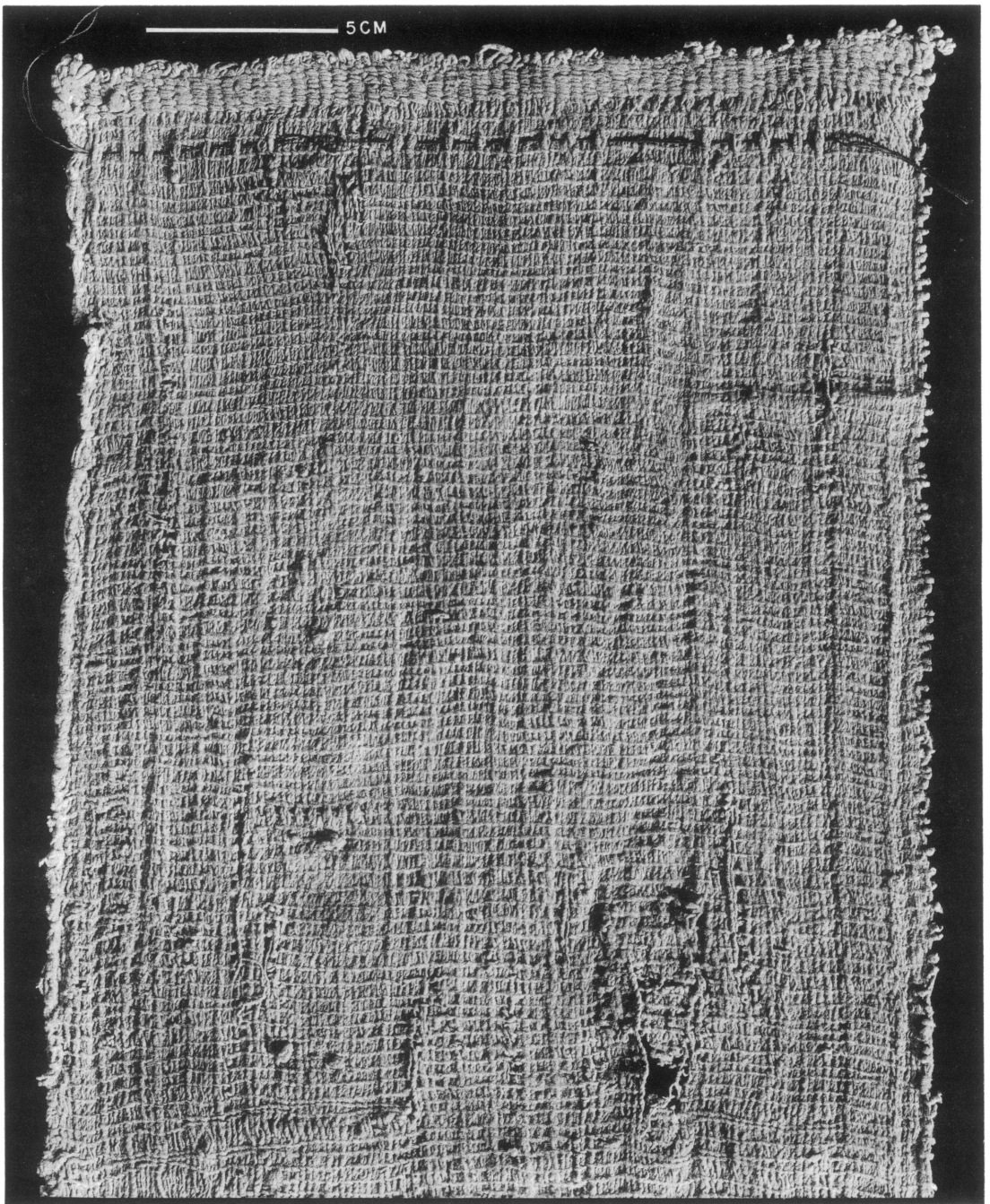


FIG. 69. Plain twining with multiple warp ribbing. Thread at top separates multiple warps. 41.2/1541, HP 3—L.

The advantage of this system is that the completed warp occupies a space equal to

only half its length, and on completion of full weft insertion the cord is pulled out of the

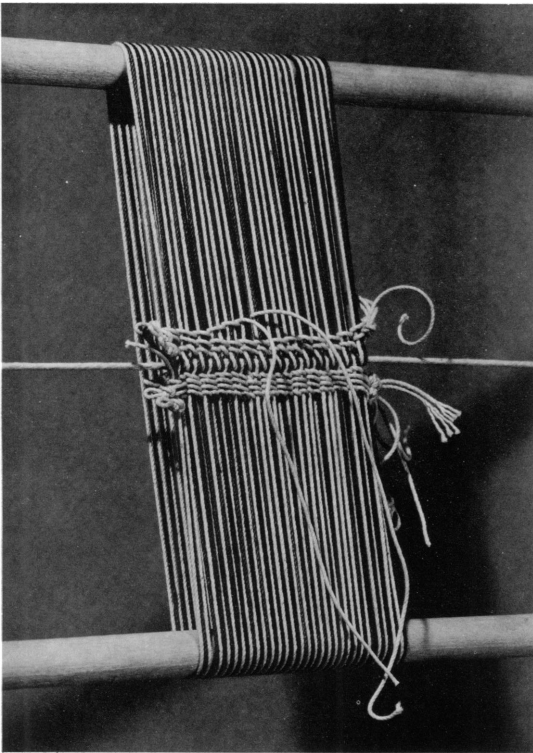


FIG. 70. Loom model with a reconstruction of warp arrangement for both twined and woven fabrics. The warp yarns turn about the transverse cord in such a way that when this is removed the finished fabric forms a flat rectangle. Initial weft insertion consists of twining as shown on either side of the cord. AMNH neg. no. 123949.

warp end loops, freeing both ends. Thus one has a product with end selvages that will not fray.

The only possible alternative procedure which could account for the warp-end turns would have been the use of two parallel cords attached to a frame or to supporting stakes. Warping could then be done directly about and between the two cords and probably was the method used for certain pieces of unusually short warp length and relatively narrow widths (specimen 41.2/2227).

Whether or not one or both systems were employed, the net result is the same: preceramic twined and woven fabric ends have completed end selvages. The end selvages retain small warp end loops where the warps were turned about the supporting cord or

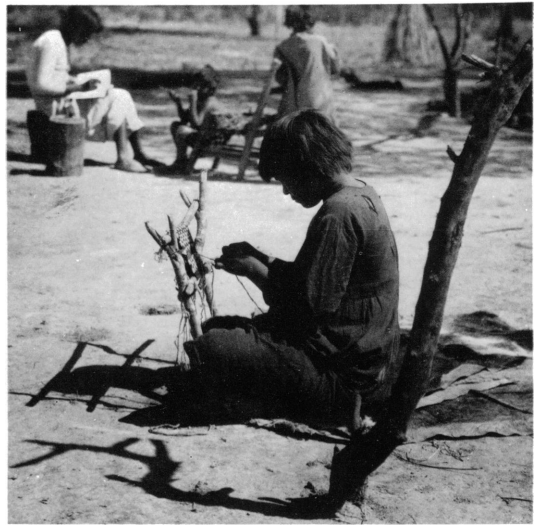


FIG. 71. Toba loom. Robert Lowie Museum of Anthropology, University of California, Berkeley.

cords in most specimens. Where warp end-loops are absent, the condition of the specimens strongly implies loss from wear. Cutting of the warp ends is suspected in only 7 of 451 end pieces. These in no way modify our interpretation of warping procedure.

3. Weft Yarns: Weft yarns are consistently the same size as the warp yarns and, as remarked above in comments on fiber use, are virtually all of pure cotton. Ninety-two point four percent of weft yarns are spun S, doubled Z, identical in structure as well as size with the majority of warp yarns. The reason for stressing the identity of warp and weft yarns in terms of their size or diameter is that in twined products from Ancon and northern Chile the wefts are deliberately finer than the warps. There the spinners deliberately made one product for the warp, another for the weft. The only analogy to be found in Huaca Prieta twining is in some specimens where the spinning and doubling of the weft yarn is opposite to the warp structure. In these as well, the size of warp and weft remains the same.

4. Weft Handling; Single-Passage Wefts: A consistent characteristic of the preceramic twining is the use of single-passage wefts: weft rows starting at one selvage and terminating

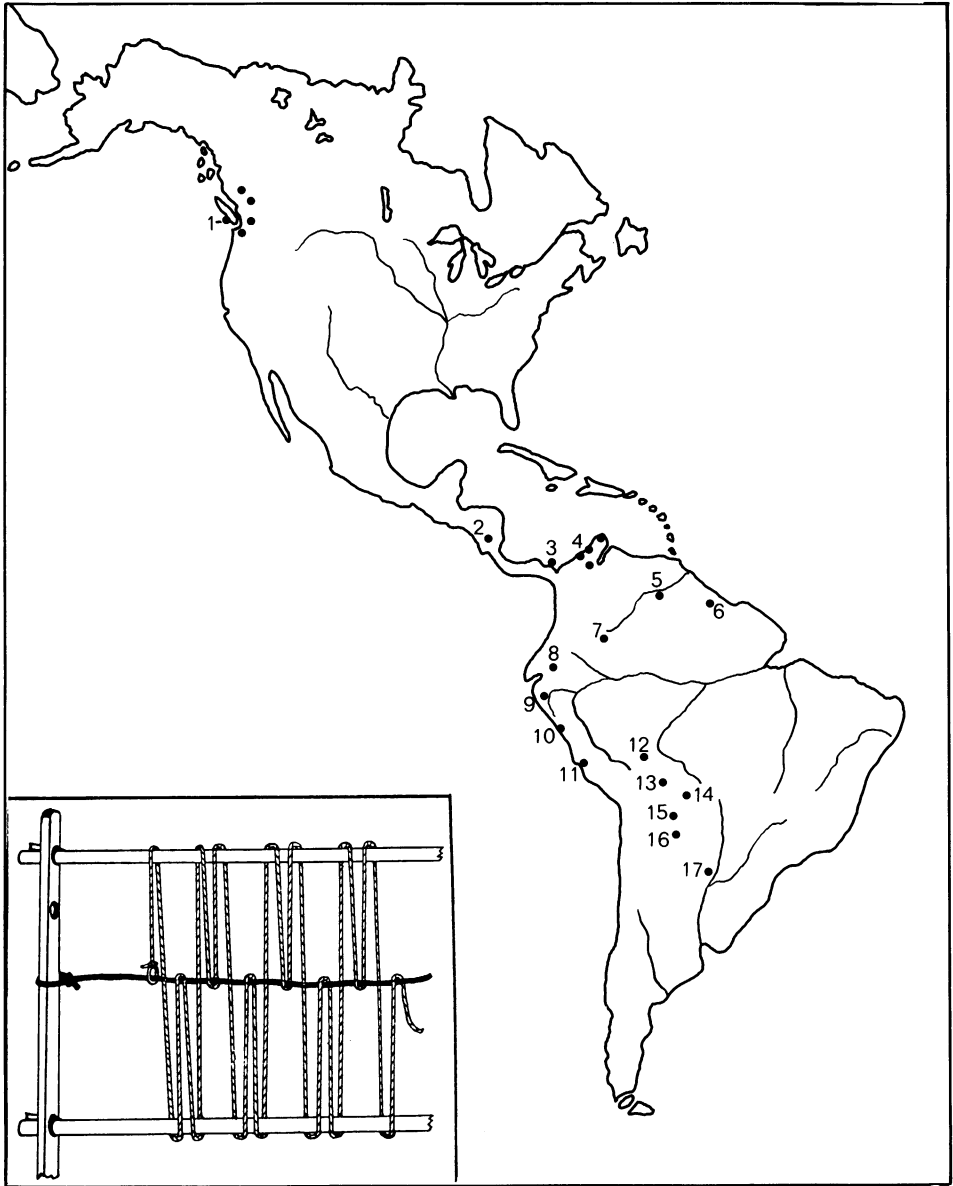


FIG. 72. Distribution of warping system as used at the Huaca Prieta. Insert shows warping, continuous, around cord or rod. When cord or rod is pulled out, finished loom product will have warp end-loops and four selvages. Areas where warping system used: 1. Northwest Coast—Chilcotin, Thompson, Lillooet, Salish of South Coast of British Columbia, and coastal and eastern tribes of Washington. 2. Coastal Rica—Boruca (cord in backstrap loom). 3. Northeast Colombia—Guajiro, Ijca, Sáha, Kogi, and Yuko. 4. South of Rio Orinoco—Panare. 5. British Guiana—Macusí. 6. Brazil—Arawak. 7. Ecuador—various localities in interior (rods and cords). 8. Peru—Rio Cenipa, alto Rio Marañón-Aguaruna. 9. Peru—Huaca Prieta (cord). 10. Peru—south of Lima, late period tapestry belting with cord (British Museum spec. no. 1907-3-19-81). 11. Bolivia—Chacobo. 12. Bolivia—Yuracaré. 13. Bolivia—Chané (cord). 14. Argentina—Chiriguano of Prov. of Ivu (cord). 15. Argentina—Chaco area, Mataco. 16. Argentina—Toba.

Occurrences in the Old World include: Denmark, West Nepal (around stick), Kansu Province of Tibet—Tebbu (rod), Philippines—Mindanao (rod), Basilan, and Talaud Islands (2 rods).

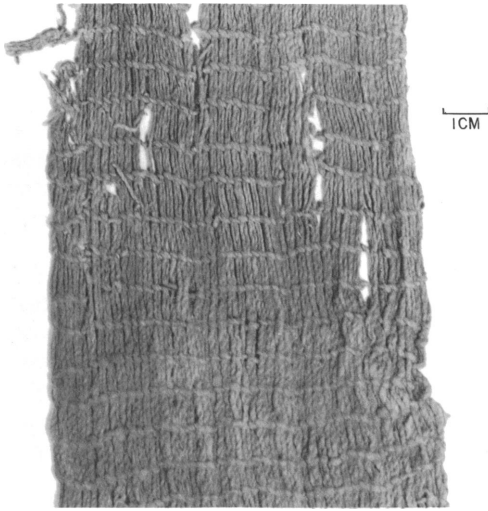


FIG. 73. Narrow 8 cm wide plain-twined fabric with continuous weft. 41.2/1208, HP 3—H2I2.

at the opposite edge. All start at the same selvage, are generally secured to a group of several warps, and are terminated in knots outside the last warp pair. As the knots frequently differ at the selvages, it is often possible to identify the primary or beginning selvage from the terminal edge even when the first warps are not grouped.

Exceptions to the single-passage rule are very rare. Only one twined fabric has a continuous weft, advanced along the alternate selvages. However, the wefts are knotted after each crossing. It is the narrowest of all the twined pieces (8.0 cm; fig. 73), so the special handling of the weft might be related to its width. Another fabric apparently had wefts which made four crossings between each starting and terminal knot. There are no twined fabrics having two weft rows starting from a common knot, subdivided for the warp crossing, and reunited at a terminal knot. Only two examples of this have been found among woven pieces (41.1/9636, 41.2/2565). Terminal knots joining the ends of two weft rows in specimens left with only one selvage are not proof that the rows were united at the start, for one specimen (41.2/2550) has two otherwise separate weft rows so joined at the terminal selvage.

Only one specimen deviates from the rule that wefts travel from selvage to selvage. Its



FIG. 74. Unique specimen with regional use of wefts. 41.2/1606, HP 3—M.

wefts are regionally used to create unified areas joined by free sections of warp (fig. 74).

**5. Weft Handling: Uniformly Spaced Wefts:** Weft rows within the body of twined fabrics are normally spaced at regular intervals. Weft counts range from 2.0 to 14.0 per 2.5 cm, averaging 4.9. This means that the warp constitutes the major portion of the fabric surface and that warp color, order, or movement are the visually dominant features. The figures quoted are based on all twined specimens, regardless of construction type (detailed data on counts are given in table 12).

Weft alignment naturally deviates somewhat from a perfectly uniform, parallel order; yet, a surprising regularity of count per area

TABLE 12  
Weft Counts per 2.5 cm  
(Twined Fabrics—All Types)

Layers	Number of Specimens			Average
	High	Low		
<b>Test Pit 3 (HP 3)</b>				
I C	51	10.0	3.0	6.14
D	289	12.0	3.0	6.48
E	126	9.0	2.5	5.71
II F	75	12.0	2.5	5.73
G	178	12.0	3.0	5.52
III H	198	12.0	2.0	5.44
H <sub>2</sub> I <sub>2</sub>	78	9.0	2.5	4.74
I	120	11.0	2.5	5.24
J	130	10.0	2.0	4.82
IV K	27	9.5	2.5	4.95
L	49	14.0	3.5	5.27
M	122	8.0	2.5	4.83
V N	22	8.0	3.0	5.32
O	14	5.5	3.0	4.24
VI P				
Q				
R				
W.T. Lots 1-5	74	9.0	2.7	5.21
Sample 2 Middle	96	10.0	3.0	6.23
Position Uncertain	74	8.5	2.5	5.35
Totals	1723			5.55
<b>Test Pit 2 (HP 2)</b>				
A	4	5.0	3.5	4.25
B	4	5.0	3.0	4.00
C				
D				
E	1	5.0	5.0	5.00
F	1	4.5	4.5	4.50
G	5	5.5	3.0	4.50
H				
Totals	15			4.33

Test Pits 2 and 3 produced 1738 specimens with an average weft count of 5.54.

within a single product is the rule rather than the exception.

Occasionally, the weft rows deviate unintentionally from a square crossing of the warp. As this became apparent, the worker made a correction by starting a weft within the fabric. This was united with the last of the slanting

or curving rows and gradually separated from it to form the standard space. Without such a correction the space in the area of terminal construction would be of uneven width.

The only exception to regularly spaced passages of single wefts is the use of compact bands of two or more wefts bounded on either side by spaced wefts. In all, such bands occur in only 0.7 percent of the total.

6. Weft Handling; Compact End Bands: Another common denominator of both twined and woven fabrics is the use of several rows of compacted wefts set against the warp-end loops. Of 296 pieces having complete ends or sections of ends, only 26 have a single weft row. As details of end finishes, the number of rows, order of twining, etc. differ considerably. They are described in the subsection on composition of compact end bands.

We are convinced that the creation of compact bands at the warp ends was the first step in weft insertion following warping, for the bands serve to stabilize the warp order. This is an important, in fact critical, step in the fabrics where yarns of differing colors or materials create warp stripes or other patterns. In many of these the alternate yarns are advanced to the desired points along the end selvages and if not held by the twining at those points they would have slipped out of position. It is true that a single weft row would serve this purpose, but obviously several were preferred probably because they strengthened and reinforced the edge.

One may question the necessity of constructing the compact bands at both ends of the warp as an initial step, when one alone would hold the warp order. We believe that both were completed prior to further weft insertion because it is very difficult, but not impossible, to construct many of the end bands within the space they occupy if the rest of the weft is in place.

7. Twining Twist Direction: If one views a row of twined weft, looking from one end toward the other, the exposed portions of the visible element slant either to the left or right, like the twists in a two-ply yarn. Accordingly, we have recorded twining twist direction in the same notation used for doubling twists, Z and S. There seems to be no sound reason to prefer one direction to another as far as

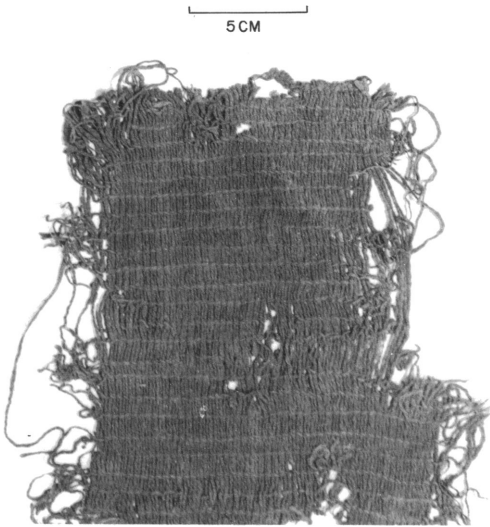


FIG. 75. Fabric with S and Z twining twists used in alternate weft rows. 41.2/1166, HP 3—I.

the manipulations are concerned. Makers of twined hammocks in the Amazon area frequently alternate the twists in successive weft rows. Whether both twists are done with equal facility and speed has never been recorded.

Possibly there may be some relation between twining twist direction and the doubling twist of the warp yarn. A fabric with Z-doubled warp yarn may wear better with a Z-twine twist. To settle the question, wear and abrasion tests could be made with new fabrics in which both twining twists are used.

In this material, Z-twining twists are the rule throughout the preceramic occupation. Excluding end finishes, there are only five exceptions, barely one-tenth of one percent of the sample. All of the five have both S- and Z-twists; in two used alternately, in the others, irregularly, within the areas between the ends of the fabrics (fig. 75).

In end finishes and compact bands the S-twining twist is used somewhat more frequently, seemingly for the visual, chevronlike effect the two twist directions create when used. Among 443 end finishes for which twining twist is recorded, 15 have both S- and Z-twists; the remainder are all Z. Of the 25 fabrics with compact bands placed in the areas between the warp ends, three have both twist



FIG. 76. Bone bodkin, left (41.2/4341c, top of mound, House 3), and thorn needle, right (41.2/4336, HP 3—D) with yarn attached.

directions and only one has only S. In summary, grouping both end and other compact bands, the S-twist is present in 4.1 percent of the total.

8. Lack of Noticeable Areas of Terminal Construction: In all ancient and modern fabrics with the warp turned at warp end selvages, the work of weft insertion must be completed within the space of the warp length. When near completion, there is a point at which the exposed warp is too short to permit the functioning of the normal system of weft insertion. At this stage some substitute for the normal procedure must be devised, so in weaving the last passages of the weft are darned in with a needle. If the weavers are meticulous in their work it may be impossible to distinguish the needle-inserted weft from

the picks laid in with a bobbin. More often they can be recognized and, as the location of such work in relation to the warp ends may vary by period or region, there is some reason to record data on this feature. For reference, we have listed this as the area of final construction. In twining, even with spaced wefts, two needles or bodkins must have been used, one for each weft element end. The needle, and perhaps the bone object shown in figure 76, could have been used for this work.

All twined fabrics of complete warp length demonstrate that this final step was carefully done, for none have any portion recognizable as the area of terminal construction. One sometimes finds one point where two adjacent weft rows are interlocked accidentally. Such interlocking will not occur during normal weft insertion, so the weft rows where this has happened may be the ones constructed with needles. They are easily overlooked and in no way affect the appearance or wearing qualities of the fabric.

Within the space between two weft rows, one may also find two or more warp units which cross, or transpose, or twist about each other. These are errors made when the initial wefts were placed at the warp ends and the same warp order was not maintained at both ends. Such errors can be corrected by securing the crossings at any desired point along the warp length. We suspect, however, that they were normally left to the last and that they, too, are indicators of the point where construction was completed. In spite of the presence of such minor, accidental features, we can state that the makers of the twined fabrics were meticulous in the final finishing, that the area of terminal construction cannot be determined either by a change in weft counts or by the technique used.

Still another feature directly related to the use of warps fixed and stabilized at each end is the fact that any warps moved from their original order by transposition or shifting must at some point reverse their course and return to their original positions. This means that within the space occupied by any design, figure, or textural effect created by transposed warps, the total of weft spaces in which such movement occurs must be an even number.

This could have influenced design concepts, and certainly was considered when planning the final construction.

VARIABLE FEATURES IN TWINED CONSTRUCTION

The sequence of topics will follow the order of the list below. Again, the purpose is to record the overall picture of technical details with little or no reference to chronology.

1. Weft selvage knots
2. 360° twists in weft rows
3. Use of interwarp knots
4. Composition of compact bands at ends
5. Use of compact bands in body of fabric
6. Combination of split and plain twining
7. Warp striping
8. Transposed-warp constructions
9. Floated-warp construction
10. Design
11. Pigments and dyes
12. Use of yarns spun and doubled counter to normal practice

1. Weft Selvage Knots: The complete range of selvage knots and hitches and their variations in combinations, 21 in all, is shown in Code XXIII. As will be noted, they are divided into two groups depending on the identification of the selvages. We have designated the edge where weft insertion starts as the primary selvage and the opposite edge, where insertion was completed, the terminal selvage.

Most positive identification of the primary selvage is based on the use of single lengths of weft yarn doubled at the middle before insertion (see Code XXIII-B, C). In many cases (enough to consider it the normal procedure), several warps or warp pairs were grouped together at the primary selvage (fig. 77). This was never done at positively identified terminal selvages, so grouping of warps at the edge indicates a primary selvage in those instances where no weft loop survives. However, if the primary selvage knots are simple, overhand bends joining two lengths of yarn, and the selvage warps are not grouped, a primary selvage cannot be distinguished from a terminal selvage.

From 18 fabrics retaining both selvages it

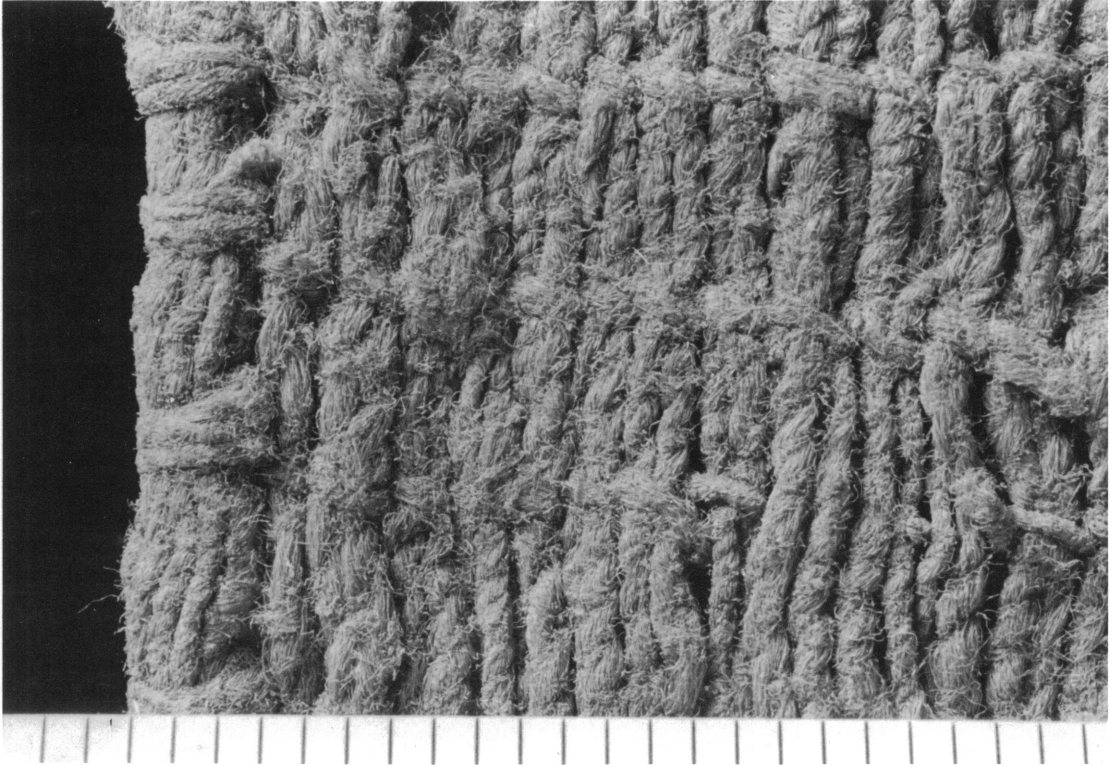


FIG. 77. Primary selvage with grouped warps held with half-hitch selvage knots. 41.1/9975, HP 3—H.

is evident that the commonest knot, the overhand bend, normally used for the terminal selvage (Codes XXIII, IV), is also found at the primary selvage (Code XXIII-E). It is certain that some, perhaps most, of these were overhand bends-on-a-bight with small loops projecting beyond the turns of the knot (Code XXIII-D). This was the knot placed at the centers of yarns to be used as wefts and projected out from the fabric edge. With wear, the loops broke and the yarn ends chafed and in such condition the knots cannot be distinguished from, and must be grouped with, the overhand bend used commonly at the terminal selvage to tie off the yarns at the end of the weft row (fig. 78).

In all, there were only 18 twined fabrics in the Huaca Prieta series that retained both side selvages. From the knots and hitches, the primary, and hence the terminal, selvages

were identified on 16. Two fabrics of this group have different features. One (41.2/1208) has a continuous weft; the other has rejoined wefts (41.2/1606). Both were discussed earlier. The 16 remaining fabrics with both selvages show a relatively high frequency of overhand bends among primary selvages started with the first twining twist about one warp pair.

Among the 294 twined fragments with one selvage in the same series, 123 selvage knots are positively identified as primary. Theoretically, half the total should be primary, half terminal. Thus one might calculate that of the 171 unidentified selvages, 123 might be the companion pieces to the 123 primary edge fragments. The balance, 48, will be either primary or terminal.

Whether the overhand bends at the primary selvages united two yarn ends or if they

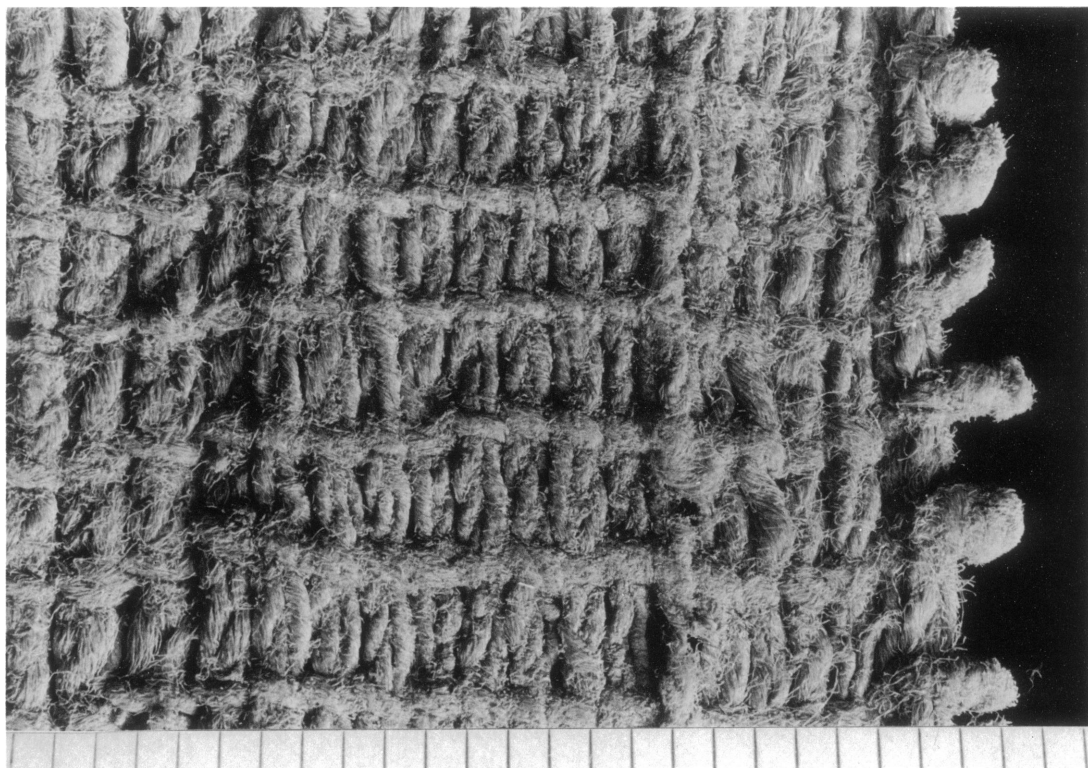


FIG. 78. Terminal side selvage with overhand bend knots with yarn ends chafed. 41.2/1541, HP 3-L.

projected a short loop marking the center of the yarn remains unsettled. In view of the extreme wear characterizing almost all the fabrics, they could all have had loops. From a practical viewpoint it seems pointless to cut two lengths of yarn, then join them, when only one length need be cut. The mechanics of tying the knot remains the same.

For anyone familiar with knots, the use of the overhand bend to finish off a weft row seems impractical. Once the knot has been formed, the loop must be rolled against the warp as the knot is set and it is difficult to do this and preserve weft tension against the warp. A square knot would seem preferable, both for ease of tying and for holding the correct tension. From a check of knots joining lengths of yarn and breaks in warps, it is apparent that the twiners and weavers of that time, like almost any modern lady, automatically tied a granny knot when they should

have tied a square. If they could not distinguish the advantage of the one against the weaknesses of the other, they were much better off using the overhand bend at the terminal selvages.

It will be noted that various differences in the selvage knots are quite minor. The commonest primary selvage hitch (Code XXIII-K) in most cases probably had the loop (Code XXIII-J), later broken by wear. Certain other differences can develop in the setting or fixing of the knots after they have been formed and may have little significance. However, at this stage of our knowledge it seemed best to record all distinctions and the percentage of occurrence figures are given with each illustration. These derive from a total count slightly greater than the score of selvages because in four cases two or more types of knots or hitches were used along the same edge (table 13).

TABLE 13  
**Twining—Selvage Knots (Code XXIII)**  
 Test Pit 3 (HP 3)

Layers	Combined																			Totals	
	Primary Knots									Primary Knots									Terminal Knots		
	A	B	C	D	E	F	G	H	I	J	K	S	T	U	V	W	M	N	P		Q
I						1				2		1						2			6
D	2	1			3	4	2	2		11	1			1	1			41		1	70
E	2				2	1				2			1			2		13	2		25
II		1								1							5				7
G				1	2		1			4							19				27
III																					
H				1	1	1				12							19	1			35
H <sub>2</sub> L <sub>2</sub>				1	1	1				5							14				22
I					1					4							16				21
J				1	2					7							12		1		24
IV																					
K	1									1							4				5
L	1				2												5				9
M		4								2						3	17				26
V																					
N	1																2				3
O																1	3		1		8
VI																					
P																					
Q																					
R																					
W.T. Lots 1-5	1						1		2												9
Sample 2 Middle					1					9					1						19
Position Uncertain	2	1																			12
Totals	8	14	0	4	15	6	1	4	2	2	60	1	1	1	1	2	7	193	3	1	328
Percentage	2.4	4.3	0.0	1.2	4.6	1.8	0.3	1.2	0.6	0.6	18.3	0.3	0.3	0.3	0.6	2.1	58.8	0.9	0.3	0.6	

Test Pit 2 produced only one specimen (layer G) with a selvage knot, type B.

2. **360° Twists in Weft Rows:** In commenting on the twining movement of the weft yarns, we noted that each element alternates to opposite sides of the warp as long as the usual 180° twist is used. If a full 360° twist is made between each element or warp pair, the weft elements remain on, or continue along, opposite sides of the warp. If tension on each element is the same, the twists tie between the warps. If tension is unequal, one element will lie in a straight line while the other turns about it, the turns being visible on that face and not on the other. Speaking generally, this is a widespread and presumably ancient feature of patterned twined basketry and has been given the unsatisfactory name "wrapped twining." It occurs in various parts of the world and is present to a limited extent in Huaca Prieta basketry.

In the Huaca Prieta twined fabrics, 360° twists are very rare; in basketry perhaps less so. In the fabrics there are only seven instances (five in compact end finishes, two in other compact bands), all occurring in layers G to M in excavation HP 3. The complete absence of the 360° twining twist in the body or main area of the fabrics must be related to the minimal use of color, and the nature of spaced wefts, which cannot produce patterning. As it serves no other purpose, the absence of the 360° twist is not surprising. What is noteworthy is the fact that the twiners, knowing the technique, did not experiment and use its real potential for structural patterning.

3. **Interwarp Knots:** Another way of handling the weft yarns as they pass between the warps is to form an interwarp knot, a simple overhand crossing of the two strands just as one does before tying bow knots with shoelaces. One finds the interwarp overhand knot sporadically throughout the Preceramic Period in about 0.75 percent of all twined fabrics. Among the 147 specimens in which it was noted, the knot appeared once or several times in every weft row within one fabric.

The normal procedure was to repeat the knot in successive weft rows, always at the same point or points in relation to the warps of the specimen. There seems to be no consistent relationship between the location of the knots and the distance to the selvages, the number of warps between repeats, or the fab-

ric width or length. Nor is there any recognizable relationship to type of yarn or any other distinguishing feature.

Structurally, the knot serves to fix the weft tension at the point where it is made. If the weft breaks to one side or other of a knot, the subsequent loosening of the weft turns is halted or retarded at the knot. To this degree it is advantageous, yet it was not sufficiently important to make it popular, even though almost all twiners must have known about it. One cannot explain the limited use by any modification of the overall appearance for it is difficult to see and, in the archaeological material, may be easily overlooked. What we cannot evaluate is a possible relationship to fabric function, for we have almost no information on that topic.

4. **Composition of Compact End Bands:** The variables in the end selvage bands are: number of weft rows, the use of single versus pairs or multiple elements in each weft row, the use of both single and two-ply yarns, the use of natural brown and white cotton and dyes for color effects, the use of bast with cotton, the twining order in relation to the warps, twining twist direction, and the rare use of 360° weft twists between warps. Fortunately, we can ignore the selvage knots, for they generally follow the types used in the rest of the fabric.

The formidable mass of minutiae is difficult to encompass. One wishes that our friends of the Huaca Prieta had held to one or two standard systems, but they did not. Presentation of the data in any meaningful way is not simple.

Note that the majority, irrespective of what may be done subsequently, start with a single row in which the warp pairs are handled as in the main area of the fabric. Table 14 gives percentages of overall occurrence, and presents the turning order, and preference.

In the commonest type, all end rows are twined regularly about the same warp pairs as used in the rest of the fabric. Such ends are found throughout the Preceramic Period debris, continued in use after the local appearance of pottery, and are associated with Cupisnique wares.

Types totaling 26.2 percent of the sample share the common feature of having the first and last row made on the regular warp pairs.

TABLE 14  
**Twining—Warp End-Finish (Code XXVI)**  
 Test Pit 3 (HP 3)

Layers	A	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	V	Totals
I C			1			1	1											3
D		1	3	12		3		28	17		11	5						80
E		4	3	8	1	1		7	4		6	1						35
II F			6	4				2	5	1	4	1						23
G	2	2	6	8	1	1		11	8		8	1						48
III H		1	9	24		1		9	3	1	12	1					2	63
H <sub>2</sub> I <sub>2</sub>		1	1	14				1			2		1					20
I		1	2	15	1			1	1	2	3	2						28
J		4	2	15	2			1	1		2		2					28
IV K				3	1	2					1							7
L		2	1	2		2		1			2	1						9
M		2	2	6	3	6				1				6	4	1		31
V N						2							1	2	1			6
O						2								2	3			7
VI P																		0
Q																		0
R																		0
W.T. Lots 1-5				4		1		3			3	1						12
Sample 2 Middle			3	5		3		3	3		6	9						32
Position Uncertain		1		2		1		2	2	1	4	3		2				18
Totals	2	17	39	122	9	26	1	67	45	6	64	25	4	12	8	1	2	450
Percentage	0.4	3.8	8.7	27.1	2.0	5.8	0.2	14.9	10.0	1.3	14.2	5.6	0.9	2.7	1.8	0.2	0.4	

Test Pit 2 produced only 2 specimens with warp end finishes, type A, from layer A.

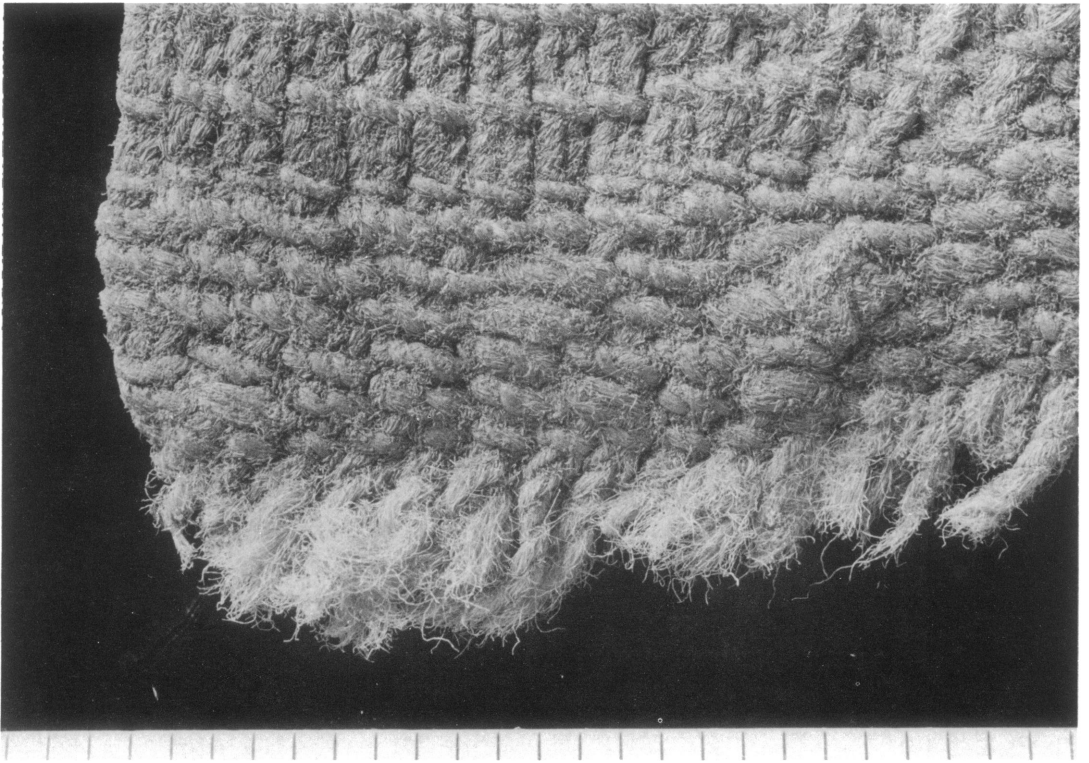


FIG. 79. End-finish with compact twining. First and last weft rows are around regular warp pairs. 41.1/9613, HP 3—F.

Between these rows twining is over two, sometimes three pairs, in both regular and split-pair order (fig. 79). This occurs between layers M to D of HP 3.

The number of weft rows at end selvages range from 1 to 24 and are summarized in table 15.

The weft handling, i.e., the number of yarns in each element of each row appears in table 16. The grouping of elements naturally gives greater mass to each row and, in the aggregate, a heavier band is produced.

Twining twist direction in the end finishes has been summarized previously in the comments on the use of S-twist. We note again that in the ends the function of the S-twist is to create a chevron effect when twists in adjacent rows are reversed. Also, the use of S-twists is limited to the upper third of the preceramic debris and is thus significant in the chronology of technical features.

TABLE 15  
Number of Weft Rows—Twining Warp End-Finish

Number of Weft Rows	Examples
1	26
2	54
3	95
4	106
5	49
6	25
7	16
8	4
9	3
10	1
11	2
12	2
15	1
16	1
24	1
Incomplete	66

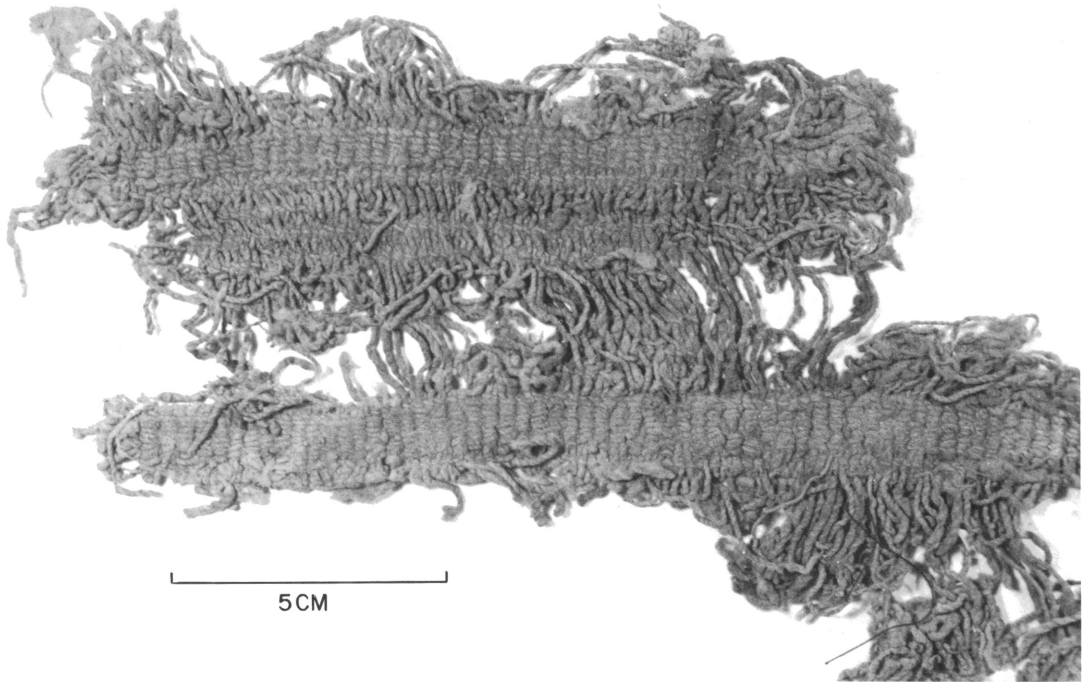


FIG. 80. Fabric with compact bands with full or 360° twists. 41.2/1670, HP 3—M.

TABLE 16  
Weft Handling—Twining Warp End-Finish

Number of Yarns	Examples
1	166
2	79
3	1
4	1
1, 2 combined	135
Varied	3
Uncertain	29

The five instances of full 360° twists in end finishes, distributed in layers M (41.2/1651, 1662, 1708), H (41.2/1987), and G (41.1/9830) were all apparently for control of color distribution. Color traces, seemingly red and blue dyes, survive in only one, but the order of full and half twists, will reveal the plan. In making such twists, the twiner applies more tension to one element than to its companion. Thus one element travels in a relatively straight line while the other moves down be-

tween the warp, around the taut element, and back to its surface. A normal half-twist reverses the colors, and the element which formerly was active then receives the added tension. This results in a sharp color contrast on one face and a flecked combination on the reverse.

By plotting structure, we have found that one band (41.2/1651) had a row of broad-based opposing triangles; another (41.2/1662), a zigzag line with marginal dots. The others are too fragmentary to recover pattern.

5. Compact Bands in Body of Fabric: Twenty-six items have compact bands consisting of two or more weft rows spanning the full width of the fabric and bounded by spaced weft areas. Compared with all twined specimens, including the small fragments, this is only 0.7 percent of the total.

Six have only two rows, while the widest has nine. One fabric (41.2/1670) has bands in which full twists achieved a lateral alteration of color (fig. 80). The distribution of

TABLE 17  
Twining—Warp Ends (Code XXV)  
Test Pits 3 (HP 3)

Layers	A	B	C	E	G	H	I	J	L	R	X	Y	Z	Totals
I C					3									3
D	10			3	24	26	9	7						79
E	4		1		20	2	2		4			2	1	36
II F	7				7	2	2		5					23
G	11	2	1		21	5	4		3	1	1			49
III H	18	1	3		23	7	7		2		1			62
H <sub>2</sub> I <sub>2</sub>	11		3		3				1			1		19
I	14	1	1		7	1	2	1	1	2	1			31
J	17		4		3	2	2			1				29
IV K	6		1		1									8
L	4		2			2								8
M	26		2		1				2					31
V N	6													6
O	5													5
VI P														0
Q														0
R														0
W.T. Lots 1-5	5		1		2	3	1							12
Sample 2 Middle	7	1			7	8	4		3				2	32
Position Uncertain	3	1	1	1	5	5	1			1				18
Totals	154	6	20	4	127	63	34	8	21	5	3	3	3	451
Percentage	33.8	1.3	4.4	0.9	27.9	13.8	7.5	1.8	4.6	1.1	0.7	0.7	0.7	

Types D, F, and T have been omitted since they have only 1, 2, and 2 specimens, respectively. HP2 contained only 4 specimens with warp ends. All 4 were type A.

central area bands is from side trench OPQ up to layer G.

The presence of solid bands, both at the ends and within the fabric, has a rather broad implication. Solid bands constitute proof that the possibilities of patterning with the weft elements were known and understood for a considerable time in the latter half of the pre-ceramic occupation. That there was no greater application of this possibility is surprising. Instead, the more difficult system of patterning with the warp was preferred. The only explanation, other than a tendency to maintain conservative, traditional practices, is that weft patterning requires four or five times as much yarn as patterning with spaced wefts.

6. Combinations of Split and Plain Twining: The presence in a single fabric of the two ways of handling the warp pairs can be accidental as well as intentional. In plain twining with paired warps, if one makes a mistake

and either twines the weft about a single warp or a group of three instead of two, the placing of the subsequent weft twine will not follow the order of the preceding row. As a result, the warp pairs will be subdivided as in split-pair twining until the error is noted and corrected. In the following weft row regular pairs will normally be reestablished so the error can be detected only as a minor change in appearance within two weft spaces for part of the width of the fabric. Number of examples found: seven.

In split-pair twining a comparable error will break the warp order and result in small areas of plain twining. The three examples found suggest that this happened even more rarely than the mistakes in plain twining.

In deliberate combinations of plain and split pairs the two may alternate like weft stripes successively across the full width of the piece, or lengthwise with the warp, as a

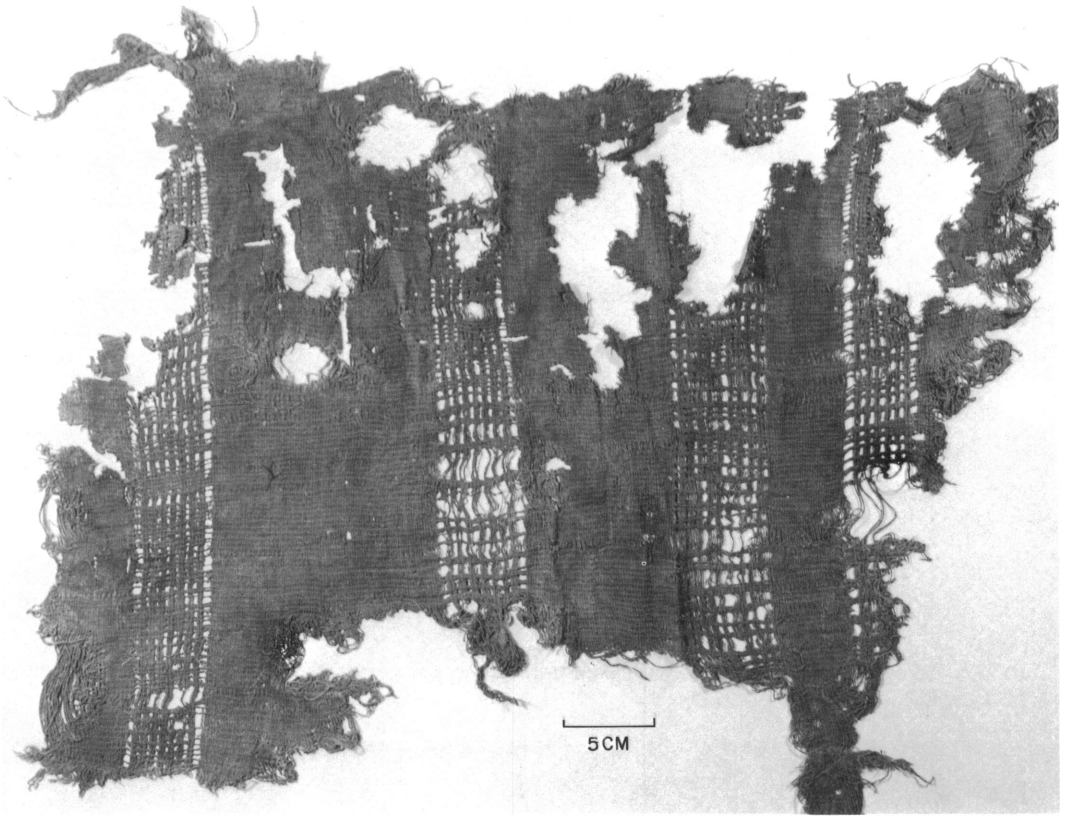


FIG. 81. Fabric with disintegrated warp stripes. The gaps were once of natural brown cotton. 41.2/1137, HP 3-I.

kind of warp stripe. There are four examples of the former, one of the latter. Five examples are divided along a warp line, with all warps on one side of that line plain; on the opposite side all are split. In eight of these the change in handling of warp pairs was apparently limited to variably sized rectangular areas. None of these applications produce much in the way of visual contrast, so it is not surprising that the number of examples is small. Distribution: layers M to F, inclusive.

7. Warp striping, nonstructural: In studying warp end finishes, the varying nature of the warp end-loop arrangement was recorded (table 17; Code XXV-D, F, and J). These finishes are summarized in Code XXV, col. 67; warping was most commonly done with paired yarns, and sometimes with two pairs. Where no color survives, and there is no difference in fiber or yarn construction, floats

along the end reveal the presence of deliberate warp stripes. They make it clear that the alternate use of bast with cotton versus pure cotton was planned for striping and was not generally a haphazard utilization of whatever yarn was available at the moment. Also, the joining of lengths of warp yarn by knotting was more frequent at an end selvage than within the fabric area where knots would mar an even texture. As far as can be determined, simple warp striping in plain and split-pair twining was present in 764 fabrics. Eleven others have both simple striping and stripes created by a shift in technique, a change to one of the transposed-warp movements.

In their present condition the striped fabrics are a totally unimpressive, sorry looking lot. Some have longitudinal gaps, bridged by the weft yarns, where natural brown cotton has partially or completely rotted away (fig.

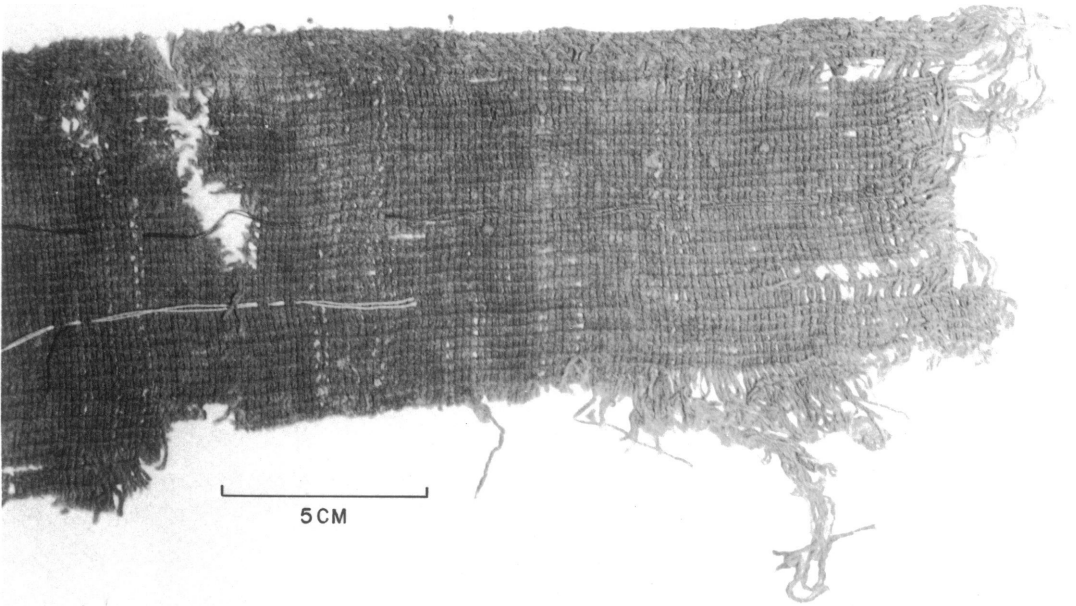


FIG. 82. Warp stripes of cotton with bast (white specks) versus groups of pure cotton warp pairs. 41.1/9195, HP 3—D.

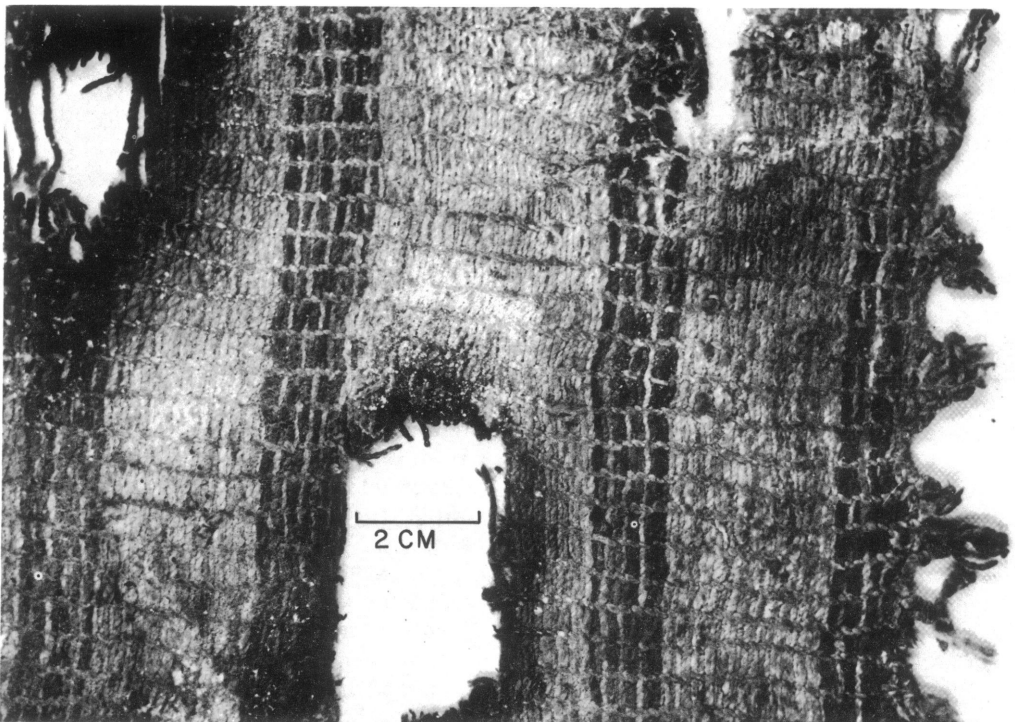











FIG. 83. Warp stripes of blue-black dyed cotton in fabric 41.2/2550, HP 3—O, associated with burial 99.1/903.

### SYMBOLS USED IN PLOTTING TWINED CONSTRUCTION

#### PAIRED WARPS

-  both of which are 2-ply cotton
-  both " " " " " " " " , tan
-  2-ply, 1 of which is 2-ply cotton, the other 1/2 bast
-  2-ply, both of which are 1/2 bast
-  2-ply, 1 having bast blended with cotton (S usually) in 1 ply of 1 pair
-  2-ply, 2 " " " " " " " " " " " " each pair
-  1 being 2-ply cotton, the other 1-ply cotton
-  1 " 1/2 bast " " " " " "

 MULTIPLE WARPS TO BE INDIVIDUALLY MARKED

 UNKNOWN BECAUSE OF CONDITION OF MATERIAL

SINGLE WARPS MUST BE SO EXPLAINED

THE ABOVE MAY BE COMBINED IN RARE NECESSITIES, E.G.,

 in 1warp, 1ply bast blended, the other bast doubled

FIG. 84. Symbols used in plotting fiber materials in warp pairs of twined construction.

81). In others, faint traces of color and the presence of bast fiber can be detected microscopically (fig. 82). Only a very few retain clearly visible stripes (fig. 83).

In all striping, if an orderly repeat is planned, counting off of warp turns while warping is necessary to achieve uniform results. To simply gauge results by eye or rough measurement will not yield stripes in which the sequence of warp counts is always the same. However, proof of whether the work was casually or precisely done is difficult to obtain unless the surviving widths are sufficient for several full repeats of the stripe combinations used. One might, from planned repeats, demonstrate that a person will count up to the maximum number involved in the structure and possibly determine their counting procedure. That such counting can be complex is demonstrated by examination of an ikated rebozo from Mexico. In a single

product basing the counts on a specific example (American Museum of Natural History collection, 65/5184), an illiterate weaver may deal with 9928 warps, arranged in 31 pattern units, each subdivided into 31 sets of 6, 8, 16, and 20 warps. For dyeing, these were assembled into a minimum of 30 groups of 120, 128, 240, 248, and 4000 yarns each. After dyeing, which involves the use of over 10,000 resist bindings at predetermined points, the correct number of warps must be taken from each group and reassembled in their planned order on the loom. Add to this the fact that the yarn is so fine that the average warp count is over 300/in. in the finished product and you will have a partial picture of the work involved.

Nothing approaching this complexity is found in the twined fabrics. Some counting is evident, but many are random sequences in which certain areas involve simple counts.

To record the differences, and the variations in warp pairs, the symbols shown in figure 84 were used (see also Code XVI, cols. 42 and 43). With these a cross-section plot of any plain-twined fabric with paired warps can be made. If there are two or more fragments from the same fabric, the relationship of the pieces can often be demonstrated with the same certainty as the overlap of sequences in tree-ring growth studies. A sample set of cross-sections of specific specimens and an instance of the assembling of pieces from a single fabric are shown in figures 85 and 86.

There are, of course, plotting problems. The regular turning about warp pairs may be marred by the accidental grouping of more than two warps for part of their length. The occasional breakage of warps during construction produces different warp counts in otherwise perfectly matched areas.

If we include the 11 items in which plain or split-pair twining alternates with some other techniques, we have the results shown in table 18 showing chronological distribution and various means of creating the warp stripes.

The chronological distribution (layers O to C) and changing frequency of warp striping is notable. There is an increasing frequency in the use of stripes in the upper third of the preceramic deposit. The use of single-ply yarns in combination with two-ply is restricted to layers J to D. The distribution of accidentally varied warp follows the trends and differences of the warp stripes, but starts with layer M.

Alternately Varied Warps: We have not included those fabrics in which successive warps differ in one way or another in the preceding account. If all alternate warp pairs are white and brown, or if three-yarn combinations are used in regular sequence in successive pairs, a simple, fine stripe effect is achieved. The contrasting yarns can be warped simultaneously, so preparatory work is no more than that required for a monochrome product. In view of the simplicity of preparation, it is surprising that there are only 33 rather varied examples. This number is so small that it merely serves as a measure of the indifference to a simple means of modifying appearance. Distribution: layers M to C.

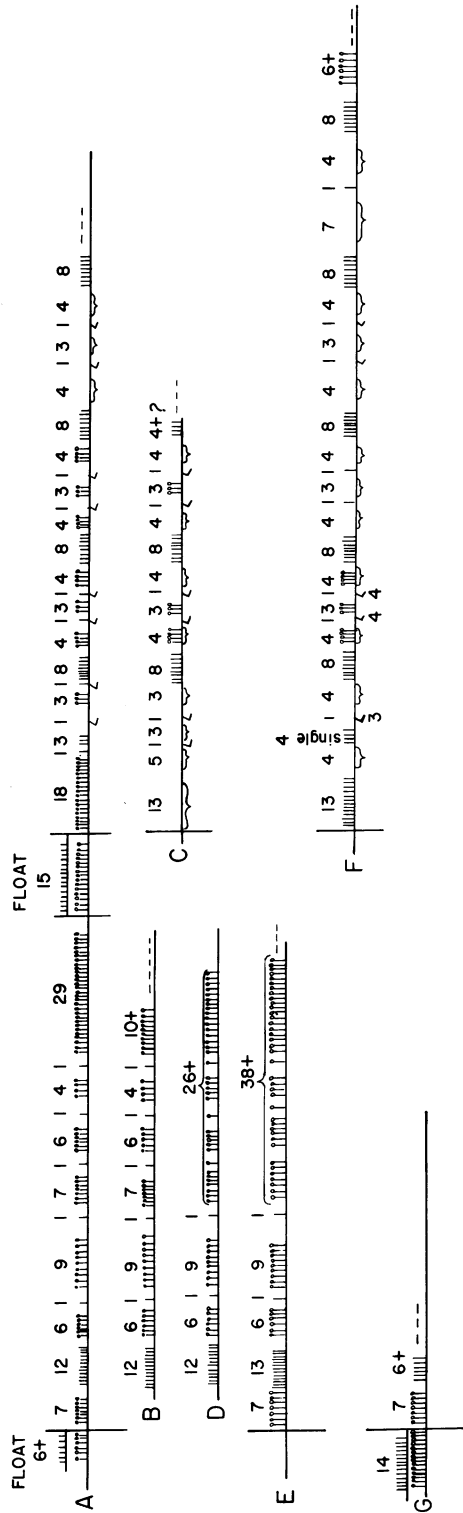


FIG. 85. Cross-section plots of warp pairs permitting reconstruction of placement of fragments in proper relationship to each other. 41.1/9379a-g, HP 3-D.

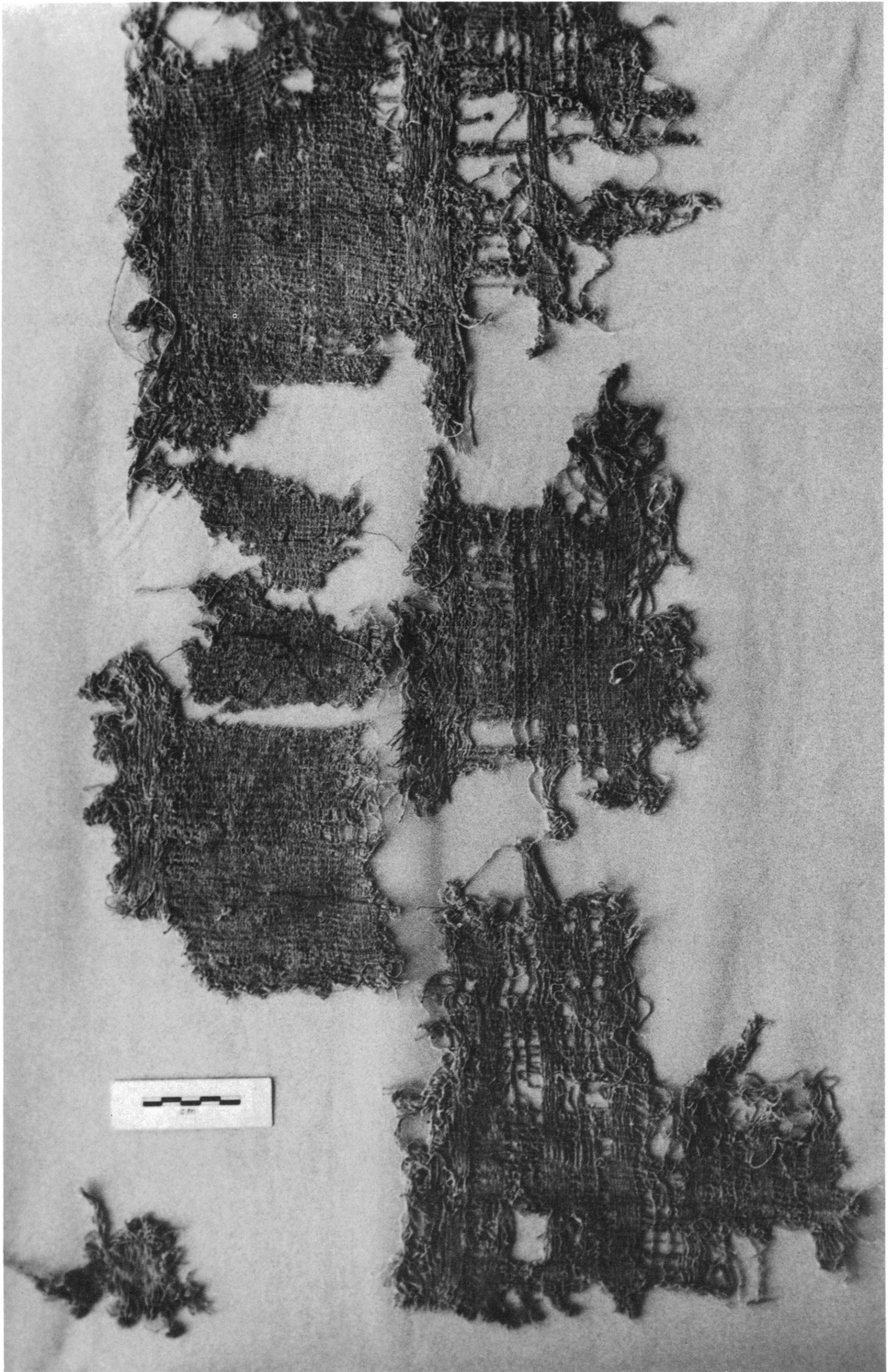


FIG. 86. Fabric restored with cross-section plots. 41.1/9379, HP 3—D.

TABLE 18  
**Twining—Warp Stripes, Nonstructural, How Achieved (Code XXXII)**  
 Test Pit 3 (HP 3)

Layers	A	B	C	E	F	G	H	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Total
I C	1								1	2		1					1	1					7
D	8	11	5	30	8	3	1		50	4	1	7	3	7	4	11	3	7	1	1	4	1	170
E	5	2	1	22	3	1			16	1		3	2	8	2	3	2	7					78
II F	1	1		16					3			1	1	4	1	1		2					31
G	6	7	3	44	6		1	1	22				5	20	5	3	2	3		2	6		136
III H	6	9	1	36	1	3	1	1	23			6	6	12	1	1		3			4		114
H <sub>2</sub> I <sub>2</sub>	5	1	12					1	1			2	1	4	7			1					35
I	1	7	3	13	1	1		1	6	1	1		1	9	1	1	2				1		50
J	2	7	3	11	1	1	1	4					1	3	2								36
IV K	1	1	1	3				1															6
L	2	2	1	1				1															7
M				2				1															3
V N			1																				1
O			3	1																			4
VI P																							0
Q																							0
R																							0
W.T. Lots 1-5	1	3	4	14	1				10					2	2								37
Sample 2 Middle	2	2		22	1	1			2			6		2	2	1	1	2		1			43
Position Uncertain	2	2	1	3					3			1	2	2	3								17
Totals	34	60	29	230	22	10	4	11	137	7	4	27	20	71	27	24	11	26	1	4	15	1	775
Percentage	4.3	7.7	3.7	29.7	2.8	1.3	0.5	1.4	17.7	0.9	0.5	3.5	2.6	9.2	3.5	3.1	1.4	3.4	0.1	0.5	1.9	0.1	

No striped fabrics were found in HP2.

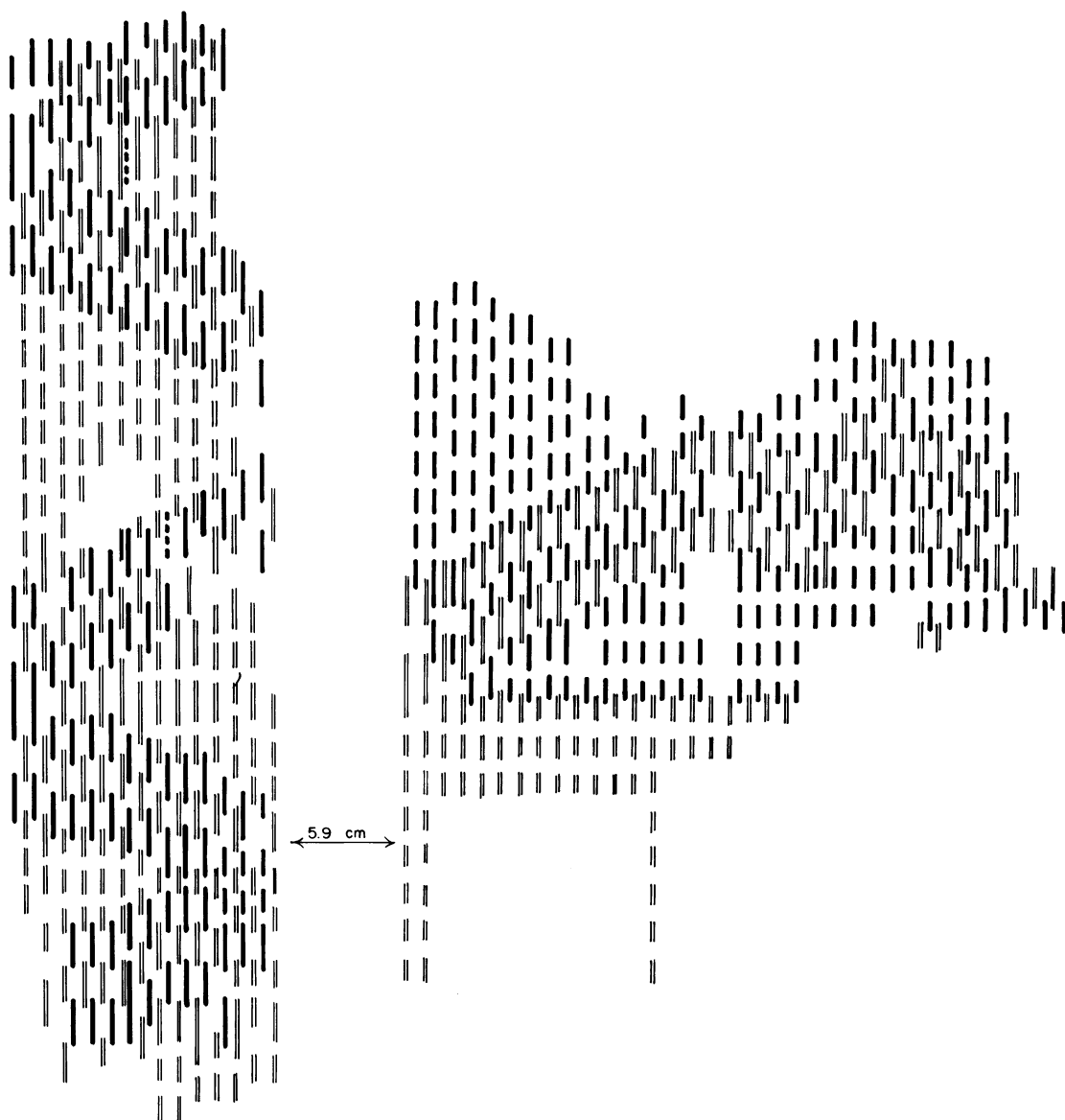


FIG. 87. Plot of warp float pattern in fabric 41.1/9380a-c, HP 3-D.

**Accidental Warp Striping or Yarn Change:**  
A second group of fabrics to be considered along with warp stripes are those in which there are yarn changes within the body of the fabric. The yarns were obviously joined before warping with no thought as to where the changes would occur, their order, or appearance. The change may modify no more than a portion of one warp length or may create

an actual stripe. It is certain that some fragments included within the planned stripe group belong here, and vice versa, for we deal mainly with fragments. Such errors will not, however, materially affect the overall picture of each category.

In this case we have a total of 266 examples showing much the same distribution (M to C) as in the striped lot.



FIG. 88. Fabric 41.1/9380a-c, HP 3-D, with warp float pattern.

Subsections 8 through 12 supplied by Milica Dimitrijevic Skinner, 1984.

8. Transposed-Warp Construction: See following chapter.

9. Floated-Warp Construction: Bird describes floated warps on page 115 (fig. 67). There are only 19 specimens made with this technique. The distribution is restricted to layers FG to O of Test Pit 3, with one specimen in Side Trench J and 2 in Sample 2, middle. The technique is absent in Test Pit 2 (table 11).

Floated warps are used only in combination with plain twining paired warps and are always kept on one face of the fabric.

Ten of the specimens use a combination of cotton and cotton with bast yarns. Eight are of pure cotton with some warp pairs con-

sisting of a single-ply yarn paired with a doubled one. One specimen has no fiber content information. Three have traces of red color.

A common characteristic of this small sample is that warp stripes of different varieties occur in addition to the stripes of patterns achieved by warp floats (figs. 85, 86).

The number of floated warps ranges from 2 pairs to 35 pairs within a single stripe. There must have been a color interplay in the floated areas, and this resulted in barred stripes or some more intricate pattern (figs. 87, 88). The color interplay is visible in only one specimen, with a pattern created with brown and white cotton (fig. 89).

10. Designs: With the exception of stripes and effects, all designs in twining are achieved through the transposition of warps. These will be covered in Chapter 10. Table 19 gives the distribution of the various kinds of design in twining. Chapter 11 describes designs made by the other major textile techniques.

11. Pigments and Dyes: Most of the Huaca Prieta preceramic textiles are of a dirty gray color. White is nonexistent, but was used in coding (Code XII) to indicate a grayish color, in contrast to other colors visually detected. In cases where color was suspected because of the technique used (such as transposed warp twining) but could not be seen, the fabrics were considered to be monochrome. Bird noted that there are undoubtedly pieces made entirely of tan cotton which were not classified as such, since tan cotton was recorded only when a contrast in the yarns of a specimen was detected.

The following colors were present in Huaca Prieta textiles: different shades of brown and tan, red, light blue, and very dark or blackish blue. They appear in all four major textile techniques. In many cases there are only faint traces of color left. Some color may have been lost during the cleaning procedure. During the initial analyses, Bird submerged some of the fabrics in benzene to detect or confirm color presence. The benzene would often show red where its presence was not previously suspected. Blue-dyed yarns also showed up slightly better. The natural brown cotton color was not accentuated. As demonstrated in the patterned twined textile 41.2/2551 from layer O, all colors were present from nearly the lowest layers in Test Pit 3.

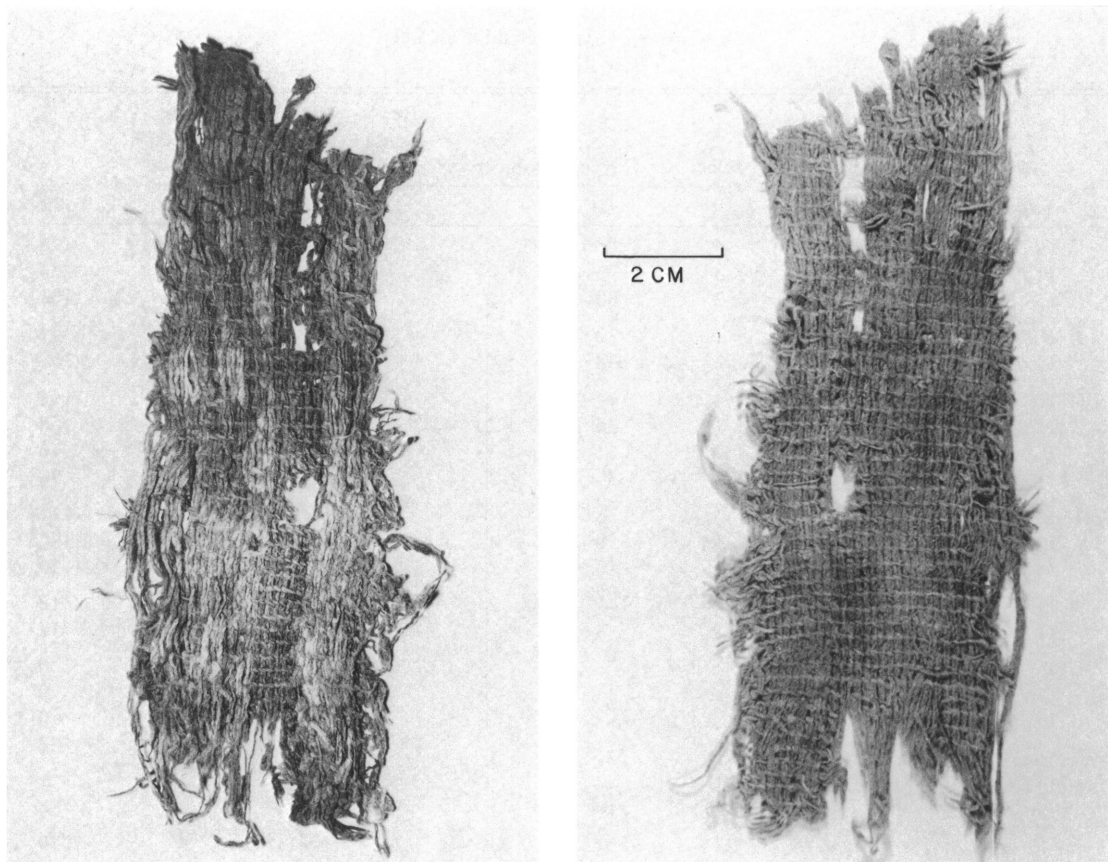


FIG. 89. Two sides of single-face warp float fabric 41.2/2432, HP 3—sample 2, middle. Left: face with warp float pattern. Right: reverse face with no floats.

The brown and tan colors are the natural shades of cotton. Judging from specimen 41.2/2551, the light shade of tan is more susceptible to disintegration than the darker brown shade.

The red color is a pigment either applied to yarn before construction of the fabric or rubbed over the finished product. There are only two examples where Bird suspected a red dye (41.2/9904 from unit FG of Test Pit 3, and 41.2/2347 from Sample 2, middle). Smudges of blue dyes on red pigment are also found.

Blue, either light or very dark, is dyed. The dye source or type has not been determined.

Code XIX records the types of color application, and Code XX records the different colors. The statistics were drawn directly from the data sheets; that is, no computer printout

was made on this subject. The study included yarn hanks, and in twined and woven fabrics the warps and wefts were scored separately. The analysis shows that the prevalence of fabrics with color drops from just under a fifth of specimens under layer F (Test Pit 3) to about a tenth in layer F and upper layers.

Natural brown and/or tan cotton yarns are noted in 125 specimens, most (100) in the warps of twined fabrics. Fifteen warps of woven fabrics have the natural coloration. One could add to the 125 specimens another 18 that have both natural and dyed color combined in them. Layer G of Test Pit 3 produced the most fabrics with natural brown and/or tan cotton. Two-tone natural yarns were found in only two instances.

Red-pigmented yarns are found in 38 specimens, mainly in the warps of twined fabrics.

TABLE 19  
Twining—Design (Code XXXII)  
Test Pit 3 (HP 3)

Layers	Non-	Effect	Stripes	Non-	Repre-	Type 3	Frag-	Totals
	deliberate							
	0	1	2	3	4	5	6	
I C	14	4	8					26
D	54	3	176	1			2	236
E	17	2	80				2	101
II F	17	1	32		1			51
G	13	2	138	1	1		2	157
III H	28	4	114			1	4	151
H <sub>2</sub> L <sub>2</sub>	11	1	36	2	1	1	3	55
I	14	2	51	3			6	76
J	23	3	37	2		3	2	70
IV K	1		6		6	2	2	17
L		1	8	4	3	1	9	26
M	2	1	10	7	7	1	46	74
V N	1		1	2	3		11	18
O			5	1		1	5	12
VI P								0
Q								0
R								0
W.T. Lots 1-5	14	5	37	1				57
Sample 2 Middle	27	3	44	1	1		2	78
Position Uncertain	30	1	18	1		1	3	54
Totals	266	33	801	26	23	11	99	1259
Percentage	21.1	2.6	63.6	2.1	1.8	0.8	7.9	

There were 7 specimens from HP2 (1 in column 3 and 6 in column 6).

Five netted fabrics also have such yarn. Layer M is richest in red-pigmented yarns.

Dyed yarns are present in 47 specimens. They are concentrated in layers O, N, and L. There are only three instances where two-tone dyed yarns were found. Another three specimens have traces or smears of dye applied to the finished product. One could add to the 47 specimens the 18 which have natural and dyed colors combined.

Overall applications of red pigment to a finished product are found in 37 specimens in Test Pit 3 and one from Test Pit 2. Smears or traces of pigment applied to a finished product are found in 103 specimens. The greatest concentration is in layers H and G.

12. Yarns Spun and Doubled Counter to Normal Practice: S-spun Z-doubled yarn is the most common yarn in the Huaca Prieta

preceramic fabrics. Since the twining represents the largest group of textiles, the greatest variety of yarn structures is found among those fabrics. Table 8 shows that the ratio of the reverse structure, Z-spun S-doubled, to the common structure is 79 to 1885 (HP 2 and HP 3 together). The use of Z-spun S-doubled yarns in twined warps declines in the upper layers of Test Pit 3. This yarn structure is not present in the twined warps of Test Pit 2. In twined cotton wefts, the ratio of the common to the reverse structure is 143 to 1706 (HP 2 and HP 3 together). The Z-spun S-doubled yarns in wefts are found in most layers of Test Pit 2, and are present in layers O to H of Test Pit 3. No Z-spun single plies were used for wefts.

The Z-spun S-doubled warps are used in groups to create nonstructural warp stripes

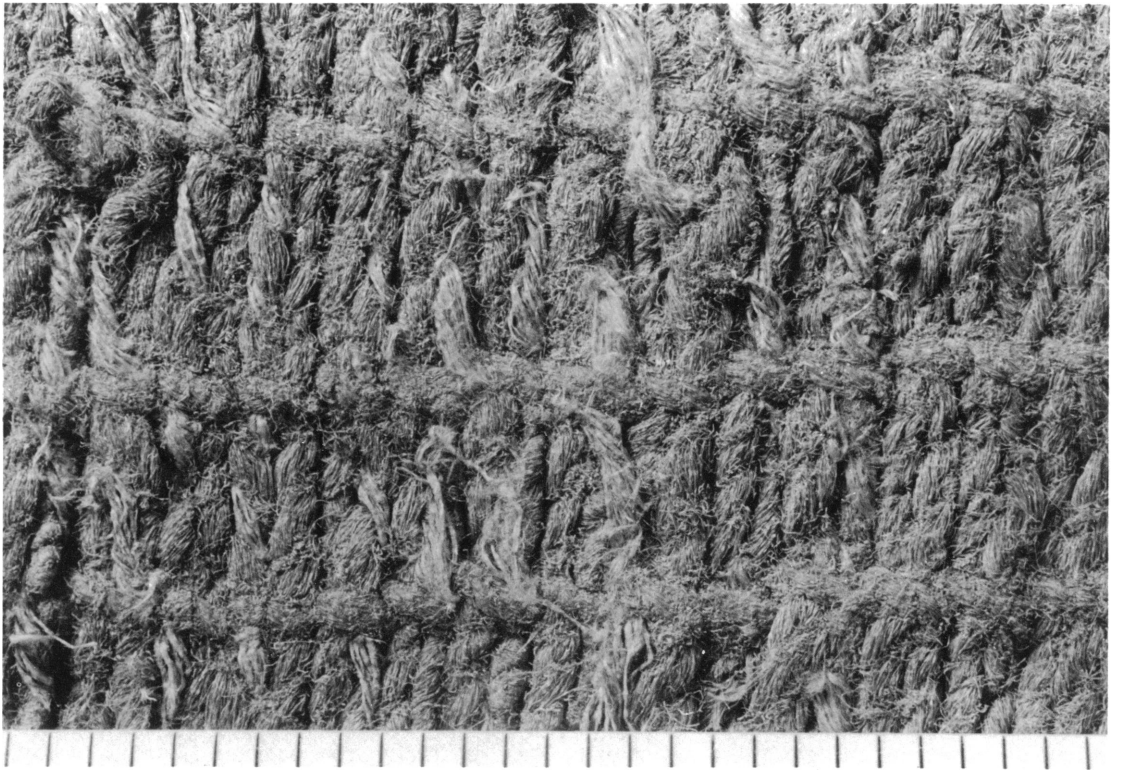


FIG. 90. Detail of plain twining: warp stripe achieved by use of different material and S and Z doubled warps. 41.19814.

either against the normally structured yarns or in combination with other means of creating stripes in 40 instances (fig. 90). Fourteen specimens with apparently random groupings of warps of different yarn structures were classified as accidental yarn variations. Only two small fragments of plain twining have a different structured yarn in each pair of warps. In a new, complete fabric this may have created a visual effect. Oppositely structured yarns were used in wefts of some twined fabrics, but could not have had a visual effect.

Apparently they were not introduced systematically.

The subtlety of using oppositely structured yarns in warps are seen today in some ethnographic textiles. An example is a carrying cloth from Cuzco, Peru, in the collection of the AMNH, catalog no. 40.1/2196. It is not known why opposite yarn structures were used at the Huaca Prieta, but from ethnographic sources, such uses are recorded as having special symbolic meaning.

## CHAPTER 10. TWINING TRANSPOSED-WARP CONSTRUCTION

This chapter deals with the textiles constructed with transposed-warp techniques. The technology of the construction is highly significant, for it was used to create patterns and designs which are the earliest known art in American textiles. A few of these textiles and their representational designs (motifs representing identifiable figures such as animals) were published by Bird (1961, 1962, 1963a); they were republished numerous times by other authors. The following pages present a full catalog of these transposed-warp textile designs. New details are given about the specimens which have been published already, but more than half the designs here are published for the first time. Not all textile fragments made with this technique warrant illustration since they are too fragmentary to detect any clear design. In addition, some geometric designs are not illustrated. However, all specimens are described in their appropriate groups. The classification of transposed-warp textiles utilizes the nine groups described in the Textile Code XII—Twining Warp Movement. Table 20 presents the number of specimens in each group, and their stratigraphic position. It includes all fabrics of every group, whether or not they were sufficiently intact to produce a design.

Bird recognized in his first analyses and groupings of the twined fabrics that the transposition of warps, restricted to smaller or larger areas within the textiles, was made with the intention of creating patterns. Thus, these specimens were separated within the excavation units from those called twined fabrics with “paired parallel warp” (later named “plain twining”) and other categories. They were cataloged as “Twining paired warps, patterned zigzag warps.” Some of these were plotted, as is mentioned in the following descriptions, but their complex motifs were never detected. This is understandable since twining as a technique had not been studied previously, and since it was not known that warp manipulation might be used to create representational figures. Early in the analysis, Bird was able to reconstruct the double-head-

ed bird in the woven piece with warp floats (41.2/1205). That reconstruction was relatively simple, since the techniques used in that fabric are widely used elsewhere.

In 1960, plotting was improved to the point that complete representational and geometric designs could be recovered. These more precise plottings involved both greater accuracy in charting the warps, and improved strategy for observing and recording their movement.

After several designs were discovered, a second check was made in 1963 of all transposed-warp fragments previously considered too poorly preserved or too small. Several new patterns were recovered. At the same time, newly reconstructed geometric designs demonstrated that the first version of the code on warp movement was inadequate. The code was therefore redone. Its revised form appears in this publication (Appendix 1, Code XII). Corrections with new numbers were made on the data sheets.

For tracing the warp movement, a low-power microscope was used (fig. 91). It was fixed to a stand with a long arm which could extend out from the support post. The long arm was particularly helpful for analyzing the larger textiles. The microscope table was adjustable for height and level. Higher magnification was used mainly for fiber analysis and identification. The fabric was placed on a Homosote board lined with off-white contact paper, or on cardboard, so the textile was not handled when moved. The fabric was placed in the warp direction (up and down to the microscope observer) while being examined. A blunted dental tool, pins, and thread served for counting and marking. Some of the following illustrations show modern threads which often mark the design or patterned areas.

Choosing the correct weft space from which to start plotting is important. It should be the one with the highest number of intact warps. In most of the transposed-warp techniques dealt with, the warps slant either left to right or right to left, individually or in groups. Within the chosen weft space one starts

TABLE 20  
Twining—Transposed-Warp Movement (Code XII)  
Test Pit 3 (HP 3)

Layers	I #11	I #12	II	III	IV	V	VI	VII	VIII	IX	Totals
I C	3	—	—	—	—	—	—	—	—	—	3
D	7	1	—	—	—	1	—	—	1	—	10
E	4	—	—	—	—	2	—	—	—	—	6
II F	3	—	—	—	1	—	—	—	—	—	4
G	5	1	1	—	2	4	—	—	—	—	13
III H	6	—	1	2	1	5	—	1	—	—	16
H <sub>2</sub> I <sub>2</sub>	3	—	—	2	5	2	—	—	—	—	12
I	6	—	—	—	6	3	1	2	—	—	18
J	5	—	2	3	3	7	—	—	—	1	21
IV K	—	—	—	1	3	10	—	1	—	—	15
L	—	—	—	3	7	9	3	2	—	—	24
M	—	—	1	4	—	37	19	4	—	—	65
V N	—	—	—	2	—	12	3	1	—	—	18
O	—	—	1	—	—	6	1	1	—	—	9
VI P	—	—	—	—	—	—	—	—	—	—	—
Q	—	—	—	—	—	—	—	—	—	—	—
R	—	—	—	—	—	—	—	—	—	—	—
W.T. Lots 1-5	2	2	—	1	—	—	—	—	—	—	5
Sample 2 Middle	5	1	1	—	1	—	1	1	—	—	10
Position Uncertain	2	—	—	2	1	3	—	—	—	—	8
Totals	51	5	7	20	30	101	28	13	1	1	257
Percentage	0.20	0.02	0.03	0.08	0.12	0.39	0.11	0.05	0.003	0.003	—

Test Pit 2 produced only 7 specimens with twining transposed-warp movement: one specimen (Group IV) in layer G; six (Group V) were distributed with two specimens each in layers A, B, and G.

counting left and right from a point where the direction of the warp slant changes and therefore forms a "V." One assigns two arbitrary colors to the slants, one for each direction. The plotting of the first weft space must be executed with utmost precision and should be well marked, both on the textile and chart, since it establishes the arbitrary color distribution of the warps. In poorly preserved areas of the fabric, one is often obligated to return to this starting point in order to trace a single warp to an area where the warps are held in position by wefts. The textile fragments are of irregular shape and state of preservation. Therefore, the plotting progresses in all directions from the starting point.

After the plotting of a fragment was complete, a translucent plastic overlay was placed over the plotting, and lines were drawn on

the overlay where a change in the warp movement (that is, the warps' slant) indicated a color change. Areas of different colors revealed different patterns and designs.

In the following illustrations of textile motifs, the straight lines and dense dots indicate the plotted design as it is found in the fabric. The reconstructed segments, based on plotted evidence indicating the repetition of the motif, are shown by broken lines and sparse dotting.

The exact identification of the motifs is naturally somewhat arbitrary. Figures are named fish, shrimp, cats, and so on because of a general similarity to those animals and because such designations permit one to differentiate and refer to the motifs in a simple way.

The length (l.) of a specimen is the maxi-



FIG. 91. Plotting a preceramic textile on graph paper. The microscope is used at two and four power. Threads and pins are inserted into the fabric to mark plotted points. AMNH neg. no. 2a-6934.

mum measurement that can be made across its warps; the width (w.) is the broadest point across its wefts. All measurements are of in-

complete (fragmentary) textiles unless it is noted that the length or width is complete (comp.)

### GROUP I—MISCELLANEOUS AND ACCIDENTAL TYPE

The Textile Code explains this group's category 11 as accidental crossings of warps. Fifty-one specimens were recorded with this feature. No comment is justified except, perhaps, that their chronological distribution spans layers J to C in Test Pit 3.

Only five fabrics fall into category 12 of Group I. The code notes that the function of transposing the warps is merely to redistribute the warp sequence. Specimen 41.2/2188 is an example of this feature.

Specimen 41.2/2443, described and illustrated with Group II, is the only textile with Group I warp movement that is made entirely of cotton. All others have warps made with bast blended with cotton, or plyed with cotton.

Title and no.: 41.2/2188—HP 3, Wheelbarrow Trench, Lot 4

l. 53 cm, w. 18 cm

Bird wrote the following description in Textile Notebook No. 5:

Transposing the same 20 pairs of warps, handled in 5 sets of 4 pairs each, occurs 7 times in the incomplete length. An eighth occurrence is incidental at one end. The transposition at each occurrence is limited to the space between 2 weft rows. The warp then run parallel for 8 and 9 weft spaces, and are again transposed to return to their original positions. This would yield a noticeable effect only if the warps involved were of contrasting colors or shades. At either side of the patterned area the warps are alternately cotton and cotton plyed with bast fiber. Some blended cotton-bast yarns are within the transposed warp area in addition to all cotton and cotton by bast yarns. No color contrasts can now be detected, so to check possible color effects, a diagram was made with a color assigned to each of the three types of yarn present. No regular repetition of color is evident on this basis, so either the distribution of color did not follow exactly the yarn type, or lateral regularity of color repeat was not essential. In the latter case the overall effort came from the regular occurrence of the transposed areas. One other feature is worth noting when discussing counting as a feature of fabric construction. That is the evident counting of weft spaces with one error in 7 repeats, where 8 instead of 9 spaces were assigned. The distances between the transposed

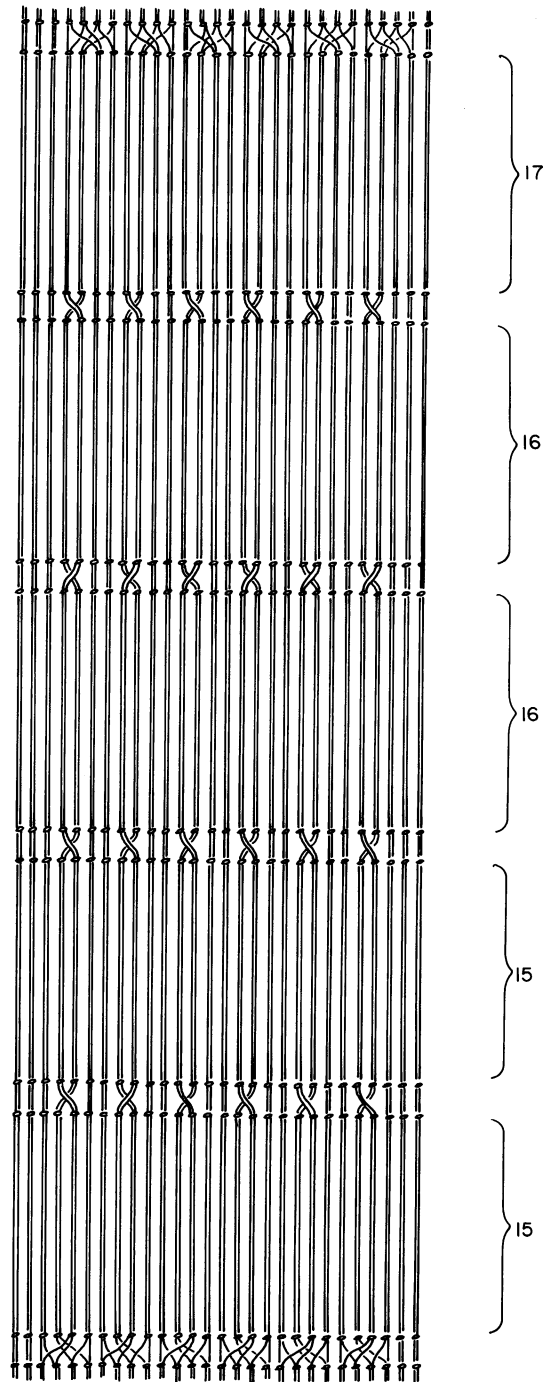


FIG. 92. Plotting of plain twining with crossed warp pairs at intervals. Numbers on right indicate weft rows. 19 weft rows equal 5 cm. 41.2/2433, HP 3, Sample 2.

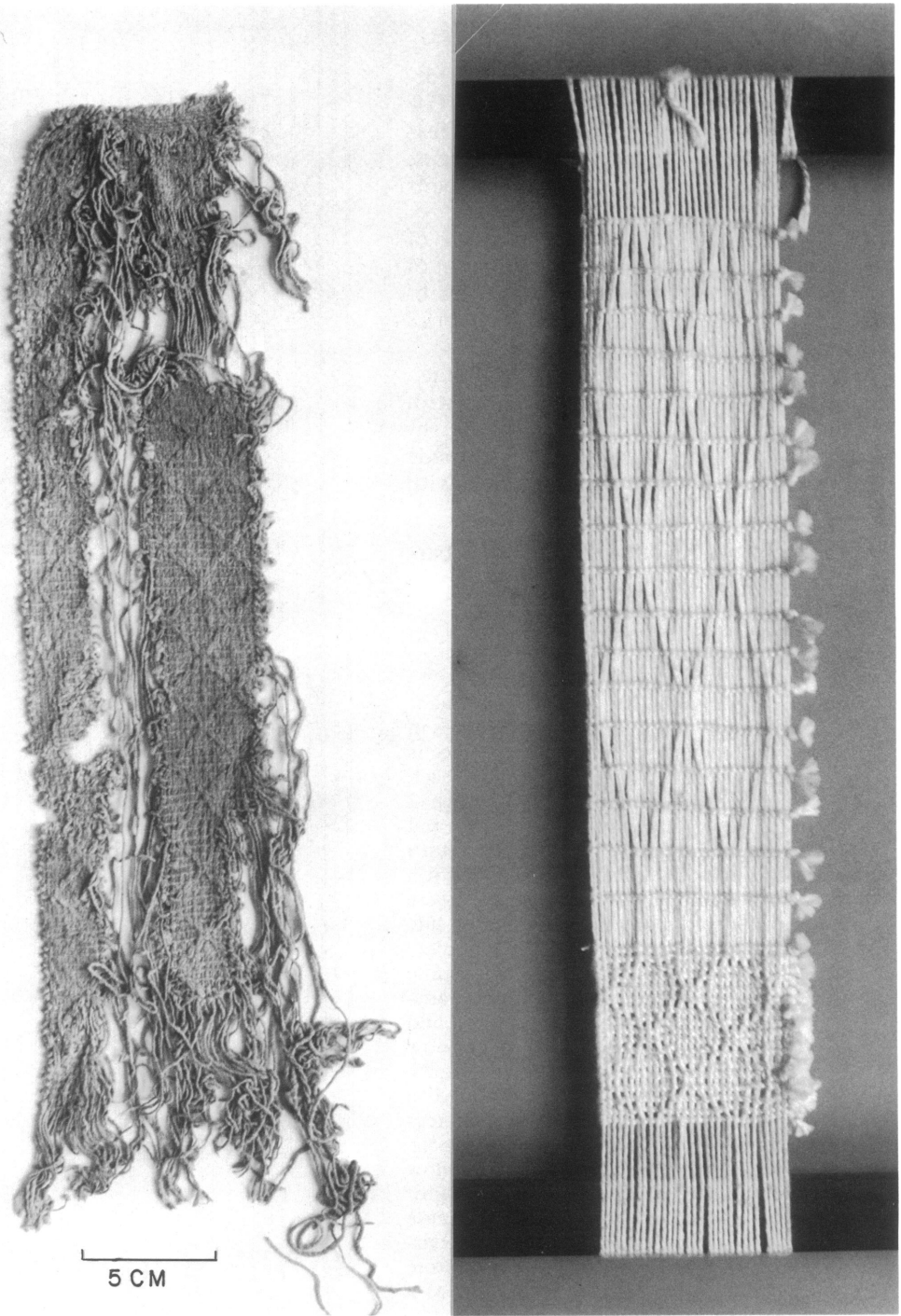


FIG. 93. Left: Staggered crossings of adjacent warp pairs creates an overall diamond pattern in fabric 41.2/1334A. Model (right) replicates specimen on left. In the upper part the wefts are widely spaced, and in the lower part they are compacted as in the original textile.

warp areas varies from 4.8 to 5 cm where 9 weft spaces occur. In the one place where 8 are used, the distance measures 4.6 cm.

Four other specimens (41.1/9325—HP 3, D; 41.1/9759—HP 3, G; 41.2/2187—HP 3, Lot 4; 41.2/2433—HP 3, Sample 2, Middle) are all similar to the one described above by Bird.

### GROUP II—PAIR-TRANSPOSITION TYPE

This warp movement is distributed between layers O to G in Test Pit 3. Only seven fabrics were made with this warp manipulation, most in combination with one or more other warp movements. Six of the fabrics have category 21 assigned to them and only one is assigned category 22. The simplest pattern consists of crossed warp pairs at intervals within one weft space (fig. 92), with various lengths of plain twining between them (e.g., 41.2/84—HP 3, H; 41.2/1693—HP 3, M; 41.2/2433 HP 3—Sample 2, Middle).

The staggered crossing of adjacent warp pairs creates an overall pattern of diamonds as in fabric 41.2/1334A found in HP 3, J (fig. 93). It is an all-cotton fabric 39 cm long and 9 cm wide. It has only one end selvage with no warp-end loops left. The end finish consists of five rows of compact twining. There is also a terminal selvage made with overhand bend knots. A reproduction was made on a frame with sustained warps.

The same warp movement was used in the stripes of concentric diamonds in specimen 41.2/2551 described in the section on condor-type warp movement in this chapter. See also specimens 41.2/1693 and 2021 dealt with in the sections on Groups VII and IX.

Three of the seven fabrics are made entirely of cotton; the others have some cotton warps mixed with bast fibers.

### GROUP III—SINGLE-WARP TRANSPOSITION TYPE

In this group a variety of pattern effects is achieved by an interplay of crossings of one element of a pair of warps over or under the adjacent pair of warps. The single transposed warp is always joined with another warp to be twined as a pair, or twined with a pair of

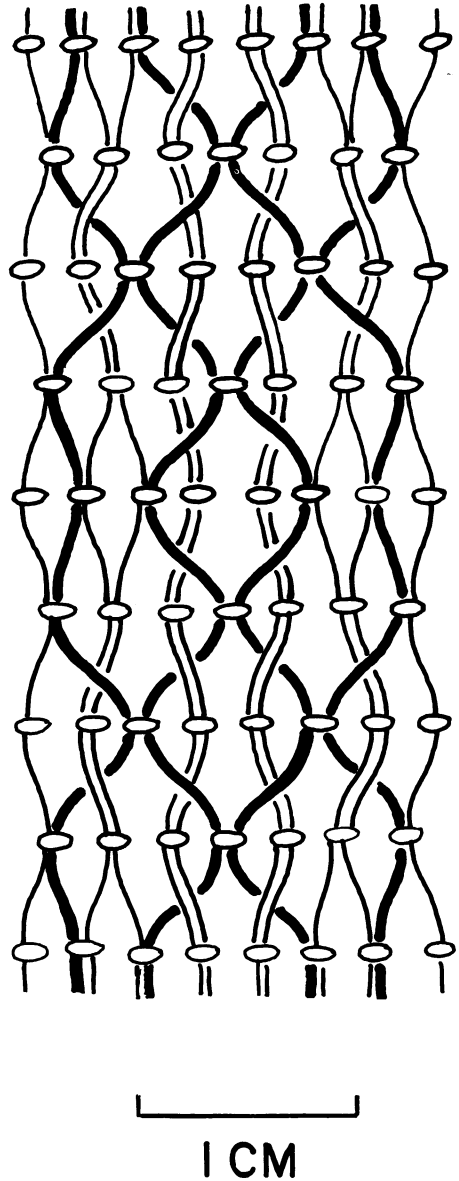


FIG. 94. Drawing of segment of textile showing diamonds created by crossing of single warps. 41.2/1559.

warps. Examples of such possibilities are illustrated in the Textile Code. The patterns vary depending on the frequency of the warp crossings, whether they are isolated, overall, or in stripes, and whether they are used on a field of plain or split-pair twining. The distribution of this group is from layer N to H.

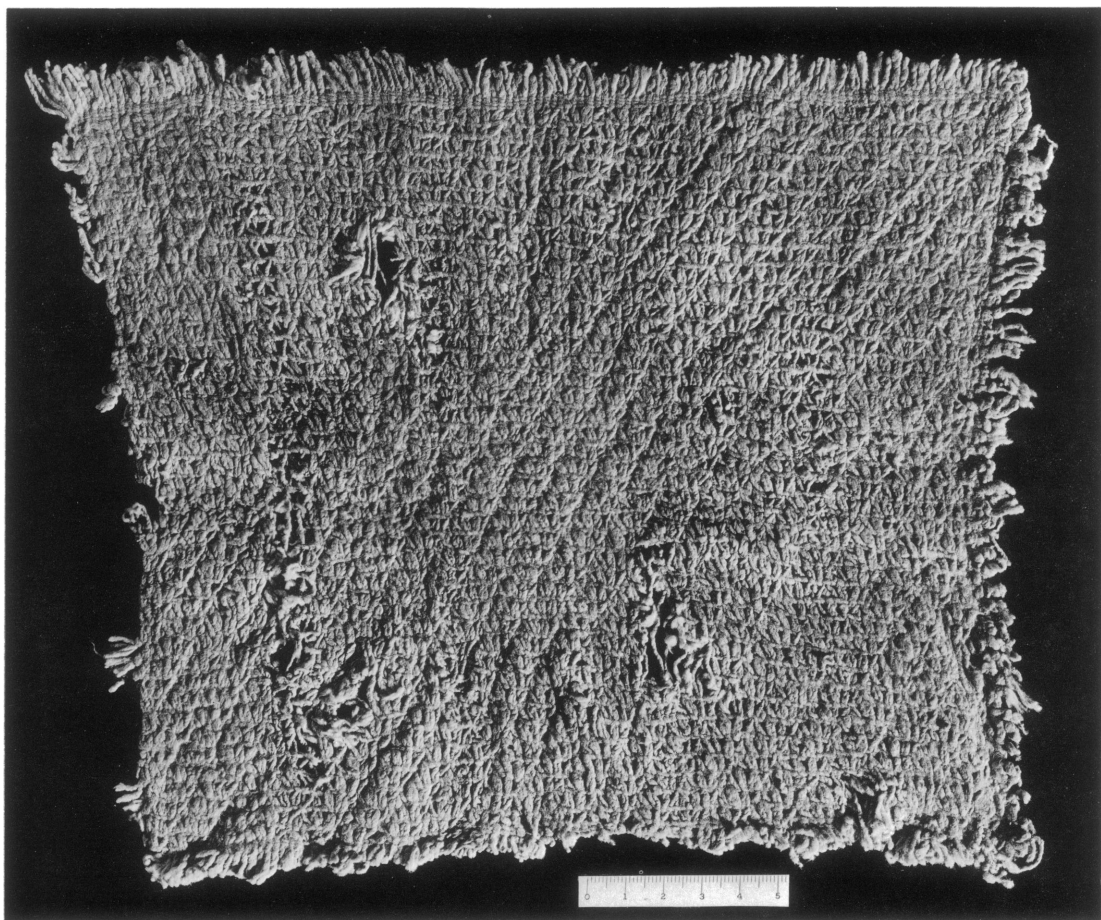


FIG. 95. Fabric 41.2/1563.

Seven have stripes with the transposed single warps forming diamonds which shift from one face of the fabric to the other, or remain all on one face. Fabrics with this feature are: 41.2/2035, 1521, 1693, 2085, 2151, 2244, and 2297D. In four other fabrics the shifting of transposed warps from face to face of the fabrics create X figures: 41.2/1048, 1049, 1289, 2084. A small chevron pattern stripe, where the single warps work in opposition with a blue pair of warps, is found in specimen 41.2/2060. It also has a plain blue warp stripe. These specimens serve as examples for code illustrations.

In Group III, 12 specimens of the 19 are made entirely of cotton. Four have some bast. One has no record of fiber content since it consists of a number of very small fragments. Bast is used only in textiles with a less com-

plex pattern, namely the ones with X figures and narrow stripes of diamonds.

Title and no.: 41.2/1559—HP 3, L  
l. 12 cm, w. 10 cm

A stripe of double diamonds is created by the crossing of single warps on a field of split-pair twining (fig. 94). This is similar to a stripe in specimen 41.2/1499 (Shrimp) described in the condor-type warp movement section. It differs in that the inner outline of the diamond is made with paired warps.

Title and no.: 41.2/1563—HP 3, L  
Comp. l. 19.5 cm, comp. w. 25.5 cm

This textile was created with 122 warp pairs, not counting the two blue warp pairs at the primary selvage and three blue pairs at the terminal selvage (fig. 95). All 122 pairs were

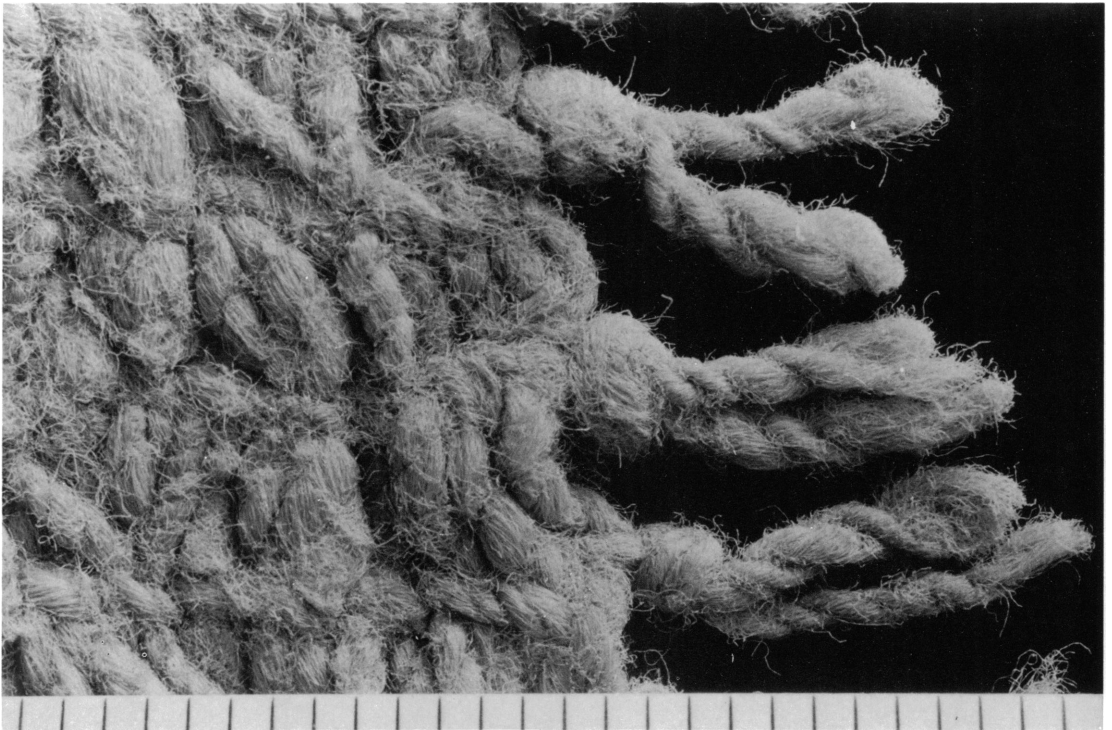


FIG. 96. Terminal selvage and warp crossings of fabric 41.2/1563.

used in creating the overall diagonal pattern effect.

Only four other warp pairs are blue, the 41st and 44th pairs counting from the primary selvage. Some of the warps have a reddish or brownish tint, but distribution cannot be traced due to fading.

The primary selvage knots are of two types, with all wefts starting around four blue warps. Of 40 weft rows, 19 are made with a single turn; 18 are overhand bends; three are missing. The terminal knots are all formed in the following manner (fig. 96). The weft yarns make a twist outside the last warp pair after which one weft element turns around the same pair, sometimes two pairs, and meets the other weft element to form an overhand bend knot.

The two blue warp pairs at the primary selvage are knotted before they turn to create the two compact weft rows of the end finish at one end. The opposite end finish is made with three blue compact weft rows which turn into the three warp pairs at the terminal selvage. They are also knotted before the turn.

This proves that the end finishes were made prior to the creation of the fabric. The same feature was found in specimen 41.2/2551.

Title and no.: 41.2/1700 a and b—HP 3, M  
l. 17 cm, w. 4 cm (fragment a)

l. 14 cm, w. 4 cm (fragment b)

The overall pattern in this textile is made by the manipulation of seven warp pairs in four weft spaces to create a grid of diamonds (fig. 97). Both fragments have a reddish color. It is difficult to conclude if the red pigment was applied or rubbed on the yarns or on the finished product. The end finish is made with three compact weft rows made with blue yarns. A 1.5 cm warp end fringe extends beyond the end finish.

Title and no.: 41.2/1286—HP 3, H2I2

This complete textile is described and illustrated (fig. 130) in the condor-type warp movement section since a portion of the textile has representational designs. However, the larger part of the textile, 13 cm wide, has six zigzag bands. The apexes of each of the adjacent zigzags are close enough to each oth-

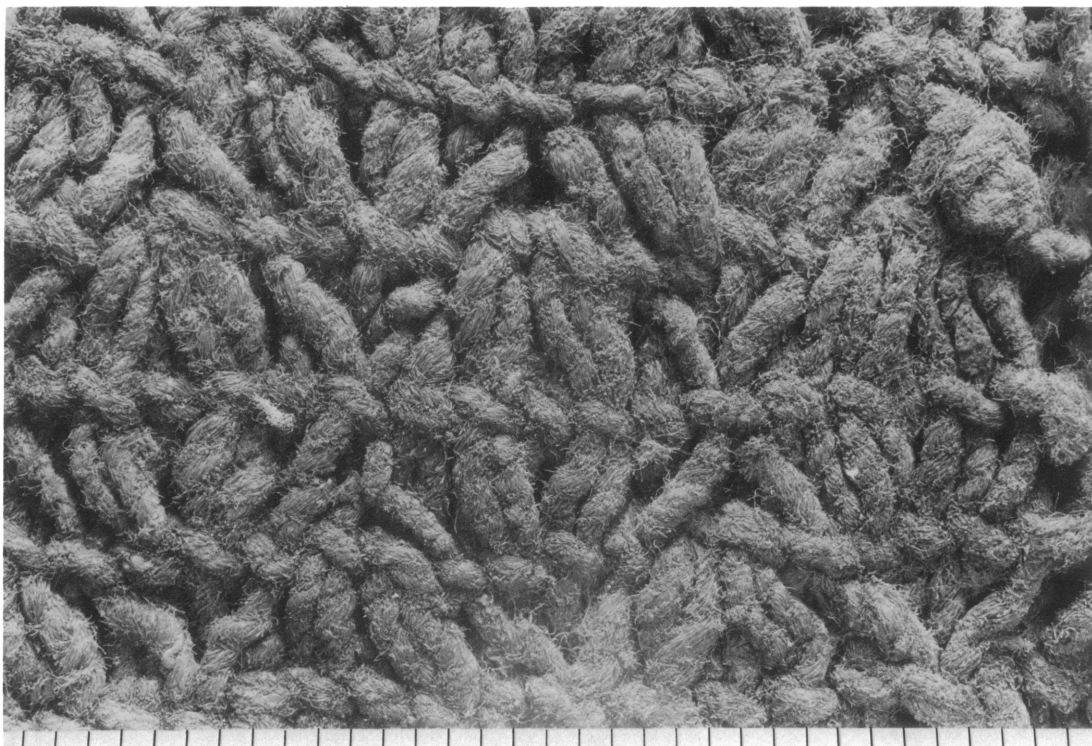


FIG. 97. Detail of warp crossings in fabric 41.2/1700.

er to create an outline of solid diamonds of split-pair twining. The fabric has traces of red pigment. The crossings of single warps falls in category 32 of the Textile Code. A reproduction of the pattern was made on a frame with sustained warps (fig. 98).

Specimen 41.2/2021 has three other types of warp movement and is discussed in Group IX.

#### GROUP IV—WOODLAND-TYPE TRANSPOSED WARP

This technique is given the name woodland type because North American Eastern Woodland Indians used the same technique to make bags (fig. 99). The warp manipulation is described in the Textile Code XII. The textiles of this group are found from layer K up to layer L in Test Pit 3. A single specimen from Test Pit 2 comes from layer G1.

Specimen 41.1/9613 established the cate-

gory 41 of this group. The colored warps in this case were distributed, at the time of warping, in alternate pairs (2 red, 2 tan). This sequence was stabilized by the wefts at the warp ends. The warps were then transposed to form grids of diamonds in opposing colors.

This technique was used in 31 instances. There are only 29 specimens of this type, but some have a combination of groups. Category 40 was designed to accommodate specimens that were too small or too poorly preserved to be classified as anything but general woodland type. There are five specimens with this designation. Category 41, the basic woodlands type, was used in 15 instances. Its variant, category 42, was used 11 times.

The Textile Code XII notes that the distinction between the woodland- and condor-type warp movements lies primarily in the distribution of color at the time of warping, and subsequently in the warp manipulation. The color is distributed in alternating pairs, or within each pair of warps. With the ex-

ception of 41.1/9613, the only specimen in which color is well-preserved, and possibly 41.2/1564, all plotted patterns are either textual or geometric.

The distribution of the warp fibers is as follows: all-cotton warps are found in 12; bast-blended warps, or warps plyed with cotton, are found in 17. The one specimen with some color intact, the Two Human Figures (41.2/9613), is all cotton.

Half-twists are found in five specimens. Of those, three are purely geometric.

Title: Two Human Figures

No.: 41.1/9613—HP 3, F

l. 13 cm, w. 22 cm

It is the only representational design achieved in this technique (figs. 100, 101). The specimen is a corner fragment that retains a meticulously executed primary side selvage. The colors used are natural tan, dark blue, and red. The red has bled and makes the tan warps appear pinkish.

The design was laid out in three panels. The left panel is bordered at the primary selvage with a 1.6 cm band of plain twining with paired warps. The very edge consists of four pairs of dark blue warps. The design in this panel represents a standing human figure with solid feet and rigid, upright legs. The figure wears a "skirt" with a geometric, symmetrical pattern consisting of two diamond-shaped motifs, the centers of which employ the half twist between two weft rows. The hands of the figure are disproportionately large, each positioned as fists in front of the chest. There is a collarlike pattern at the neck level. The head is missing. There is a hole at the shoulder level of this figure, but enough details of the transposition of the warps remain to justify a symmetrical reconstruction.

The right panel also has a standing human figure. The feet are similar to those of the first figure, but the legs slant outward. Between them is a geometric pattern with a half-twist in the center. The top of the figure is asymmetrical. One fully defined arm is bent, with the hand (possibly with staff?) positioned above the waist. The other arm is raised, its hand holding a pointed object which slants in one direction. Several weft rows at the neck level have an asymmetrical pattern, probably related to the figure's head. As with the first

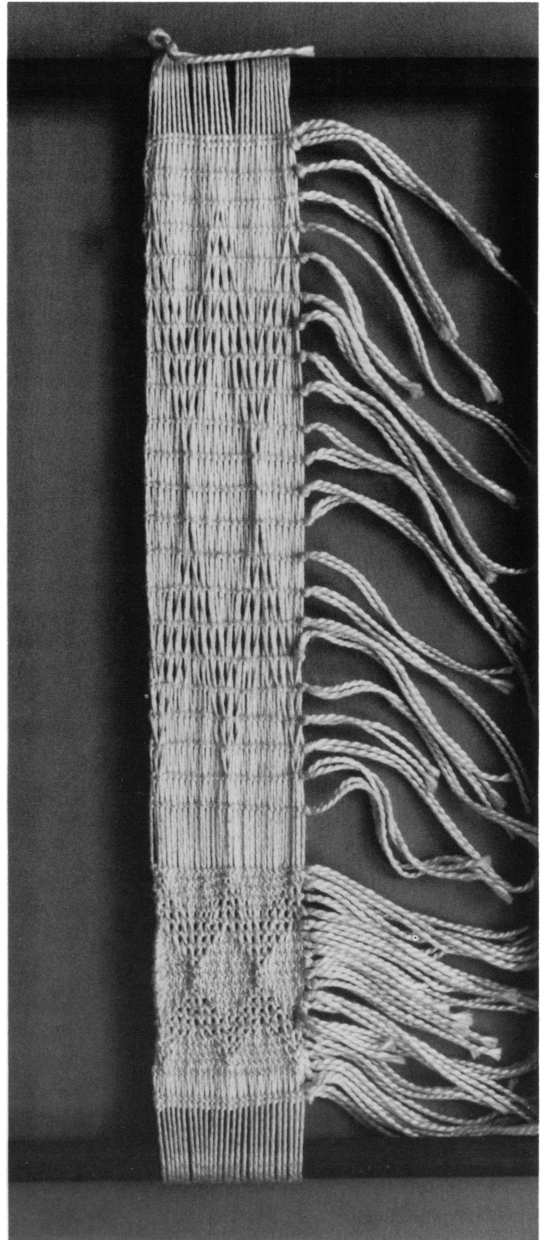


FIG. 98. Model of geometric design in fabric 41.2/1286.

figure, the portion of the fabric with the head is missing. Both human figures are red, with tan outlines and details.

The panel that divides the figures is dark blue and red. It has two figures: (1) An

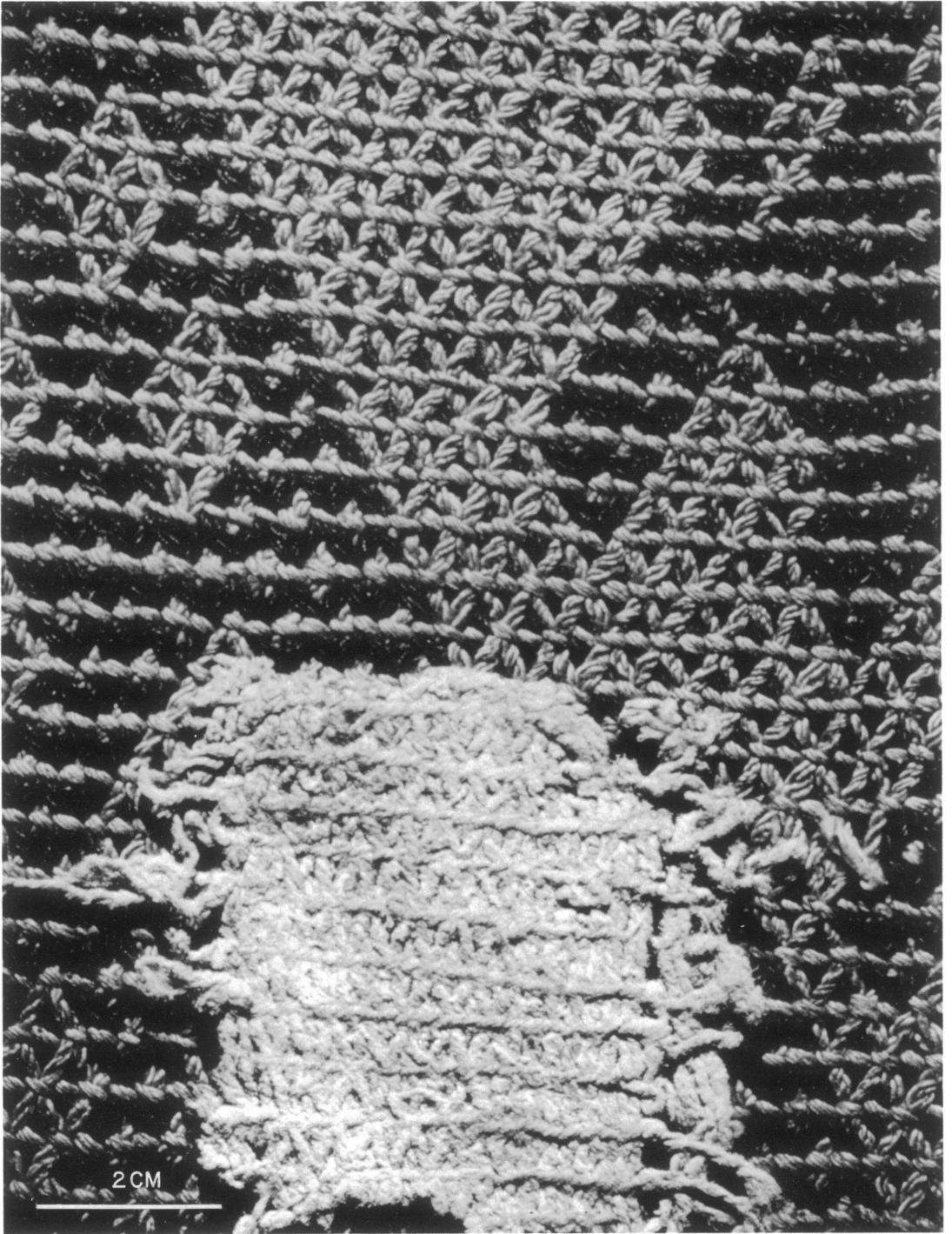


FIG. 99. Fabric 41.1/9827, HP 3—G, on Eastern Woodland bag, 50.1/7407. The warp movement of each is identical.

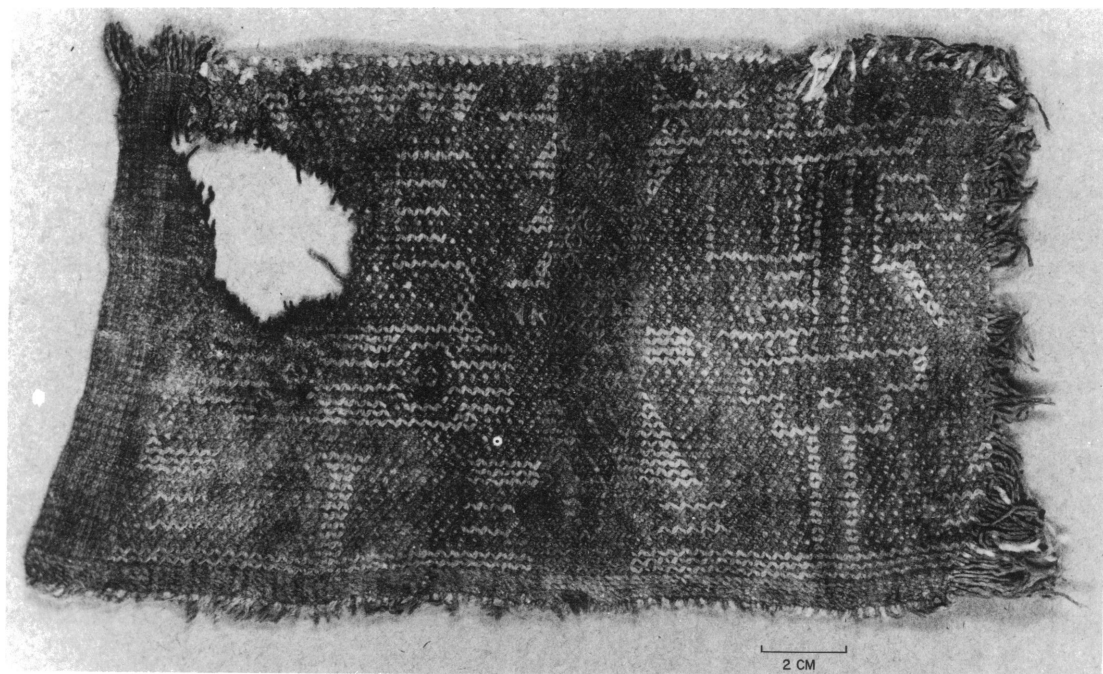


FIG. 100. Fabric 41.1/9613, Two Human Figures.

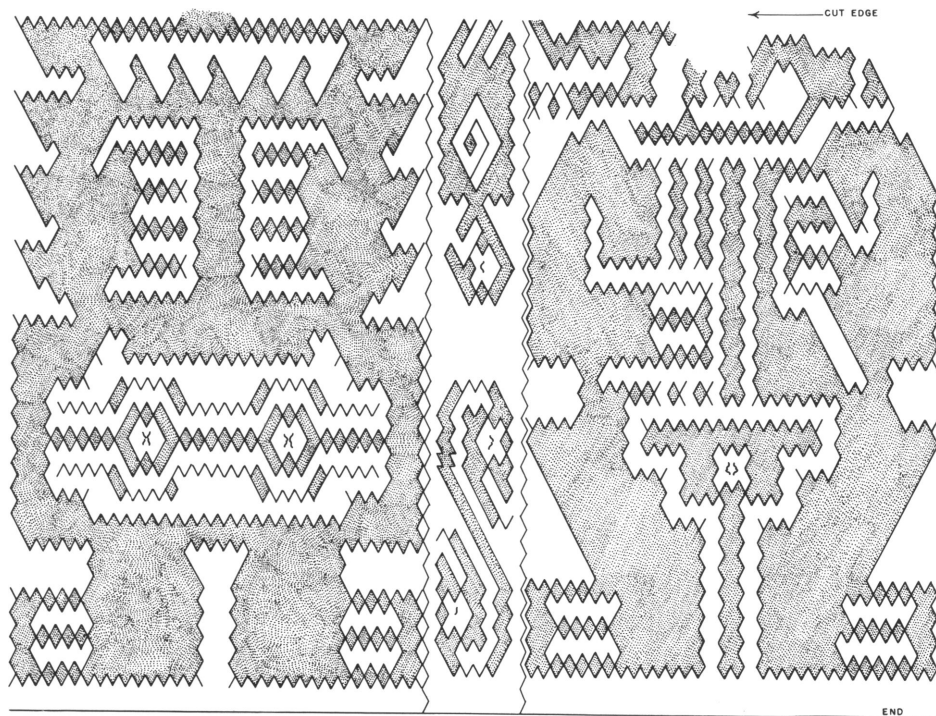


FIG. 101. Drawing of design in fabric 41.1/9613, Two Human Figures.

S-shaped design with bird or snake (?) heads at each end, and (2) A bird head in profile with a geometric spiral in its body. All the heads have half-twists indicating eyes.

Blue yarn is used not only in the side selvage, but as weft yarns in the end finish, which has five rows of compact twining bordered on each side with one row of twining in red. A worn warp-end fringe of uneven length remains at this end (fig. 79).

This design was plotted very accurately prior to 1957. The specimen file card indicates that only zigzag, lozenge, and diagonal patterns were discerned. The overall design was not recognized.

Two other very small fragments (41.2/1564—HP 3 L, and 41.2/1048—HP 3 GH) have plots with some vague similarity to 41.1/9613.

In the specimens without color, one must assign color arbitrarily to the warps. In some cases, the manner in which this is done yields naturally different visual results. The following three textiles (41.2/1173, 1287, and 1500) are examples of this. Different colors are represented by the fine and thick lines in their designs.

Title and no.: 41.2/1173 a and b—HP 3, I  
Comp. l. 12.5 cm, w. 8.5 cm

Bird was intrigued by this fragment because of its complete, but short, warp length. On the specimen file card he noted, "... in view of the compact nature of the piece, the closeness of weft rows, it is more probable that the warps were not secured at each end . . ." An attempt was made to make a model of the specimen with sustained warps, but the project was inconclusive.

The illustration (fig. 102) shows two interpretations of the design, one with alternate pairs of colored warps (all four warps create diamonds of the same color), and the other with each color represented within each warp pair.

Title and no.: 41.2/1287 a and b—HP 3, H2I2  
l. 15.5 cm, w. 12 cm (combined fragments)

The textile has a pattern stripe about 3.6 cm wide and is bound by split-pair twining. As indicated on the illustration, five weft rows are reconstructed on the basis of an existing

symmetrical repeat of movement. Two possibilities for color distribution are offered (fig. 103). Many warps are either plyed or blended bast with cotton, but not in accord with the pattern. Thus the fabric might have been monochrome originally.

Title and no.: 41.2/1500 a to g—HP 3, K  
l. 28 cm, w. 24 cm (largest fragment)

This fabric could be plotted only partially (fig. 104). The other six fragments are in poor condition. The fabric is made entirely of cotton. Some warps are S-spun and Z-doubled. Others are the reverse, Z-spun and S-doubled. Their distribution has no bearing on the pattern. There are two weft rows with traces of blue color.

The pattern consists of two identical narrow stripes involving 12 warps. They are divided by split-pair twining. There may have been more stripes, but the fabric's condition is too poor and the pattern too elementary to justify additional attempts at plotting.

Title and no.: 41.2/2243 a to f—HP 3, position uncertain

l. 20 cm, w. 24 cm (frag. a)

l. 42 cm, w. 12 cm (frag. b)

All fragments of this fabric are badly deteriorated, but it was possible to make plots of the larger fragments a and b (fig. 105). The largest, a, has four patterned stripes with split-pair twining between them. The widest stripe, with 31 warp pairs, was made with the condor-type warp movement. It depicts some kind of a representational design with the eye symbol, but is impossible to identify accurately. This stripe is bound on both sides by a narrow geometric pattern with small diamonds made with half twists distributed alternately from one side to the other. Each stripe is made with eight warp pairs. On the "left" side of this, after about 3.5 cm of split-pair twining, another stripe (not illustrated) made with nine warp pairs follows. In it, the warp pairs are not transposed throughout their length; after six or seven weft spaces, two weft spaces of plain twining divide the transposed warp units. Due to the poor condition of the specimen, no specific design could be recovered.

The b fragment fits below fragment a, and has a repetition of the same stripes.

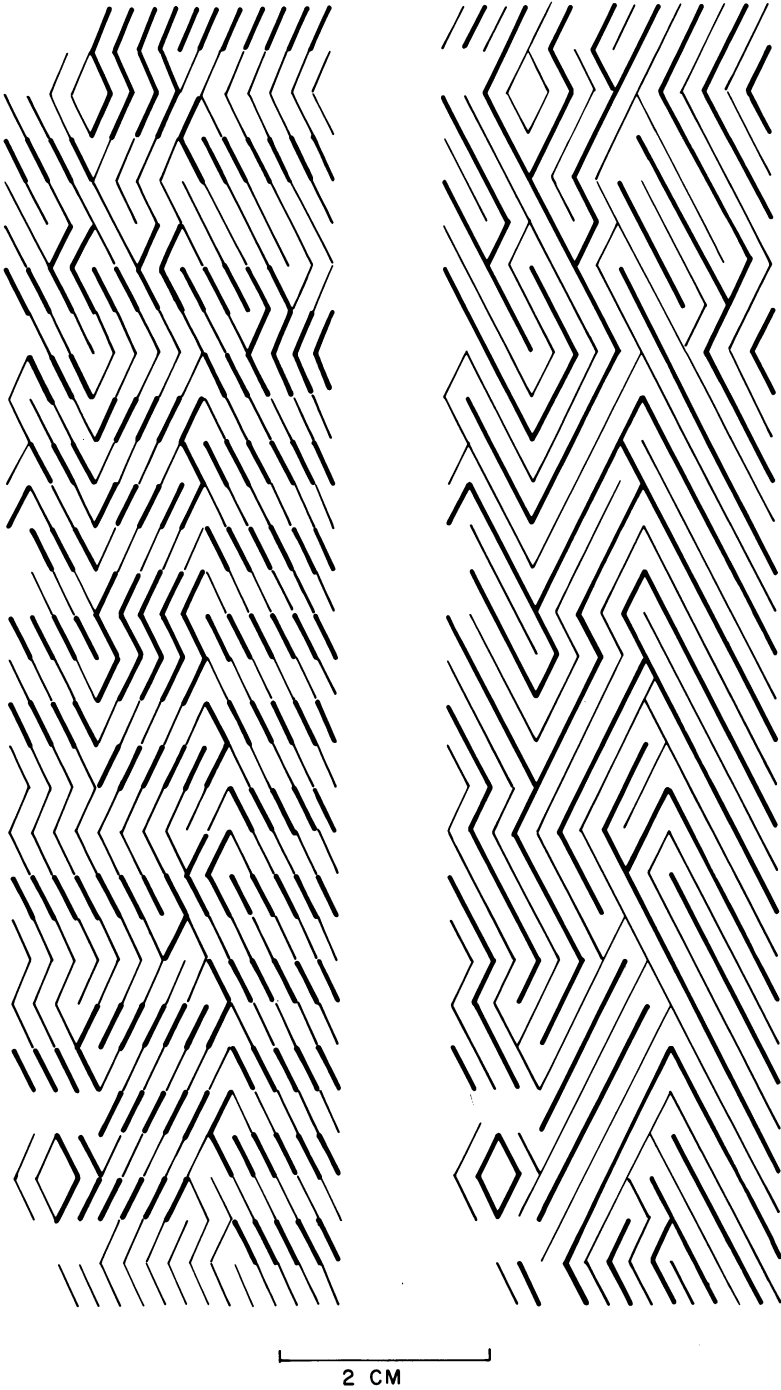


FIG. 102. Drawing of two possible color distributions in fabric 41.2/1173.

Title and no.: 41.2/1283—HP 3, H2I2  
l. 90 cm, w. 7 cm

This specimen has an unusual continuous

weft for several insertions which results in S and Z twining twist direction.

It has warp stripes with two tones of natural

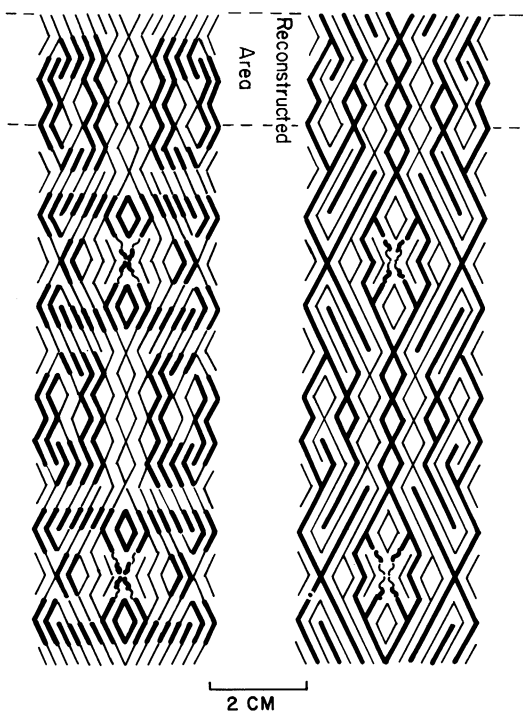


FIG. 103. Drawing of two possible color distributions in fabric 41.2/1287.

cotton, detectable mainly because of its disintegration. At the torn edge there is a patterned stripe which is incomplete in width. Its pattern is of blocks of transposed warps alternated with one or more rows of plain twining (fig. 106).

Title and no.: 41.2/1285 a to f—HP 3, H2I2 l. 58 cm, w. 23 cm (largest fragment)

Of the seven fragments composing this specimen, the largest has an end finish, and two different pattern stripes divided by 10.5 cm or 70 warp pairs. The pattern's characteristic is that it makes use of half-twists in four consecutive weft rows at relatively even intervals in opposing position, namely on both sides of the stripe. This detail occurs first in the fifth to eighth weft space near the left side of the stripe and then reappears again after 20 weft spaces near the right. It repeats on the opposite side after 22 weft spaces and reappears on the right after 24 spaces. Four weft spaces below, it reappears but not in its

complete form. If one disregards this possibly erroneous placement of the half-twist, then fragments c and b could fit below, giving the piece a minimum length of 84.5 cm.

The narrow stripe is made with approximately 20 warps. Its width is not complete. There are no half-twists in what remains.

This specimen's design is not illustrated because of its poor condition caused by considerable gaps in the fabric. The plotting is available.

Title and no.: 41.2/2041—HP 3, K trench l. 62 cm, w. 32 cm

This specimen has two patterned stripes with split-pair twining between them. One stripe is woodland type involving 16 warp pairs which create mostly blocks of diamonds of opposing (arbitrarily assigned) colors (fig. 107). In one section there is some deviation of pattern. The other patterned stripe is made with condor-type warp movement. The eye symbol is used once, but there is insufficient fabric to identify the motif.

Simple blocks of woodland-type warp movement occur in a plain-twining field in the following specimens:

- 41.2/9825—HP 3, G
- 41.2/9827—HP 3, G
- 41.2/1288—HP 3, H2I2
- 41.2/1384—HP 3, J
- 41.3/1386—HP 3, J
- 41.2/1567—HP 3, L
- 41.2/1588—HP 3, L
- 41.2/1970—HP 3, GHI
- 41.2/1988—HP 3, HI
- 41.2/2436—HP 3, Sample II, Middle
- 41.2/2610—HP 2, G

#### GROUP V—CONDOR TYPE

The first design recovered utilizing this technique was the Spread-Winged Male Condor (textile 41.2/1501, described below), and thus the method was named "condor type." The technique used to create this warp movement is described in Code XII, Group V. It is used to make almost all of the representational (nongeometric) motifs in the Huaca Prieta textiles.

Specimens from this group are found throughout most layers, from top to bottom,

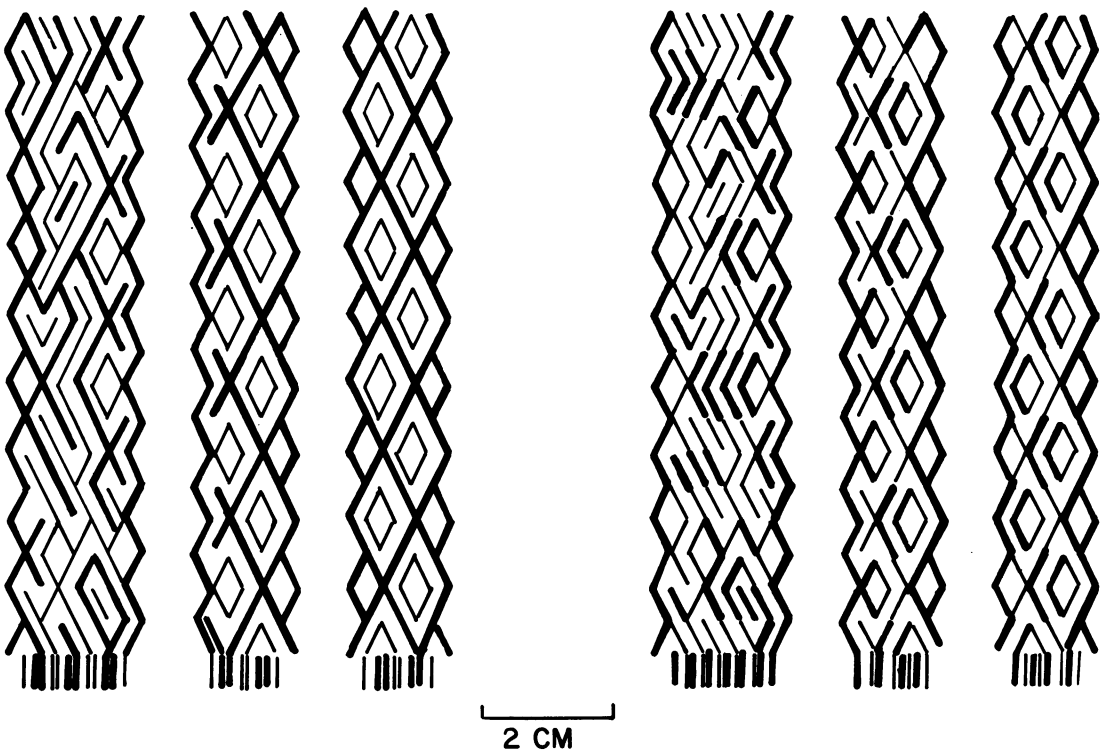


FIG. 104. Drawing of two possible color distributions in fabric 41.2/1500.

of Test Pits 2 and 3. There are 101 representatives from Test Pit 3 of this group. Nine fall into the questionable category 50. The fiber content of 80 specimens is entirely cotton. Twenty-one have warps with some bast plyed or blended with cotton. In most cases where bast is found in the warps, it is outside the patterned area. The distribution of bast in this group is limited to layers E to L of Test Pit 3. Test Pit 2 has six specimens classified in this group. They are all of cotton.

Both Test Pits 2 and 3 produced condor-type warp movement fabrics that were in such poor condition, or so small, that plotting was impossible, or, if attempted, was unable to produce decipherable designs or patterns. Two of these (41.2/2589 and 2590 a to c) are associated with the child burial 99.1/905 in Test Pit 2. Figure 108 demonstrates the insufficient, yet tempting, nature of the design extracted from specimen 41.2/2589. Twenty-eight different plottings of specimens from Test Pit 3 also produced limited evidence of their patterns or designs. They are not pub-

lished here. All were given the same attention and energy devoted to the published specimens.

Title: Spread-Winged Male Condor with Snake in Stomach

No: 41.2/1501—HP 3, K

l. 10.5 cm, w. 21 cm

This is the best-preserved piece of this group (fig. 109); however, it took two attempts at plotting the warp movement to recover the design (fig. 110).

The first analysis (done in the early 1950s) describes the technique of the piece as “twinning, Z, paired warps, zigzag warps with occasional diamonds—upper warps remain on top except when angle of zigzag is changed.” Thus the movement of the warps from one face to the other of the fabric was well understood, but the overall design was not detected. Bird’s comments on the specimen file card indicate that he detected a “rather intricate pattern,” and had counted points at which

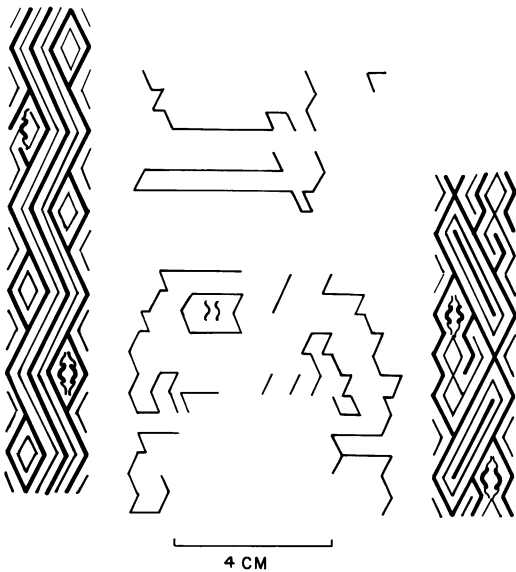


FIG. 105. Drawing of design in fabric 41.2/2243.

the warps moved. When the fragment was given its museum catalog number in 1959, it, and all other specimens of its type, were still described as “twining, transposed 2-ply warps zig-zag etc.” In 1960, the textile was plotted again, this time with great precision, and the condor design was revealed for the first time. Bird pointed out that the condor was a male because of the bump on its beak (fig. 111). This fabric retains two faint colors, a very light blue and natural tan.

Title: “Eye” Symbol in Square Units

No.: 41.2/1441 a to f—HP 3, J

l. 33 cm, w. 22 cm (fragment a)

The largest fragment, a, has been united with six much smaller specimens (originally nos. 1385, 1441, 1442, 1443). Bird assembled them under number 1441 on the basis of similar warp manipulation and design.

Twenty-two warp pairs are manipulated to create rectangles 4 cm wide and 4.3 cm long in a field of plain twining. Six warp pairs with a half-twist form a small rectangle in the center of each larger rectangle. These half-twists create a subtle or small color change. In many Group V textiles they are used to indicate eye

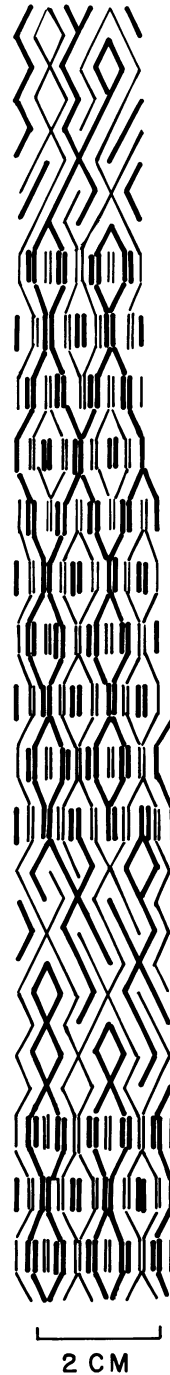


FIG. 106. Drawing of design in fabric 41.2/1283.

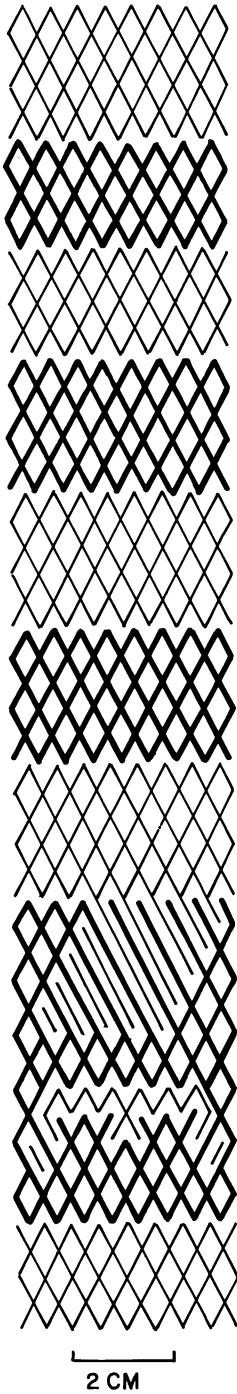


FIG. 107. Drawing of patterned stripe in fabric 41.2/2041.

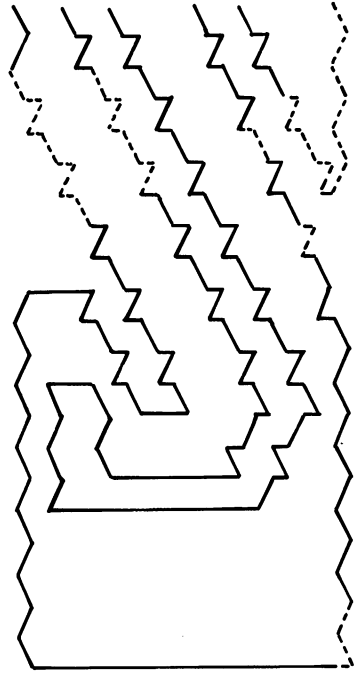


FIG. 108. Drawing of partially recovered design of fabric 41.2/2589, HP 2-B.

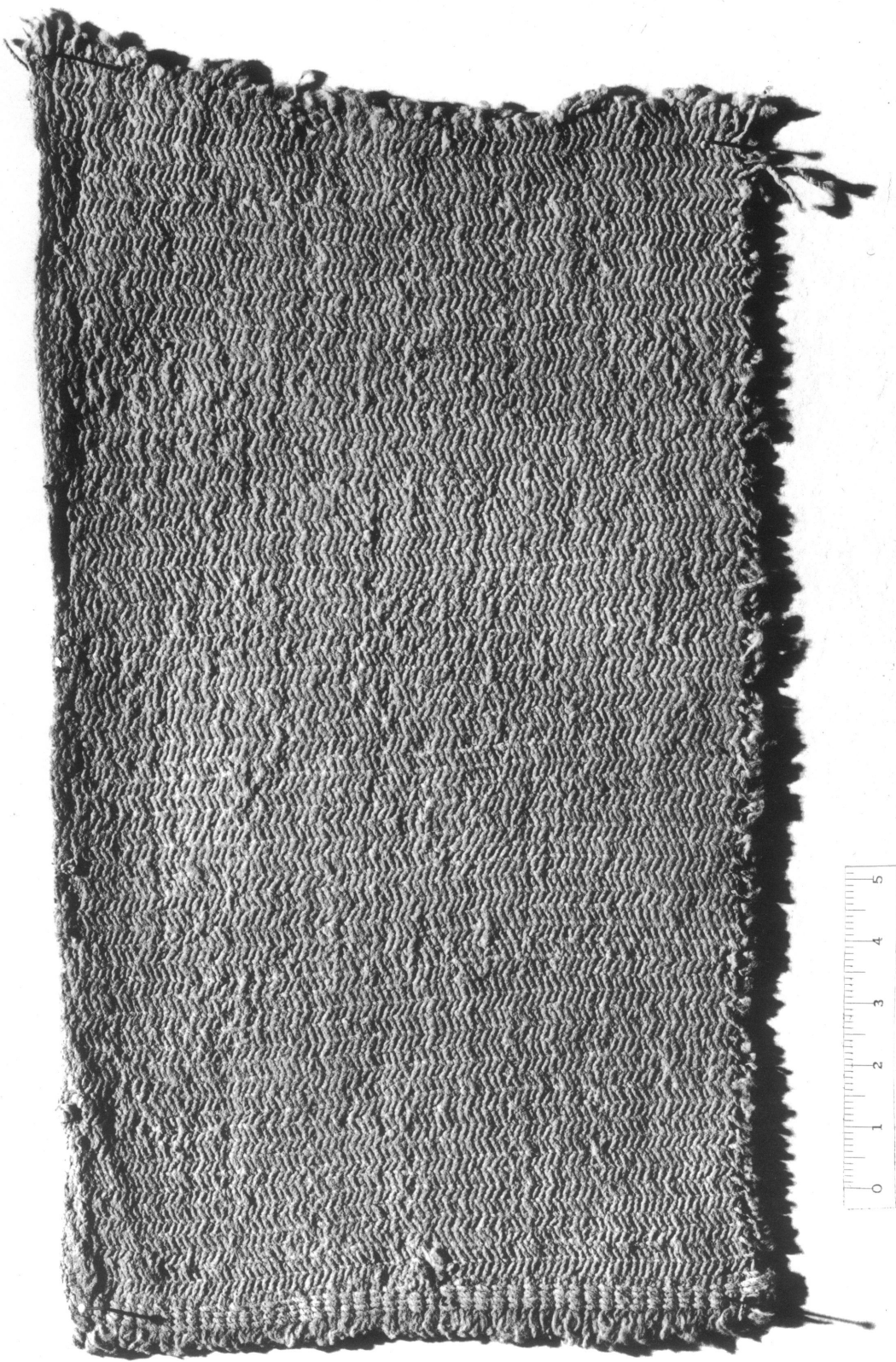


FIG. 109. Fabric 41.2/1501, Spread-Winged Male Condor.

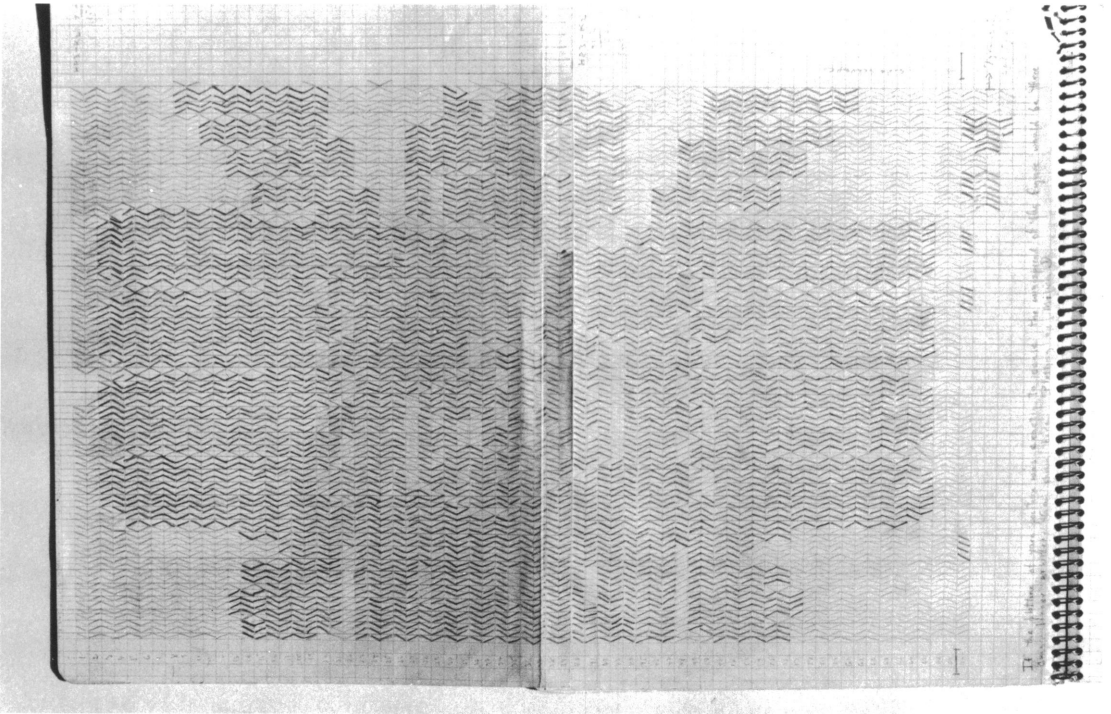


FIG. 110. Plotting of fabric 41.2/1501, Spread-Winged Male Condor.

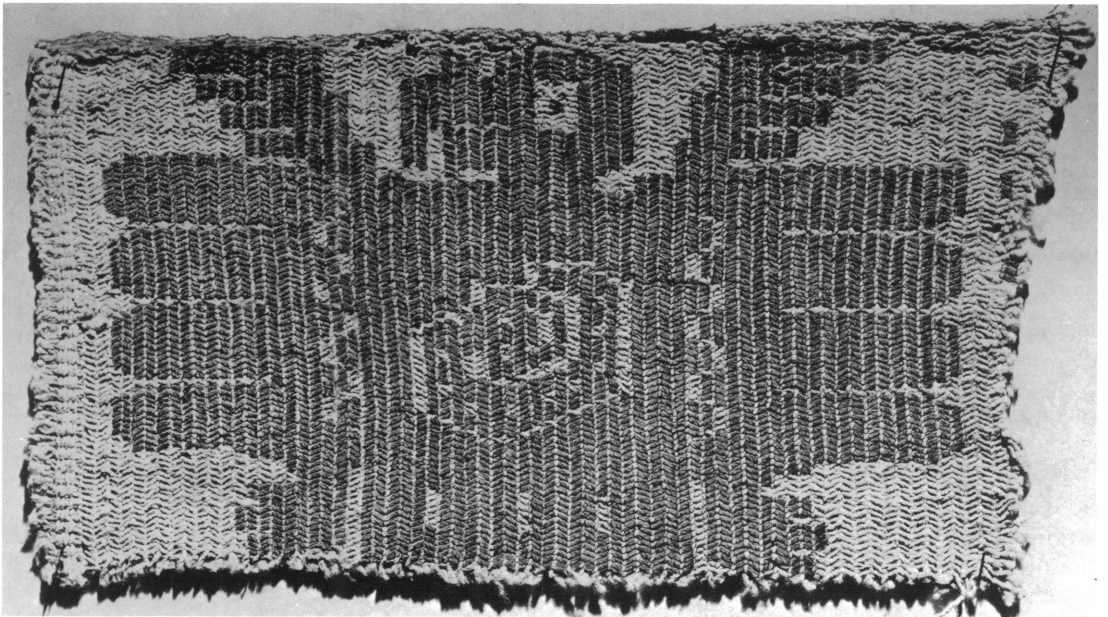


FIG. 111. Retouched photograph of fabric 41.2/1501 creates the condor as it originally appeared.

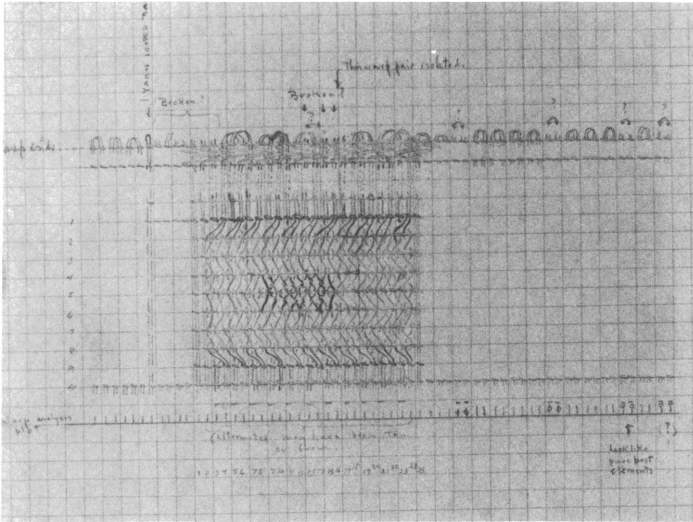


FIG. 112. Junius Bird's drawing of eye symbol in fabric 41.2/1441 (previously 41.2/1443).

pupils in representational designs. Thus this motif is called the “eye” symbol (figs. 112, 113).

All of the fragments of this specimen have some bast, plied or blended with cotton, outside the patterned area. In Textile Notebook 6, Bird wrote: “In its present condition, no visible color difference can be noted amongst the 22 warps of the transposed warp area nor between them and the adjacent pairs. Without color contrast there was little point in the manipulation. With colors the figure would be bold and clear.”

This same pattern, combined with plain twining, is found in specimens 41.2/81a, 1333, and 1383. The last has an overall application of red pigment.

Title: Synthesis Textile  
 No.: 41.2/2551 a to c—HP 3, 0  
 Comp. l. 27.5 cm, comp. w. 29.5 cm

This fabric is remarkable because it synthesizes all the features and their subtle distinctions found in the Huaca Prieta.

It was found associated with a burial (99.1/903) with other notable grave goods. The low stratigraphic position of the fabric makes it the oldest almost-complete patterned fabric of this entire collection. Some sections of the fabric are missing but most of the four sel-

vages are preserved. The selvages are of special interest. They are dark blue in color and reveal a manner of warping that will be discussed below.

The body of the fabric is made in three colors: natural brown, natural tan, and red-pigmented. The edging is blue-dyed. The colors are still faintly visible. Three different yarns, each of a different construction, were used.

There are six patterned stripes divided by split-pair twining (figs. 114, 115). Besides the “condor-type” which is used in the pattern stripes two and four, two other types of warp movement are used to create stripes with geometric patterns.

Patterned stripes one, three, and six each have 24 warps with six almost identical diamonds. Some of them are complete and a few are reconstituted where the fabric disintegrated. The individual diamonds consist of three concentric lines made with paired yarns. The outer and inner diamonds in all three patterned stripes are made with dark brown S-spun, Z-doubled cotton warp. The top and bottom points of the inner diamonds are made with pairs of red Z-spun, S-doubled yarn which reappear in the next following weft spaces to form the centers of the diamonds. However, the red yarns are used only in the

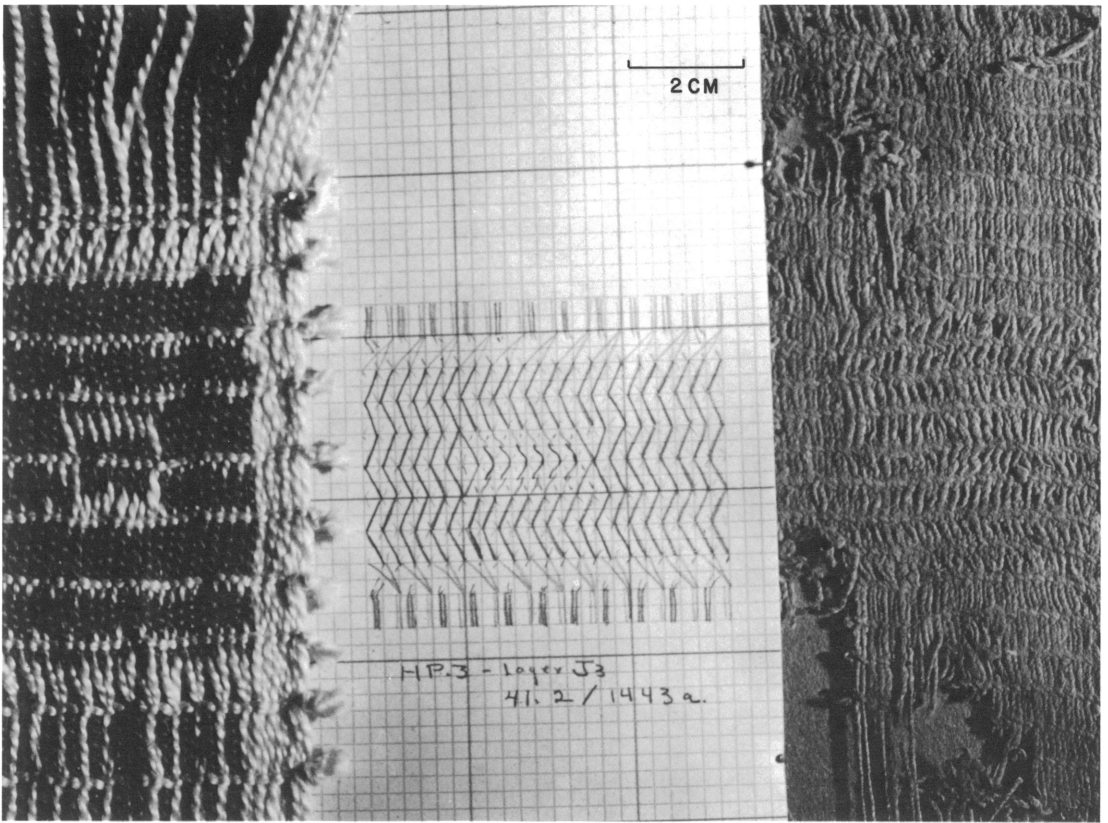


FIG. 113. Eye symbol of fabric 41.2/1411 (previously 41.2/1443). Left: model. Center: plotting. Right: original textile.

first and third patterned stripe. The rest of the outline of the inner diamonds is tan in color. In the first patterned stripe the yarn construction is S-spun, Z-doubled while in the third, the left part of the diamond is made with the yarns oppositely constructed, namely Z-spun and S-doubled. The concentric diamonds in the sixth patterned stripe do not have any red. The color sequence of the three concentric diamonds is simpler in this stripe. Dark brown, already mentioned, is used for the outline of the outer and inner diamonds with tan color between made with Z-spun S-doubled yarns. The warps in the weft space forming the center of the diamonds in all these stripes is twined in the split-pair manner. However, there are two exceptions where the warps are parallel, which are plain twined.

Stripe five is made with warp movement 61 of Code XII and involves 40 warps. It has a geometric pattern. There were originally six diamonds of which three and a half survive. The remainder is reconstituted. In the actual fabric they appear solid dark-brown diamonds set in a tan field. The dark-brown warps are S-spun, Z-doubled; the tan ones are of the reverse construction, Z-spun and S-doubled.

Stripe two is created in the condor-type warp movement. It has four male condor heads in profile facing opposite directions. There was not enough room for the entire fourth head, so it lacks the beak. The top head is reconstructed, as that section of the fabric is missing.

In stripe four the same condor heads are

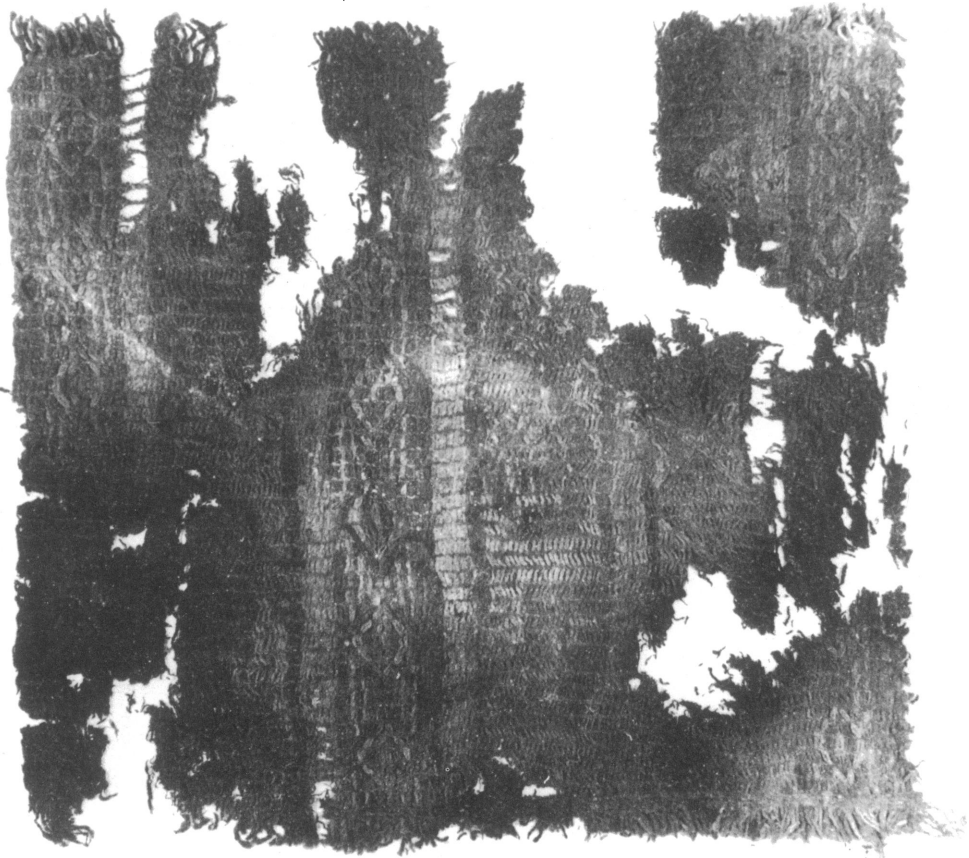


FIG. 114. Fabric 41.2/2551, Synthesis Textile. Photograph taken with ultraviolet light.

on either side of an unidentifiable motif with an eye symbol. Another unrecognizable motif is at the bottom of the stripe. There are only two colors in these two stripes, tan and dark brown. They have opposite types of yarn construction.

The split-pair dividing stripes are made with tan warps Z-spun, S-doubled. Some of these warps have disintegrated, leaving a longitudinal gap bridged by wefts. Apparently the natural light-colored tan cotton was less durable than the dark brown cotton.

The entire fabric is "framed" with yarns dyed dark blue. Three pairs of yarns are used at the primary selvage (left side). A considerable length of these warps was obviously left at the top at the time of warping, since the same yarns continue in the three compact

weft rows forming the top end selvage. The same three warp pairs were used at the opposite side of the fabric; that is, against the terminal knots (right side). Thus the warps become the wefts, to be turned into warps again. Twining in such a manner creates slightly curved corners which can be seen at the "top" of the fabric. Unfortunately, the left "bottom" corner of the fabric is missing. Theoretically, the warps could have been turned into wefts at this corner as well. Despite this missing corner, the remaining corners are firm evidence that the weft insertion of the compact bands at both ends preceded regular weft insertion. The weft ends of these dark blue yarns form a 2 cm long fringe at the right bottom corner.

Another unusual feature is that a length of six warps was left at one end, knotted with

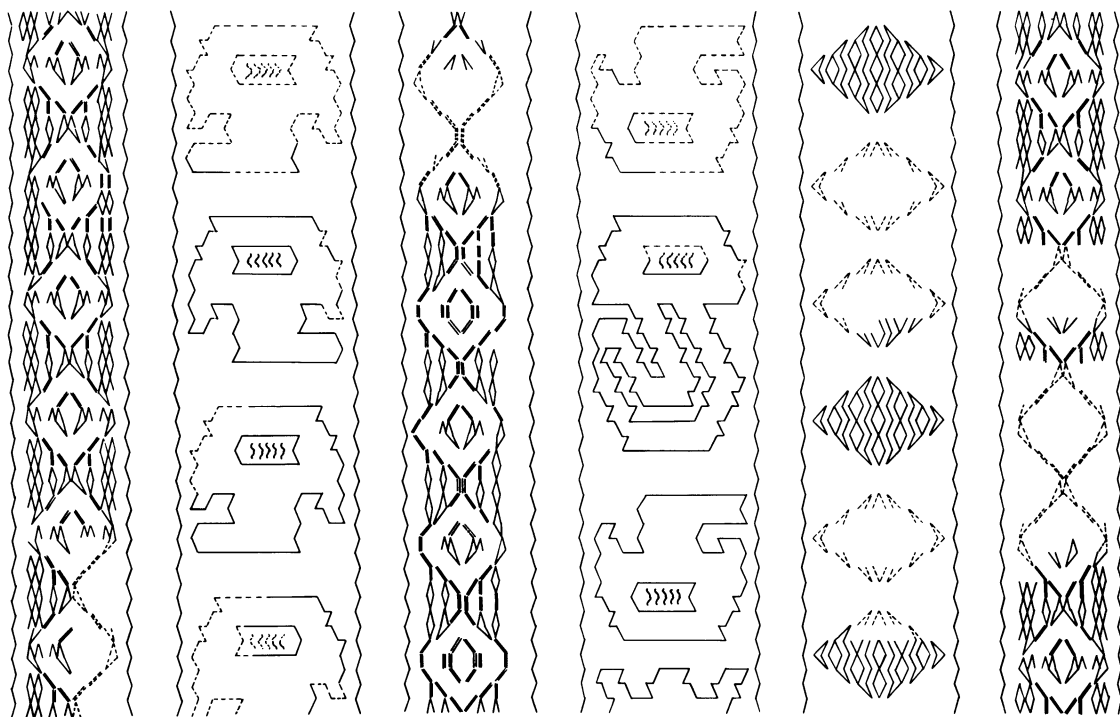


FIG. 115. Drawing of designs in fabric 41.2/2551.

an overhand knot and twisted into a “suspension” cord of which 11 cm is left.

The fabric is brittle and partly carbonized, but in some areas the fibers still have resilience. After the plotting and other analyses were completed, the fabric was mounted on nylon netting using small amounts of Flexbond, which was first spread thinly on glass and covered with aluminum foil to prevent it from drying immediately. The tip of a semihard brush then transferred minimum amounts of the Flexbond from the glass to the netting which lay on the fabric.

Title: Condors in Profile

Nos.: 41.2/1716 a-c; a in HP 3, M; b and c in HP 3, N, or the juncture of layers M and N

1. 11 cm, w. 4 cm (fragment a)

1. 43.5 cm, w. 4.3 cm (fragments b and c)

The fragments were plotted with considerable accuracy sometime between 1948 and 1952. The plotting was not complete, and missed the half-twists that typically depict eyes. At the time, it was not realized that the plotted warp movements portrayed condors.

The later plotting (1963) revealed two complete condors in profile, part of a tail (top) of a third, and the head and body (bottom) of a fourth. All condors are in the same relative position (fig. 116).

All three fragments have a terminal selvage and still retain the blue color and tan color. To a trained eye, the design is recognizable in the better-preserved section of the fabric.

Fragments b and c fit flush to each other along certain points of the tear. Fragment a fits below them with a gap of approximately 2 cm, which makes 56 cm the minimum length of the three together. This is calculated by assuming that the partial head of the condor in fragment a involves the same number of weft spaces (11) as the two other heads. Both complete condors occupy 39 weft spaces or 18 cm in length. If one assumes that the other two condors were complete, and thus added the length of the missing weft spaces, the original fabric must have been at least 72.5 cm long. This is mentioned to illustrate how, in some cases, one may reasonably reconstruct the original length of a partially in-

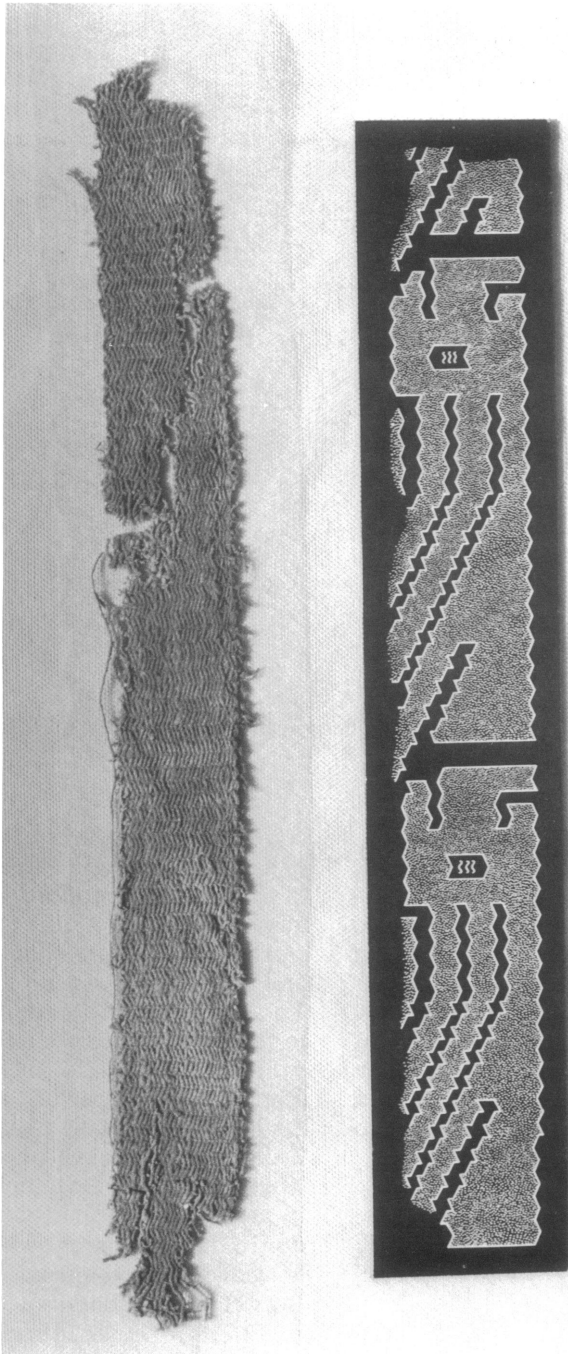


FIG. 116. Fabric 41.2/1716, Condors in profile (left), and drawing of design (right).

tact fabric. Such reconstructions are possible if a textile has yarns of an even quality, and if the designs are well-made, repetitious, and balanced.

Bird went one step further in suggesting (1963a, Plate 5, fig. 7b) that the design had an inverted, alternate side, with other condor heads facing left and right. He based his sug-

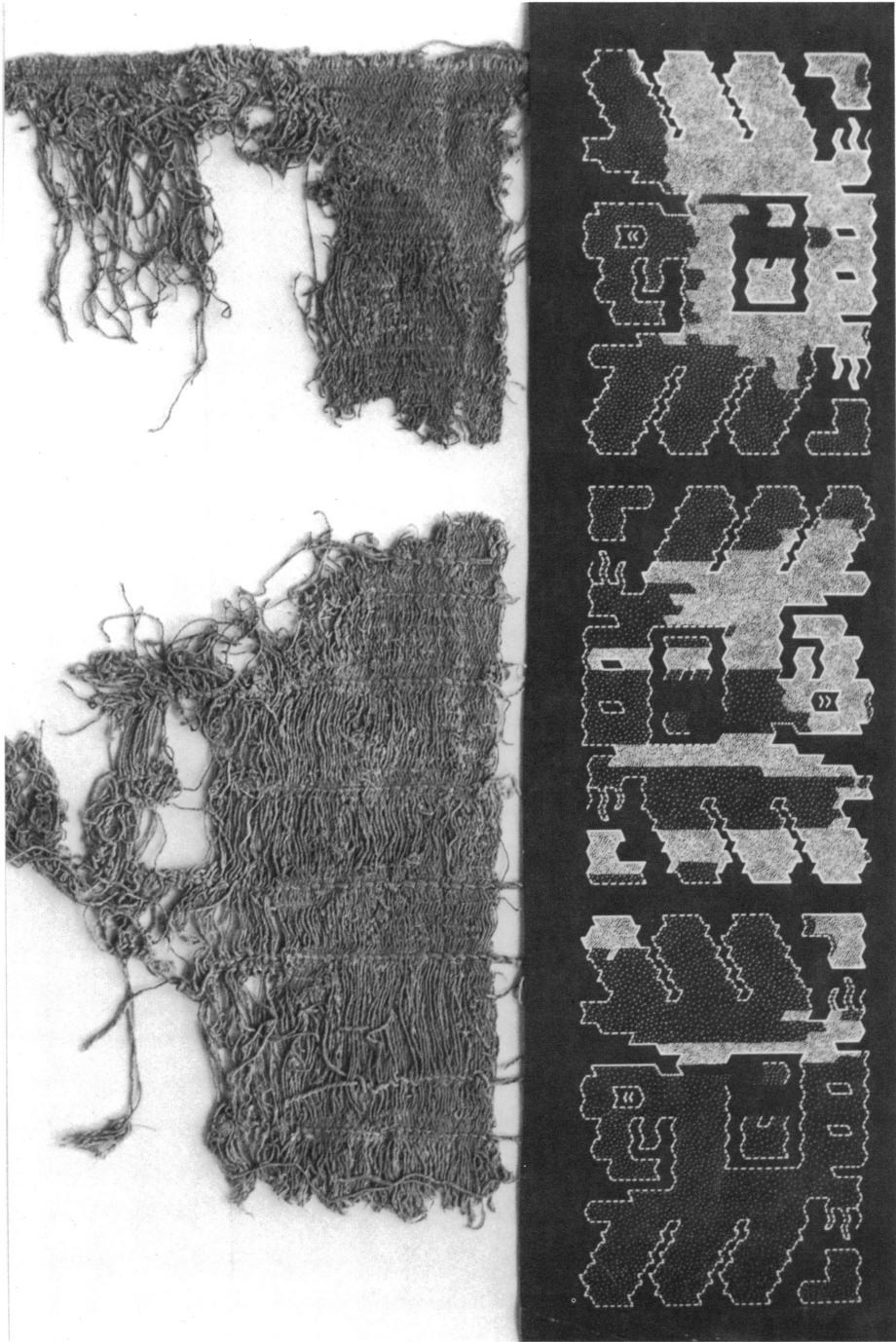


FIG. 117. Fabric 41.2/1764, Condors with Raised Spread Wings (left), and drawing of design (right).

gested reconstruction on the fact that the diagonal jagged lines indicating wings continue beyond the adjacent heads of the birds. Also,

he was guided by the duality concept in three other textiles (woven fabric 41.2/1205, and twined fabrics 41.2/1566 and 41.2/1713).

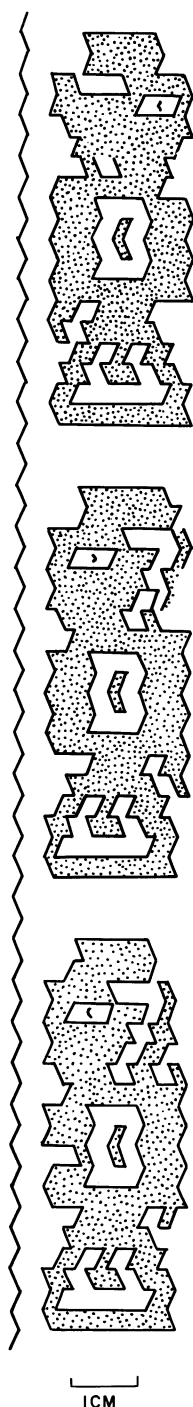


FIG. 118. Drawing of design in fabric 41.2/1695, Parrots.

Title: Condors with Raised Spread Wings  
Nos.: 41.2/1764a—HP 3, N; 41.2/1706—HP 3, M

l. 16.5 cm, w. 33 cm (41.2/1764a)

l. 31 cm, w. 17 cm (41.2/1706)

Fragment 41.2/1764a was plotted in August 1961, and showed a headless condor with one set of raised wings and a well-defined tail and feet (fig. 117). It has an incomplete squiggle in its stomach. Three other smaller fragments (b to d) were originally cataloged with this piece (41.2/1764a). They came from the same stratigraphic layer and have similar properties in their yarn structure, weft count, and repair wefts. The four fragments (a to d) resemble each other in their general physical appearance. Plottings were made of fragments b, c, and d. The resulting fragmentary design elements were not like the condor in fragment a. It is impossible to say whether the fragments b, c, and d came from a different fabric, or originally were part of specimen a. However, it was decided at the time not to consider them part of the fabric with the condor.

On the other hand, specimen 41.2/1706 was truly once a part of specimen a. It was originally considered that its condition was too poor for plotting. Many original wefts are missing and the fabric is held together by the insertion of eight repair wefts. The fabric was plotted in 1963 after experience had been accumulated in mapping warp movement, and because of the desire to extract as much information as possible from the fabrics. Although only a small part of the warp movement could be traced in the original fabric, the resulting plotting made it apparent that it had the same design as the spread-winged condor from layer N. For example, it had a condor head, sections of the raised wings, parts of the stomach squiggle, and the space fillers by the condors' feet. Vestiges of a second condor, and a space filler by its foot, indicated that it was positioned in the reverse direction.

The condors on these fragments resemble the condor on specimen 41.2/1501 (Spread-Winged Male Condor with Snake in Stomach). However, that condor has a well-defined snake in its stomach instead of a squiggle, its wings are not slanted, it has space

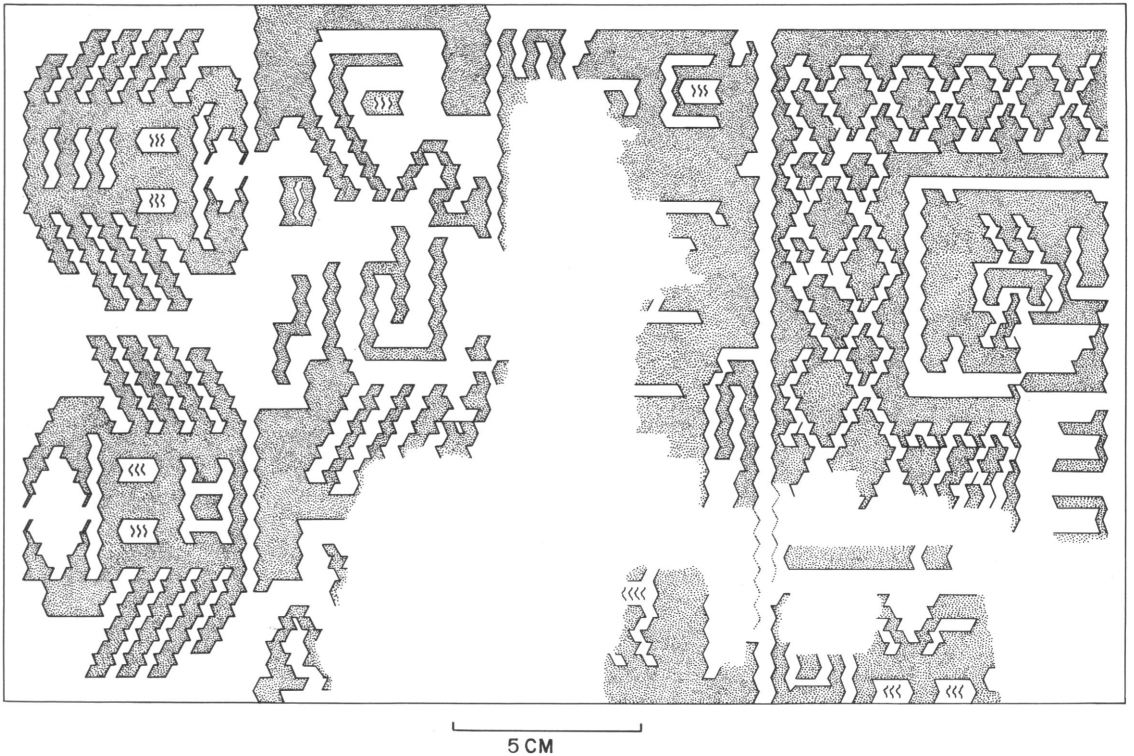


FIG. 119. Drawing of design in fabric 41.2/1711, Two Rock Crabs and Unidentified Design Units.

fillers in its body, and a set of small wings on its shoulders. On the slant-winged condors, there is a rudimentary appendage which perhaps represents these shoulder wings.

Title: Parrots

No.: 41.2/1695 a to d—HP 3, M

l. 51 cm, w. 8 cm (fragments combined)

After the four fragments were plotted, their relative positions could be determined and the textile assembled as a unit. The wider (left) part of the fabric consists of 5 cm of split-pair twining. The rest (right) part contains 3 cm of designs. According to the placement of the fragments, there are six parrots in various degrees of completeness (fig. 118). The longest (b) fragment has three parrots and part of the head of a fourth. Only these three are illustrated. All six figures are in the same relative position except for one which faces in the other direction. The details of the tail, eyes, wings, and body fillers are identical, but each figure varies in some respect. The

figures seem to give the impression of movement, not because they are repeated, but because of the design concept.

Title: Two Rock Crabs and Unidentified Design Units

No.: 41.2/1711 a to d—HP 3, M

l. 20.3 cm, w. 29.2 cm (combined fragments)

This fabric consists of four fragments. The largest has an almost intact primary side selvage, and it is complete in length with both end selvages. The adjacent fragment is torn from the first along the warp. It also has one end selvage and an incomplete terminal selvage. The two smaller fragments, each with end selvages, fit on the bottom of the fabric, but their exact position cannot be determined with certainty. Depicted here (fig. 119), they were illustrated by Bird (1963a, plate IV, fig. 5) in a previous publication.

The design is presented in four separate units. The one by the primary selvage has two rock crabs facing opposite directions.

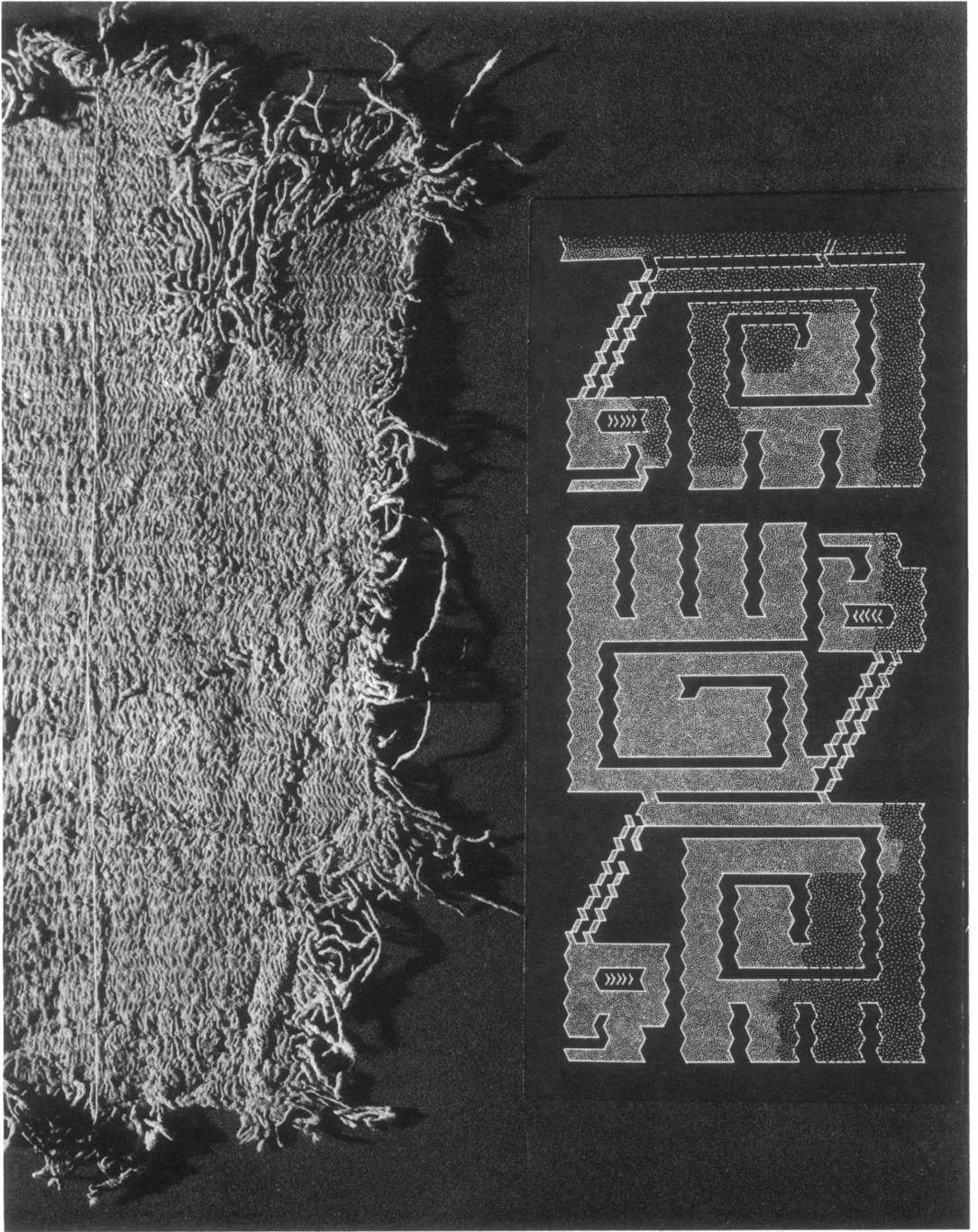


FIG. 120. Fabric 41.2/1713, Joined Birds with Thin Necks (left), and drawing of design (right).

They are well-defined and quite realistic. They do, however, differ slightly. A most obvious difference is the motif used on the carapace.

The smaller crab, completed in 23 weft spaces, has three parallel lines off-center and behind the eyes. The longer crab, completed in 28

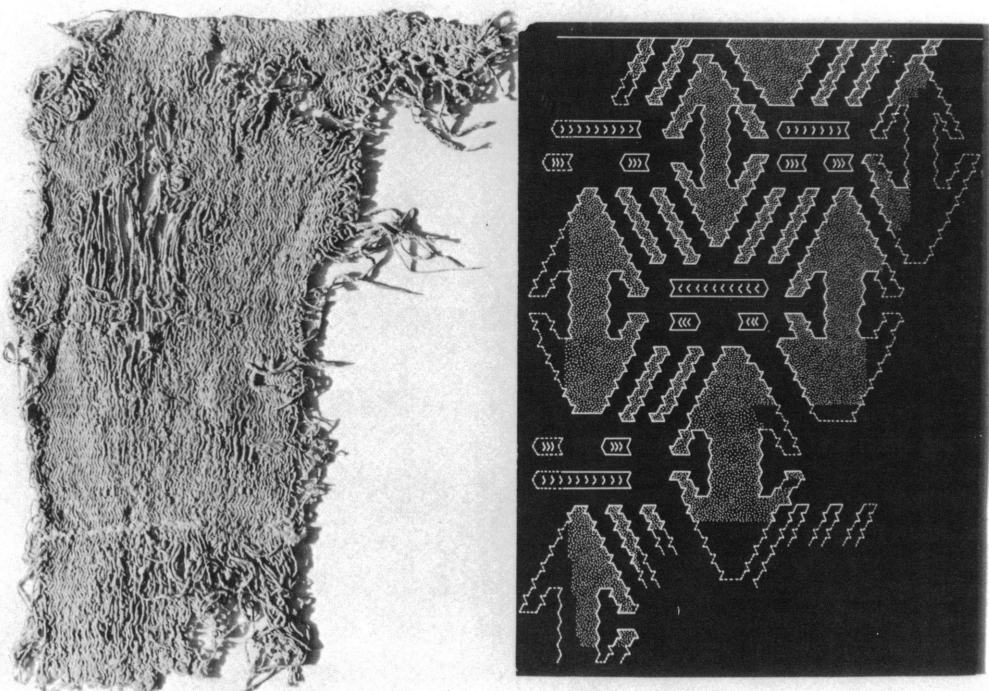


FIG. 121. Fabric 41.2/1565, Joined Faces (left), and drawing of design (right).

weft spaces, has a body marked with asymmetrical protrusions directly aligned with the eyes. The two crabs have claws of different lengths. Two weft spaces separate the crabs from each other and from the end selvages. The entire unit comprises 57 weft spaces. One might speculate that the markings on the carapaces indicate male-female differences. The asymmetrical protrusions on the larger crab could be interpreted as appendages for eggs, typical of female crabs.

The crabs are designed with much symmetry, which involved careful planning and counting. The other three panels do not exhibit elaborate symmetry.

The second panel (from the left) has a general design which is impossible to interpret. It has an eye motif, and half twists indicate a rectangular mouthlike motif.

The third panel appears to represent a head in profile. It is perhaps a birdlike figure with an "eye ring" below its eye.

The fourth panel (on the right) has a so-

phisticated leaflike geometric pattern which frames a square unit. With some stretch of the imagination, this square unit could be identified as a highly stylized bird head in profile. It has a bent beak and an "eye ring" from which two slanted, jagged lines radiate toward the beak. An extended pupil radiates in the opposite direction from the "eye ring." If one accepts this interpretation, it is notable that this eye treatment differs from all others in the Huaca Prieta textiles. Eyes or teeth are usually made in two weft spaces, each having a half-twist to achieve the color change within a half of the weft space. In this case, the half-twists are used to define the color space surrounding the "eye ring."

The two loose bottom fragments only add to the difficulty in understanding the design of this fabric. Placed as illustrated, the one in the fourth panel has a pair of eyes against the bottom end selvage. It also has a half-twist to narrow the color line of the "loop" at the left of the eyes. The other fragment,

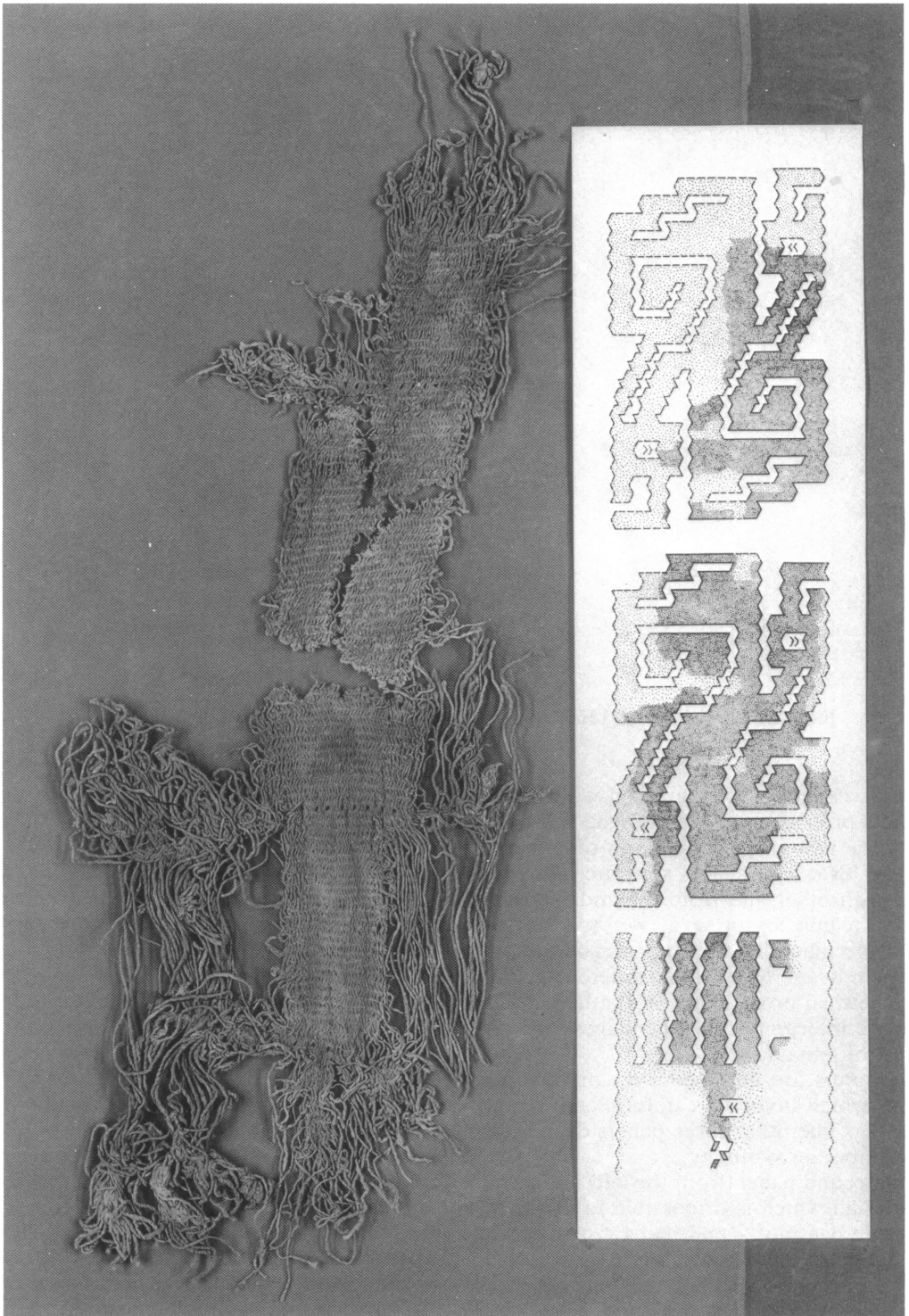


FIG. 122. Fabric 41.2/1566, Interlocked Condors and Unidentified Motif (left), and drawing of design (right).

placed at the bottom of the third panel, has an eye from which two jagged lines extend.

The half-twist is also apparent in the crab panel in the weft row adjacent to the top end finish.

Title: Joined Birds with Thin Neck

No.: 41.2/1713—HP 3, M

l. 28 cm, w. 21 cm

The complete motif of the joined birds is realized with 63 transposed-warp pairs of which 59 exist at the widest section of the fragment where it measures 7.5 cm. The length of the design takes 46 weft spaces, occupying 17 cm of the length of the fabric. Since it is an inverted figure with enough details of warp transposition preserved, it is possible to reconstruct the missing parts of the design (fig. 120).

The repeat of the motif is the same in concept, but the number of transposed warps and the number of weft spaces create variations in the details of the motif, such as in the width of the wings and the length of the bird's head.

The patterned part of this fragment is bordered on one side with about 12 cm of split-pair twining. There are some traces of blue dye and red pigment.

The design concept of the double-headed bird with joined bodies occurs on two other fabrics (see plain weave with warp-float pattern 41.2/1205—HP 3, H2I2; 41.2/1566—HP 3, L). This textile may be the oldest of the three since it was located lowest in the stratigraphy. Two of three bird faces face in one direction; the other faces the opposite direction. However, the beaks that are the lower part of the heads are all oriented in the same direction.

Title: Joined Faces

No.: 41.2/1565 a and b—HP 3, L

l. 32 cm, w. 21 cm

The fabric consists of two pieces which fit closely. The textile may have been torn after excavation. The early analysis of this fabric noted that it might have a pattern but that its condition did "not permit reconstruction." Later careful plotting revealed it to have an intricate design of joined faces in a diagonal criss-cross layout (fig. 121).

The unpatterned split-pair twined fabric (41.2/1606—HP 3, M; fig. 74) vaguely resembles this layout with its solid diamonds

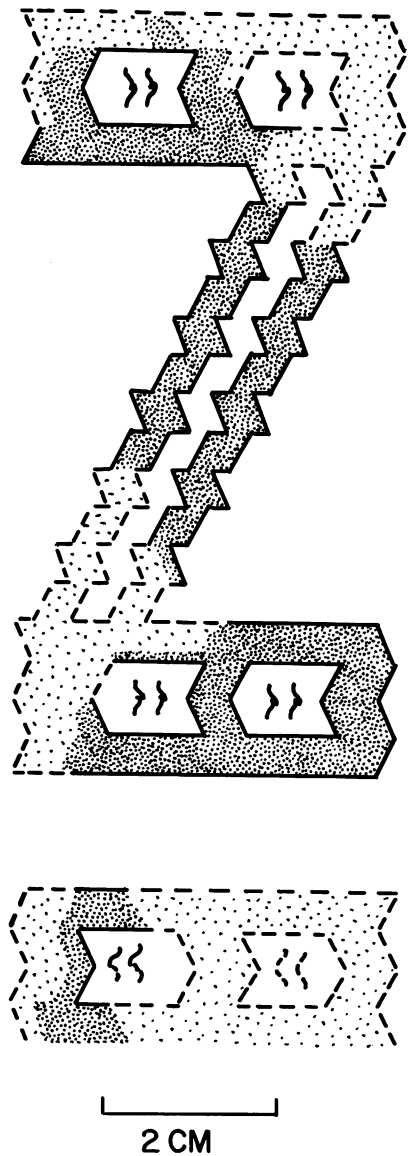


FIG. 123. Drawing of design in fabric 41.2/1587, Double-headed Snake-like Creature.

"joined" by the open work of "free" warps. The same idea was used in looping technique (41.1/9401—HP 3, D3) where solid diamonds are connected with three narrow strips of looping on a diagonal basis.

Three of the faces have the same orientation; the third (and a nonexistent lateral companion) is reversed. It is amusing that the "ears" are also represented. In the central

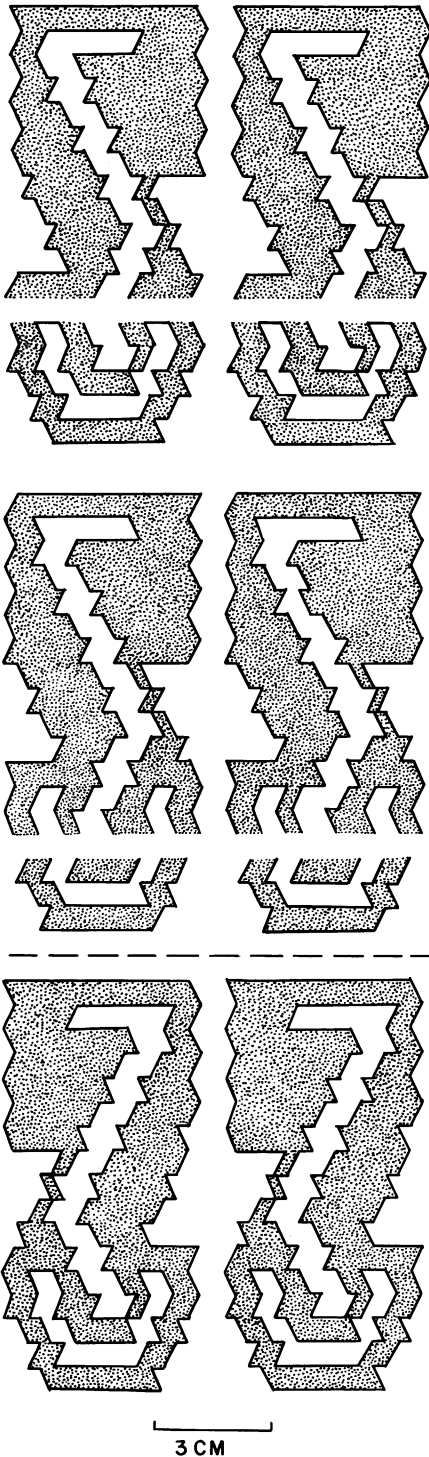


FIG. 124. Drawing of designs in fabric 41.2/1496, Snakes in Bands.

face, part of the mouth and one eye are reconstructed. That reconstruction is not shown as such in the illustration to avoid obscuring the clarity of the design. The layout of the design is not as perfect as in some other Huaca Prieta textiles. The faces are not of the same width, however they are all completed in 10 weft spaces. The ears occupy 8 to 10 weft spaces. The connecting diagonals between the faces vary from one to three. The careful observer may detect other variations.

This specimen has 11 S-doubled warps but they do not seem to have any correlation with the motif. There are five repair wefts. Some were removed or cut in order to plot the warp movement.

Title: Interlocked Condors and Unidentified Motif

No.: 41.2/1566 a to d—HP 3, L

l. 44 cm, w. 8.5 cm (fragments combined)

The pieces were plotted separately without any knowledge that they might be of the same fabric. The specimen file card contains a note by Skinner stating: "all frag. plotted—too small for pattern interpretation; one frag. has condor head?—condor-type."

Later the fragments were placed together and the design emerged (fig. 122). This was accomplished after overlays were made of the plottings—that is, a tracing of the points of color change in the fragments. The overlays hinted that the fragments were part of a common motif. The fabric was reconstituted by working the plottings like pieces of a jigsaw puzzle with the added complication that one did not know which side of each piece was "up." One of the plots was recopied to express the fragment's reverse side, and then all the pieces came together.

The illustration shows the existing part of the design in the fragments and the reconstructed area. The design is similar to the one made with warp floats in the woven piece 41.2/1205 (fig. 139). The previous knowledge of the design in that fabric, also containing interlocked condor heads, helped us discover the similar motif in this set of joined fragments.

The design is bound by split-pair twining—which is evident only on the d fragment (bottom). It actually has only part of the head, neck, and most of the body of half of the

design. Fragment c has the rest of the same body, and part of the joined head and beginning of the next body. Fragment b has the complete head and neck. Fragment a, the largest, has the a body, neck, and part of a head. Piece b also has part of a design that could not be deciphered.

Title: Double-headed Snake-like Creature

No.: 41.2/1587 HP 3, L4

l. 11 cm, w. 5.5 cm

This very small, poorly preserved fragment was plotted in 1963. The plotting revealed a nearly complete, double-headed creature, and part of a second one (fig. 123). The eyes are clearly indicated with the half-twist of the contrasting warps. The motif was conceived without a mouth. Serrated diagonal lines join the heads. The motif is completed in 20 weft spaces. Occasional interwarp knots divide the patterned area with split-pair twining.

Title: Snakes in Bands

No.: 41.2/1496 HP 3, K

l. 25 cm, w. 10 cm

This specimen has no selvages left, but along one edge there are interwarp knots. The motif has the mouth and eyes presented in a continuous U-shaped form, and a serrated body. The eyes do not have the half-twist that usually indicates pupils. The design vaguely resembles a snake (fig. 124).

Two are complete figures and three incomplete. The fabric originally had at least six figures. The textile has two compact weft bands made with three weft rows. Each cuts across the head of the "snakes," but not exactly at the same place. These appear on the drawing as blank horizontal stripes. Bird noted on the specimen file card that "red pigment traces occur all over, not on any one part of the pattern, hence seem to be applied after the piece was old [used]."

Title: Cats

Nos: 41.2/1497a and 41.2/1497b—HP 3, K;  
41.2/2202 (also 41.2/1497c)—center  
fragment on fig.—Wheelbarrow Trench,  
Lot 5

Combined l. 84 cm, w. 14 cm

Fragments of the same fabric, occasionally found in separate excavation units, could be united by a comparison of the plottings of their designs. In this case, three fragments

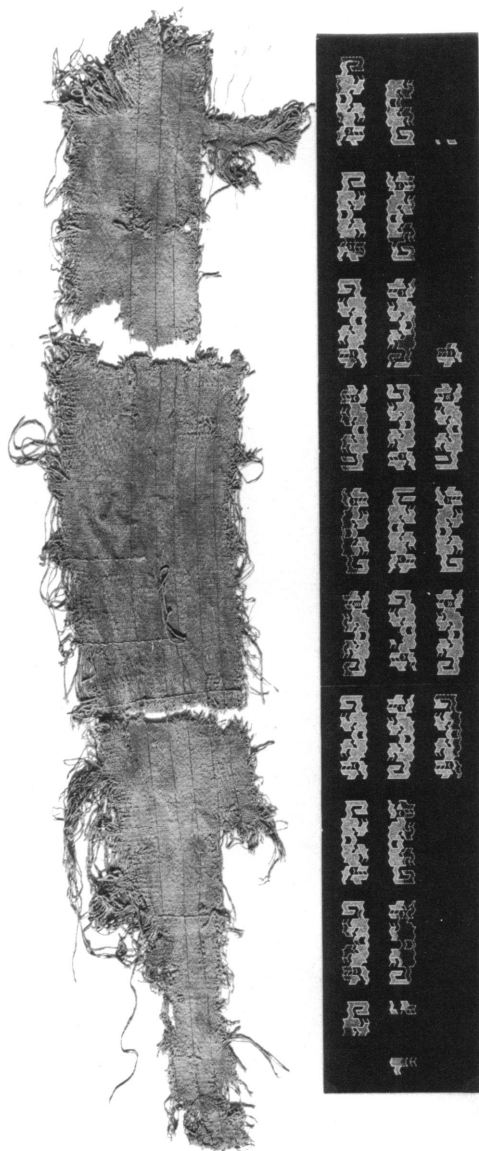


FIG. 125. Fabric 41.2/1497, Cats (left), and drawing of design (right).

with cat designs were reunited (fig. 125). The center fragment was found in the wheelbarrow trench, a considerable distance from layer K of Test Pit 3 where the other two were located.

The joined specimens contain 26 more-or-less complete cats in profile. From their or-

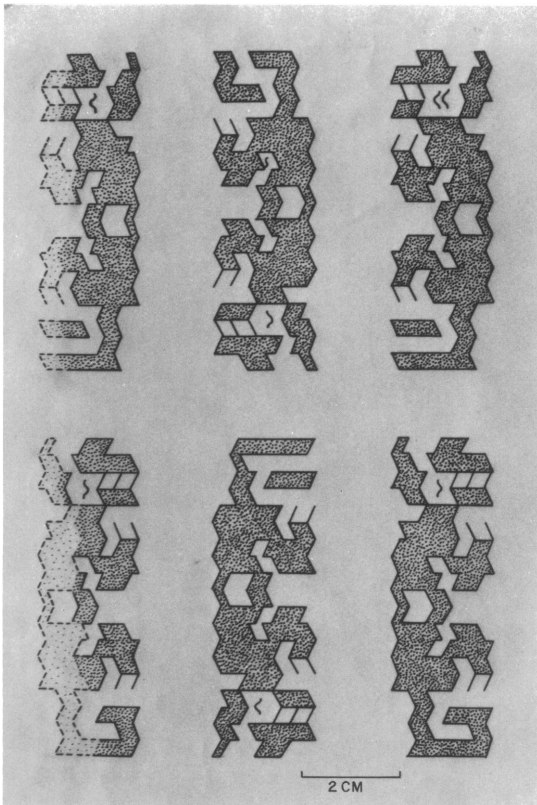


FIG. 126. Detail of drawing of cats in fabric 41.2/1497.

der, it is probable that there were 30 cat figures, 10 in each stripe. Each cat measures approximately 7.2 cm in length by 1.8 cm, the stripe width. These patterned stripes are achieved with 24 warp pairs. The dividing plain stripes between them consist of 16 warp pairs twined in the split-pair manner.

The length of each cat figure is completed in 19 weft spaces (fig. 126), with one exception done in 18 spaces. The cats are executed in a very exact manner but with some minor variations. All have their "spot" properly oriented; two warp pairs are utilized in each case. The small detail of claws is never forgotten. The half-twist indicating the pupils of the eyes mostly involves one pair of warps, but in the central fragment two pairs are used twice, and three pairs are used once. In three instances the curve of the tail is not properly executed.

The orientation of the figures is noteworthy. Bird wrote on the specimen file card: "the two outer rows match exactly, while the center row has the procession of cats going in the opposite direction, [and] the position of the legs follows that of the animals adjacent [lengthwise] to the left and right. The longitudinal orientation of the bodies shifts regularly except in two places where the position repeats two times."

A number of features indicate that the three fragments have been placed together correctly. Most important are the layout of the design and the patterning section versus the split-pair twining. The nature of the weft stripes is also indicative. Each of the three fragments has a compact weft stripe consisting of four weft rows. This time they do not cut the figures, as was the case with the specimen "Snakes in Bands" (41.2/1496). The number of weft spaces between the cat figures, where the compact wefts occur, also proves that the fragments could not have been placed together laterally. On one fragment the weft stripe has two weft spaces on either side. On another fragment there are two weft spaces on one side of the weft stripe and one space on the other side. On the third fragment the compact weft stripe is flush against the cat figures on one side, and on its other side there are four weft spaces.

There are four superstructural repair wefts. That is, a superstructural yarn was added after the creation of the fabric to hold it together. The repair wefts were inserted across the cat figures in three instances, and in one case between them. Judging from other textiles with repair wefts, their insertion served to keep a frayed textile together. In this case the frayed parts are missing. Such wefts suggest that the fabrics were given long use and considered valuable even after they had become worn.

Title: Condor Heads Joined by Plain Twining  
No: 41.2/1498—HP 3, K  
l. 82 cm, w. 30 cm

In this fabric the design is not entirely achieved with condor-type warp movement. Warp movement no. 72 is used on the necks before the warps are aligned for the plain twining. The description of this design was written by Junius Bird in Huaca Prieta textile

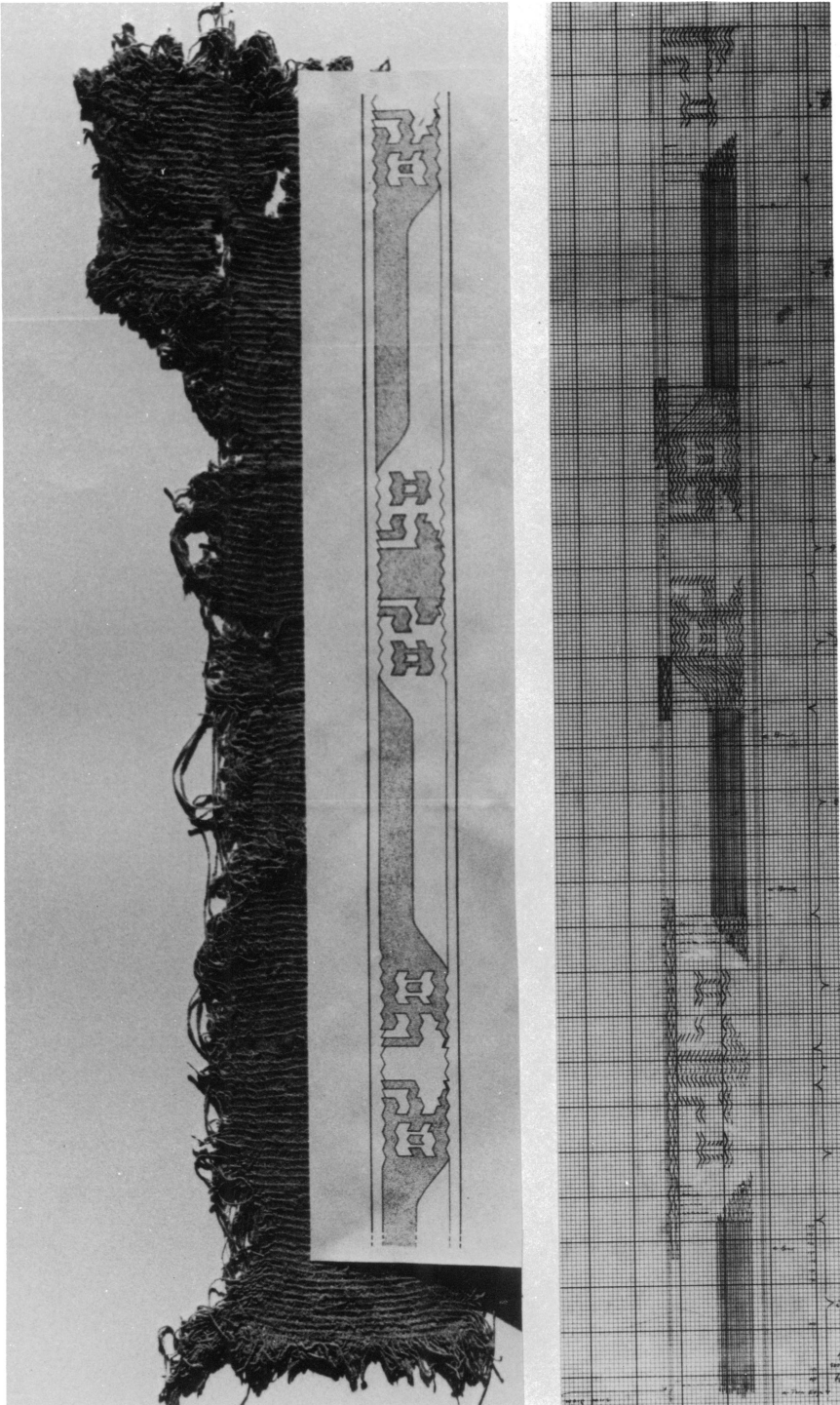
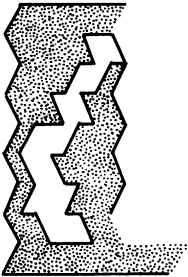
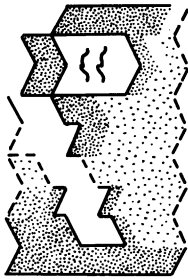
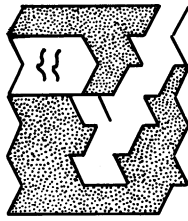


FIG. 127. Fabric 41.2/1498, Condor Heads Joined by Plain Twining. Left: textile. Center: drawing of design. Right: plotting.



2 CM

FIG. 128. Drawing of designs in fabric 41.2/1499, Shrimp and Unidentified Motif.

### notebook entitled *Transposed Warp, Condor-Type Patterns*:

The transposed-warp pattern stripe is at one margin of a fragmentary specimen and is complete in its width only at one end. It is a succession of pairs of condor heads (fig. 127), originally perhaps red against white, as some faint traces of red pigment remain. Greater contrast and clarity would have resulted if the adjacent plain areas had been of some other color or tone, and this was probably the case as the yarn pairs are one-quarter bast while in the stripe all are of cotton.

The patterned stripe has 16 pairs of yarns, each pair of two colors. The profile of the major portion of the condor head is completed in each of the five surviving examples in 10 weft spaces. In the next five spaces the two colors are shifted laterally until each is concentrated in half of the stripe width, creating a neck-like attachment for the heads. After the colors are carried 23 weft spaces in plain, parallel twining, the yarns are again separated and carried back to their original position but on the opposite sides of the fabric. One complete double-headed unit measures 28 cm in length, the other 26 cm, although both have a total of 53 weft spaces.

... within the stripe there is the basic pairing of colors in 16 pairs. An odd number of pairs would have complicated and confused the subsequent work. Then, when creating the heads, construction was held in each case to 15 weft spaces, where it could as well have been completed in 17 or 19. There is also the use of 23 spaces for the central section of each pattern unit, which may be accidental but does look like deliberate planning. The stripe with the condor heads is bound on one side with 40 warp pairs, and then comes another pattern stripe. Only a few of the warps survive—enough to prove that the condor heads were not repeated. There is a succession of lateral shifts of the warps, like the movements which expanded and reversed the color of the condor heads. These areas of shifting, as far as they exist, are opposite the plain “neck” areas of the heads.

Title: *Shrimp and Unidentified Motif*

Nos.: 41.2/1499 a-c—HP 3, K

l. 34 cm, w. 8.5 cm (largest fragment)

The textile consists of three fragments, only one of which (41.2/1499a) is large enough to detect a design (fig. 128). The first two figures face opposite directions. The top one is accomplished in seven weft spaces and the one beneath it in nine. The third figure, only par-

tially intact, is different and unidentifiable. The bottom figure faces the same direction as the first (top) one. The band with the motifs is set in a field of split-pair twining.

On the left side of the fragment there is a stripe with geometric movement falling in Group III, Code XII.

Title: Nonrepresentational S-Z Motif

No.: 41.2/1502C-HP 3, K

l. 31 cm, w. 5 cm

This design is on one of three different fabrics sewn together. All bear the same catalog number with a different capital letter indicating that they were different products originally. All are extremely worn, and are held together with repair wefts. The specimen with the design is made with transposed warps.

The first plotting revealed two motifs and part of a third. The fabric was plotted twice in the hope that half twists, indicating eyes, would be detected, but the second attempt only extended the design, revealing four motifs and the beginning of a fifth.

The motif alternates from an S to a Z figure (fig. 129). The three that are complete in their length occupy 15, 13, and 14 weft spaces, respectively, from top to bottom. Split-pair twining is used on both sides of the pattern.

Title: Humans to Geometric

No.: 41.2/1286-HP 3, H2I2

Comp. l. 20.5 cm, comp. w. 24.6 cm

The warp ends and the terminal selvage of this fabric are generally complete. The primary selvage is complete at only one point. The design of this fabric resembles a sampler. The larger field with the geometric motif is 13 cm wide. It is made with a warp movement falling in Group III of the Code XII and is discussed in the section dealing with Group II transposed-warp fabrics.

The condor warp movement section has three different motifs in three separate bands divided by split-pair twining (fig. 130). One of the two standing human figures in the first band is nearly complete and is used to reconstruct the missing corner of the fragment, where only a leg and hair indicate the presence of a similar figure. The second band has two feline figures in profile and the head of a third one. There is little reconstruction, this being the best-preserved part of the textile.

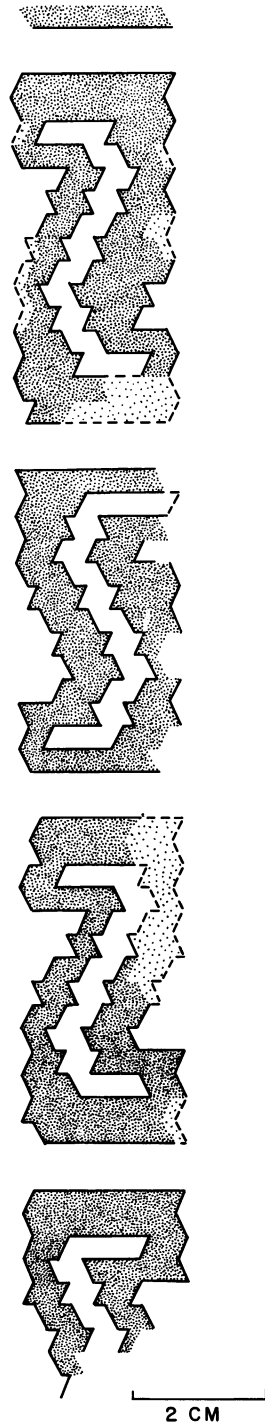


FIG. 129. Drawing of designs in fabric 41.2/1502, Nonrepresentational S-Z Motif.

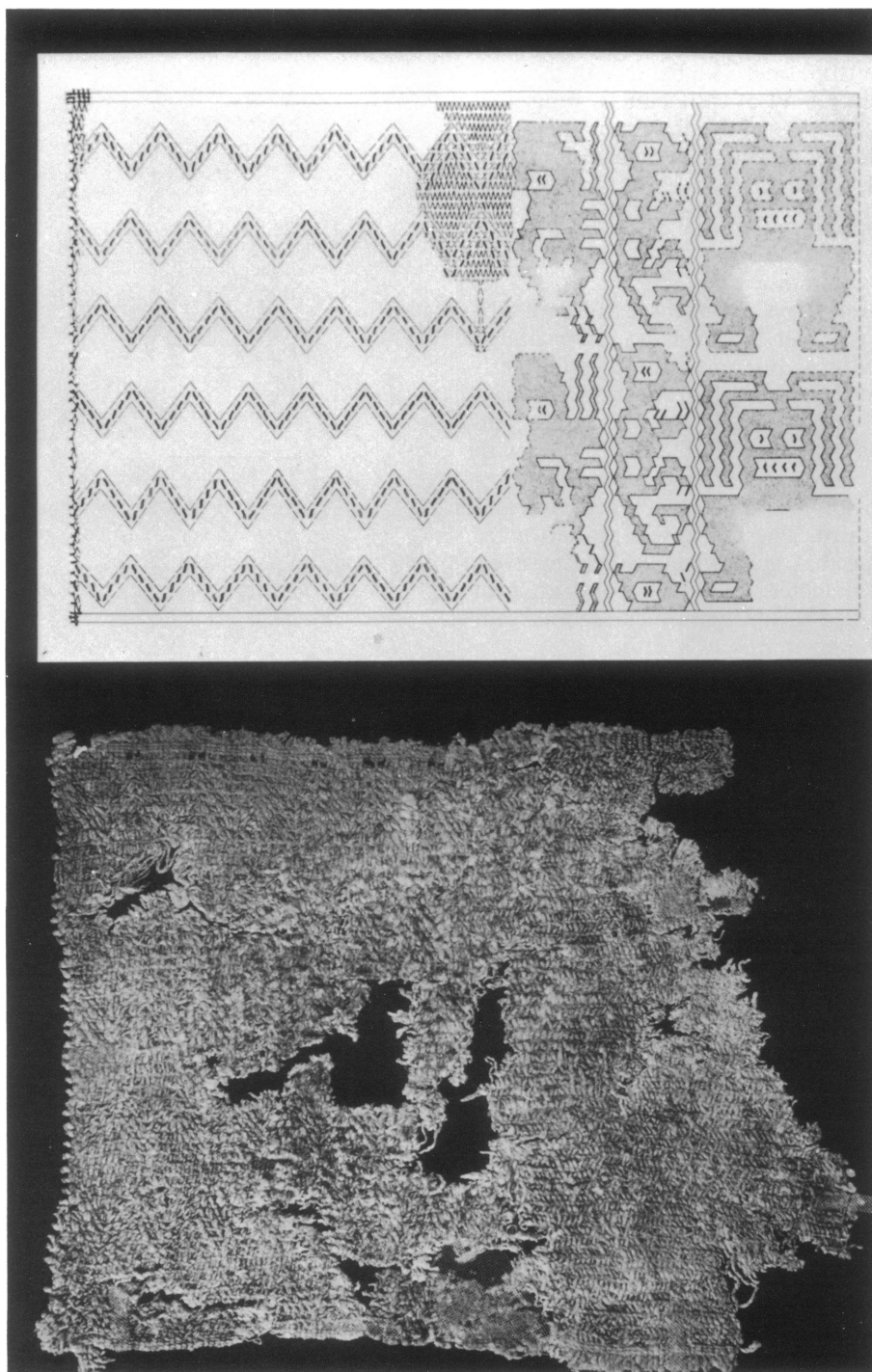


FIG. 130. Drawing of design in fabric 41.2/1286, Humans to Geometric (top), and original textile (bottom).

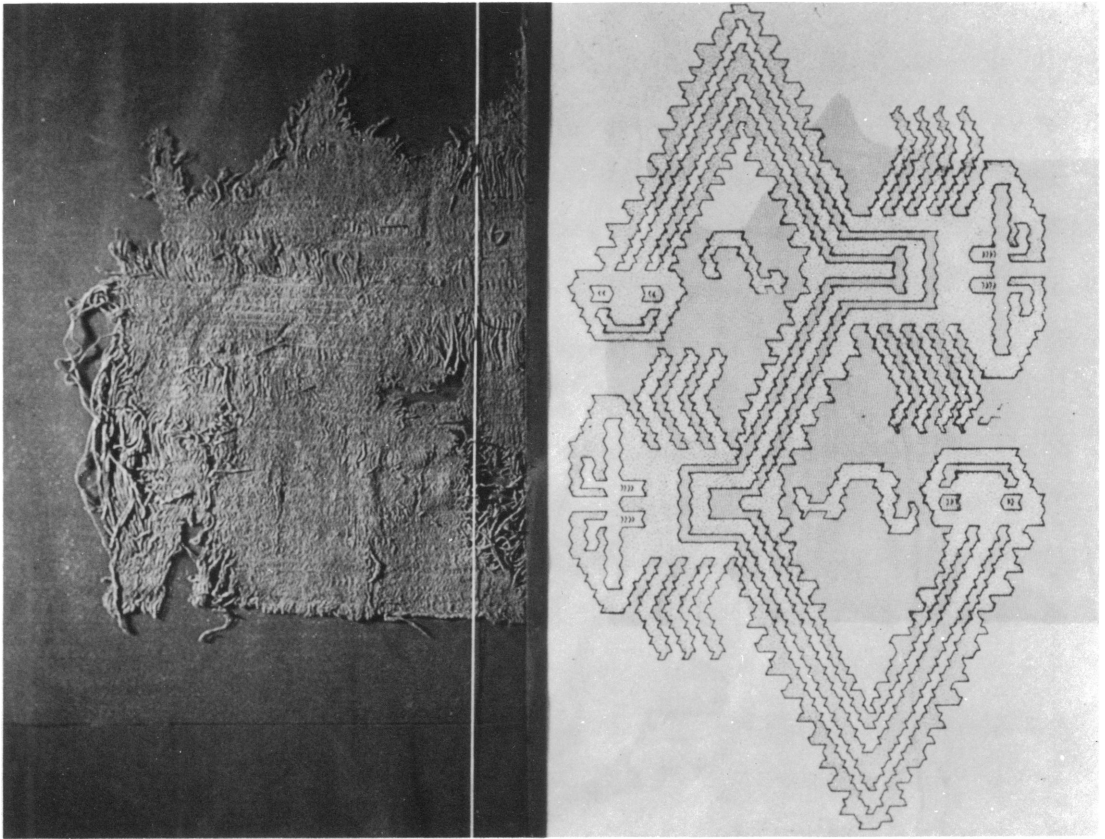


FIG. 131. Fabric 41.1/9826, Rock Crabs with Snakes (left), and drawing of design (right).

Both feline figures occupy 22 weft spaces and are similarly oriented, but they are not identical. One weft space separates the two figures. If two weft spaces separated them, or if they were created to occupy an uneven number of spaces, they would have been the same. As it is, the top of the feline's head by the warp end is Z-slanted, and the top front of the central feline's head is S-slanted. This resulting difference in the outline of the felines, their eyes, body spots, and claws was not so apparent in the textile itself as on the plotting of it. The third panel depicts two unidentifiable creatures in profile. One has one tentaclelike protrusion beneath its head. The other has two. Two similar protrusions are started beside the warp end finish. The reconstruction of these creatures is not possible because this part of the textile is badly eroded and some sections are missing. Both

figures have the same orientation and cover 23 weft spaces. They are not identical in the size of the head, number of legs, and body space fillers.

Title: Rock Crabs with Snakes

No.: 41.1/9826—HP 3, G

l. 405 cm, w. 39 cm

This widely published specimen (fig. 131) was described by Bird (1961, p. 301) as follows:

It depicts two rock crabs combined with a double-headed, snakelike figure completed in the span of 106 weft rows. Within this area 5074 separate, finger-manipulated warp movements were required for the figure and 8176 for the background. Granted that one series of warp movements is a guide for the placing of successive moves, there are many places within the composition where work must be started or ter-

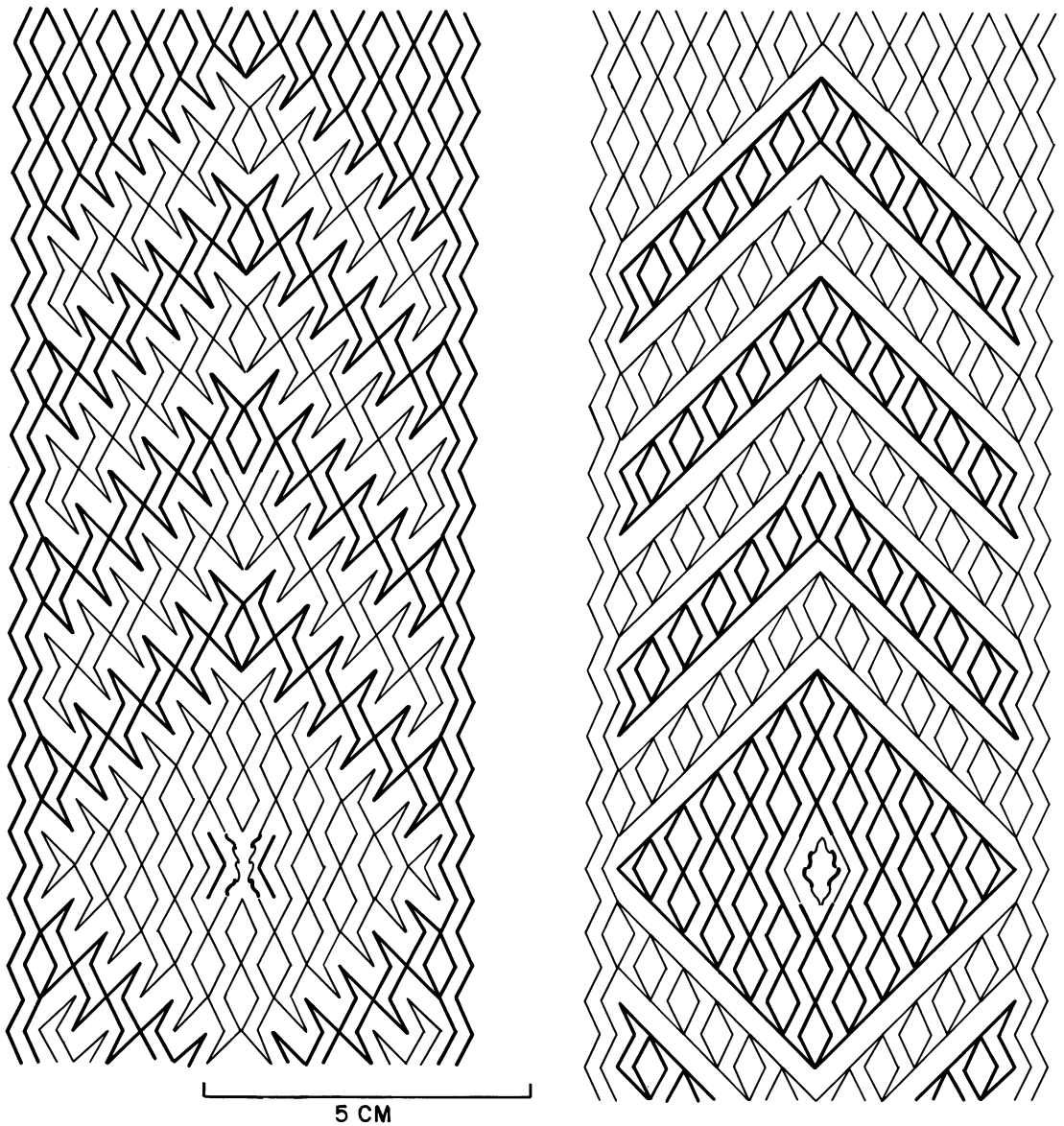


FIG. 132. Drawings of geometric design as it appears on each face of the fabric. 41.2/1679.

minated at exactly the right point or the whole will be distorted.

There is no concrete evidence that the snakes' bodies ended in the manner in which the design was reconstructed. They may have terminated on the weft lines defined by the ends of the crab legs. Either reconstruction is conjectural, and fits traditional concepts of

designs in other Huaca Prieta textiles. The left part of the design is complete and borders on split-pair twining. The right side is not complete. The planning of the design, that is, the counting of the warps, is almost perfect. The exceptions are that the space fillers are not identical, and the crab on the left has four pairs of legs, as rock crabs have in nature,

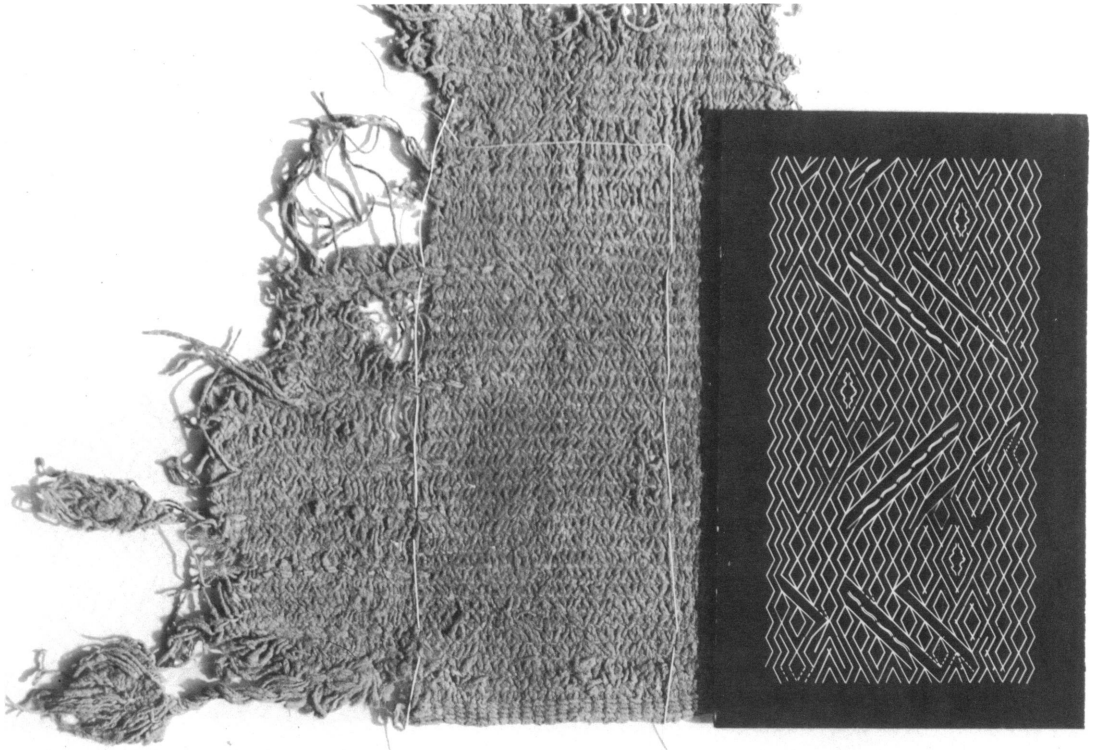


FIG. 133. Fabric 41.2/1680 (left), and drawing of design (right).

while the crab on the right has only three pairs. An error from miscounting in the layout of design resulted in an “unnatural” three pairs of legs.

#### GROUP VI—HUACA PRIETA GEOMETRIC TYPE

Only geometric patterns are made with this type of warp movement. It involves separating the warps of two adjacent warp pairs and shifting them to opposite faces of the fabric. They are united in the following weft row with the warp next to it. This generally results in patterns which are bordered with split-pair twining.

There are 28 specimens with this type of pattern, some in combination with other types of transposed warps. Seven of these with poor preservation cannot be classified with certainty (category 60). This group of textiles is found only in the lower layers, O to I of Test Pit 3. With two exceptions, all are made en-

tirely of cotton. Ten use half-twists for details in the pattern. Only seven of the textiles are included below; the other 14 are too poorly preserved, too small for pattern reconstruction, or discussed elsewhere.

Title and no.: 41.2/1679 a to f—HP 3, M  
Comb. 1. of five frags. 105 cm, w. 20 cm

The five fragments were placed together on the basis of a number of similar traits: warp end finishes, design repetition, and the appearance and placement of repair wefts. The geometric pattern, 4.8 cm wide, is found on the torn edge of the fabric. The rest is made with split-pair twining.

Fragment a is 19.4 cm long and has the end finishes of three compact weft rows. Above them, only one warp end loop survives. A chevron pattern is repeated throughout 39 weft spaces. Fragment b has repeated chevrons over most of its length, and a diamond with a half-twist in the center.

The entire length of chevrons is not in-

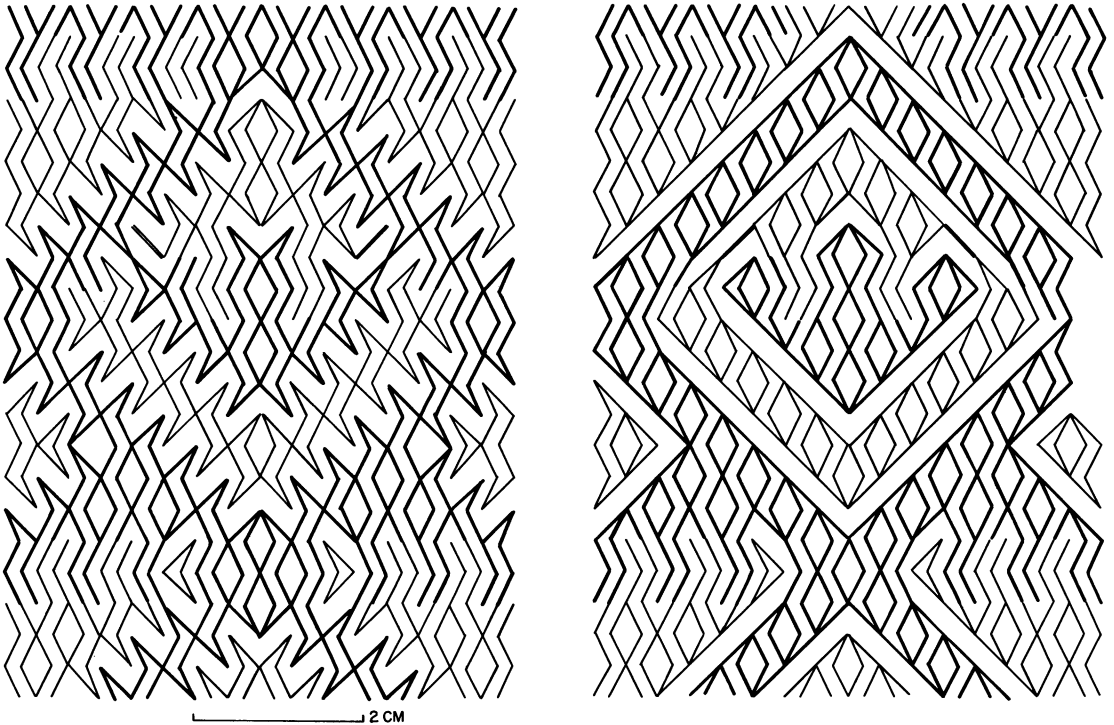


FIG. 134. Drawings of geometric design as it appears on each face of the fabric. 41.2/1687.

cluded in the illustrated designs. Figure 132 shows the warp movement of the same area of two faces of the same fabric. There is evidence that red warps were used in the patterned area.

Title and no.: 41.2/1680—HP 3, M  
Complete l. 40.5 cm, w. 16 cm

In this fabric, one end finish has four rows of compact twining and the other has three.

There are three patterned stripes. The central one is 6 cm wide and involves 34 warp pairs (fig. 133). It is a wider version of the design in 41.2/1588. A diagonal line is achieved by crossing a different warp pair in each of six successive weft spaces. These diagonal lines form a zigzag. At the lines' pivot points, in the space, there are small concentric diamonds with half-twists in the center. Both sides of this stripe are bounded by 1.5 cm of split-pair twining. On either side of the split-pair twining are two patterned stripes 3 cm wide with 16 warp pairs. One is only partially intact. Both stripes are identical in appearance to the one in specimen 41.2/1679, which has chevrons.

The counting of the weft spaces to make this pattern is quite exact. The diamonds with the half-twists are distributed at regular intervals of nine weft spaces. The exact placement of the diamonds with half-twists shows that there were originally seven diagonals of equal length, as well as two shorter ones at each end. The chevrons in the two side stripes are exactly with each other. The same number of warp pairs are in the split-pair twining between the patterned stripes.

Title and no.: 41.2/1687 a and b—HP 3, M  
l. (of a) 28 cm, w. 22.5 cm

There are four patterned stripes in the a fragment. The widest is by the torn side and is the only one that is plotted. It is 6.5 cm wide and has 34 warp pairs. The other 3 stripes have 12 warp pairs each. The width of the split-pair twining between the stripes varies.

Figure 134 shows the design on the wide stripe as seen on both faces of the fabric. The diamond pattern is symmetrical lengthwise and asymmetrical in the opposite direction. Some of the warps have traces of red.

Specimens 41.2/1691 (HP 3, M) and 41.2/1766 (HP 3, N) were plotted. The patterns are similar to 41.2/1680. Both use the crossing of warp pairs to create zigzag lines in stripes together with diamonds and half-twists. Specimen 41.2/2551 (HP 3, O) uses the warp movement of category 61 in one of its stripes.

Title and no.: 41.2/1588—HP 3, L

l. 28 cm, w. 19 cm

Within the width of this fabric there are three different patterned stripes bordered with split-pair twining. Two of them were made by using category 42 warp movement. One is 1.5 cm wide; the other is 5 cm wide. Their plotting reveals similar patterning to that illustrated in the Group IV warp movement. The wider stripe uses half-twists in three consecutive weft spaces. The twist is occasionally used three times in one weft space, a distinction not seen in any other instance. The third stripe is also 1.5 cm wide and belongs to category 61 discussed here (fig. 135).

The geometric pattern consists of small diamonds with half-twist centers repeated at opposite sides of the stripe. Two weft spaces are between them, with pairs of warps crossing in one of those spaces. The general impression given by this pattern stripe is of a wavy longitudinal line with small diamonds on alternate sides of it. The diamonds are repeated nine times.

Bird was intrigued by this fabric and had it X-rayed. The prints of the X-ray did not reveal additional information about the construction or colors.

#### GROUP VII—SHIFT AND RETURN TYPE

There are only 13 specimens assigned to this group. Four have the 70 designation which means very poor condition. Their stratigraphic distribution in Test Pit 3 is from layer H to O. Nine specimens are made entirely of cotton. The other four have some bast fiber in the warps.

The major characteristic of this type of warp movement is that the same warps are transposed for several weft spaces away from their original position. Their return to the original alignment is achieved by repeating the same transposition in the reverse direction.

Category 71 is represented by specimen

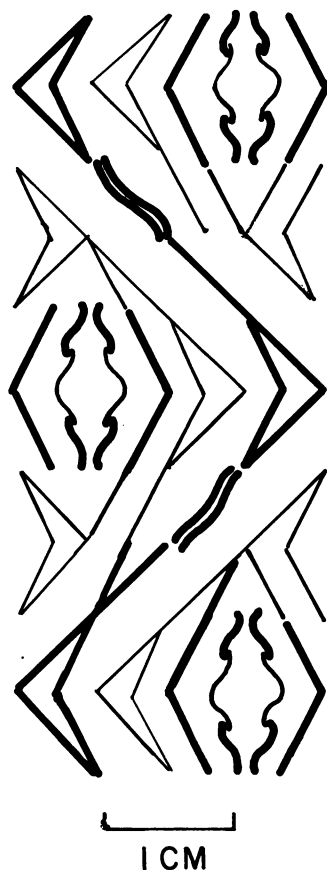


FIG. 135. Drawing of geometric design (one face) of fabric 41.2/1588.

41.2/1168 a and b (HP 3, I). Its plot serves to illustrate this category in the Textile Code. It is incomplete and in poor condition. The a fragment is 16 cm long and 9 cm wide. Bird noted on the specimen file card, "at the center of the roughly diamond-shaped transposed warp area, a pair of brown and white yarns run parallel the full length of the fragment and are never involved with the transposed yarns. The pairs on either side of the center pair transpose, always outward, over the surface of the others, then return beneath the same to their original positions. As this action repeats, it amounts to a spiraling movement."

Title and no.: 41.2/1693 a to d—HP 3, M  
l. 62.5 cm, w. 42 cm

The measurements of this incomplete, fragmented specimen could be greater, de-

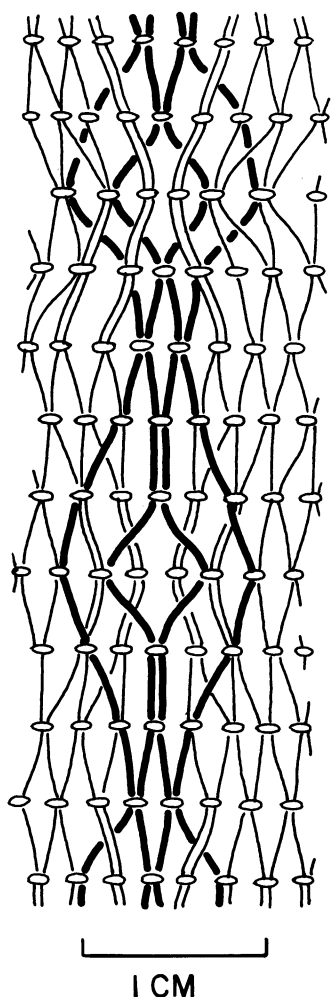


FIG. 136. Drawing of detail of design in fabric 41.2/1693.

pending on the placement of the component fragments. The layout of the fragments is based on the pattern distribution, warp and weft yarn structure, placement of interwarp knots, and count and measurement of the bordering split-pair twining.

The largest fragment has six compact weft rows at the end, with warp ends forming 2 cm of fringe. Two fragments have five compact weft rows at the end finish with a shorter fringe. The illustration (fig. 136) shows Bird's plotting of the stripe made with movement 71. It is similar to specimen 41.2/1168 except that it is in a field of split-pair twining and

is not symmetrical. There are only two more specimens with warp movement 71: 41.2/1588 and 1815.

Category 72 has five examples. Two will be briefly discussed here. Specimen 41.2/1498 (HP 3, K) is described by Bird and illustrated in Group V (fig. 127). This type of warp movement is used to create the necks of the birds and the accompanying color shifts in the plain-twined area. Specimen 41.2/1987 (HP 3, HI and IJ) is composed of ten small fragments. One has an end finish made with three compact weft rows. Besides the category 72, there are vestiges of another warp movement. The pattern resembles the code illustration except that the warps move (5, 8, and 8 weft spaces) farther from their original position than shown in the illustration. Bird wrote on the specimen file card: "Careful computing of the length of the straight warps against the zigzag ones shows a difference of about 12.5 percent for each slant. In a specimen 1 m long the zigzag warps would be approximately 125 cm in length. This would create a problem if both ends were fully secured with compact end finishes."

#### GROUP VIII—MULTIPLE SHIFT IN ONE SPACE TYPE, AND GROUP IX—SPIRAL TYPE

Only one preceramic textile was classified in Group VIII, and one in Group IX.

Specimen 41.1/9372 (HP 3, D) was placed in category 80 (Group VIII). Category 81 was illustrated using specimen 41.2/3752 found in ceramic-yielding Test Pit 5. Pottery-associated fabrics are not dealt with in this report.

The illustration of category 91 (Group IX) was based on specimen 41.2/2021 (HP 3, J). It also has the warp movements of categories 22, 31, and 40. Its poor condition prohibits accurate plotting. The wefts of the fabric are in pairs, a very unusual feature. Bird wrote on the specimen file card, "The blending of bast and cotton is irregularly done. At places the bast is unmixed with cotton, at others it is dominant. In spite of the poor condition of the entire piece, it is obvious that the blended yarns did not wear nearly as well as the all-cotton ones."

## CHAPTER 11. OTHER TEXTILE TECHNIQUES

This chapter describes and discusses the preceramic textiles at Huaca Prieta that are made with techniques other than twining. They are the woven, looped, and netted specimens, which occur in smaller quantities than the twined fabrics, but are nevertheless represented in most layers of Test Pits 2 and 3. The chapter concludes with a description and commentary on the cordage and hanks at Huaca Prieta.

### WEAVING

Test Pits 2 and 3 produced 285 woven fragments which were united into 122 different fabrics. These textiles are 4.6 percent of the total fabric yield from the two excavations (table 10). Only one gram of scraps could not be analyzed. Many features of the woven fabrics were analyzed and tables were made from the computer printouts. These tables are not published here, but significant statistical data from them is introduced in the following text.

Only two woven fabrics were found in Test Pit 2. They are plain weave  $1 \times 1$ , made entirely of cotton. All future references in this text are to specimens from Test Pit 3. There is no significant change from the top to the bottom of the pit in the ratio of woven textiles to those made with other techniques. A significant increase occurs in the ceramic-associated textiles, not discussed here. One chronological distinction is notable in the preceramic woven fabrics. The use of paired warps in plain weaves (nine specimens) is present only in the upper layers G to D.

The 122 specimens are classified in sub-categories of weaving as follows:

- 89—plain weave  $1 \times 1$
- 7—plain weave  $2 \times 1$
- 2—plain weave  $2 \times 2$
- 4—plain weave, varied numbers
- 20—with floated warps

Ninety-two woven specimens (75.4%) have warps made entirely of cotton. The rest have cotton with some bast, either blended or plyed with cotton. Only one specimen in layer G has three types of yarn structure. Twenty-nine specimens employ yarns of two different

constructions. Of all yarn construction, 78.9 percent are S-spun Z-doubled.

One hundred and eighteen specimens (97.5%) have wefts of pure cotton. Three have some bast and one could not be analyzed. Single S-spun cotton wefts are used in 70 fabrics; single Z-spun only in one; and in 48 instances the wefts are S-spun Z-doubled. It may be chronologically significant that the Z-spun S-doubled yarns are used only in the lower layers P to M. No such yarn construction occurs in warps. Where bast is used it has the same characteristics of yarn structure as in twining.

Continuous-type weft course is noted in 37 specimens with both side selvages. One of these (41.2/1594, layer M) has wefts knotted at both side selvages as in twining. It is 44.7 cm long and 46.5 cm wide. One end-finish is twined with four rows of compact twining; the other has only one row of twining. A unique specimen from layer M (41.2/1598) with warp floats has two continuous wefts entering the same shed from opposite sides; they cross within the body of the fabric and shift to the next shed. It is only 16 cm long and 12.5 cm wide. There are 52 textiles with one side selvege. Fifty show the continuous weft course. One (41.1/9636) has two picks of wefts united by an overhand bend knot at the side selvege. This specimen has an overall application of red pigment.

The warping system and probable size of looms is discussed by Bird in Chapter 9. He mentions the minimum complete length and width measurements and the maximum incomplete sizes. None of the measurements help in determining the function of the textiles. Only three specimens are complete in both directions. Their sizes are  $22 \times 10.5$  cm (41.1/9710),  $44.7 \times 46.5$  cm (41.2/1594), and  $16 \times 12.5$  cm (41.2/1598).

Forty-five warp ends are present. In 23 cases the warp ends are missing or frayed. In 16 instances warp ends form loops as illustrated in Code XXV, categories B to G, L and M. In six cases the warp ends are cut. Twining was used for warp end finishes in 40 instances (fig. 137); in five cases it was not. The number of weft rows ranges from one to ten. How-

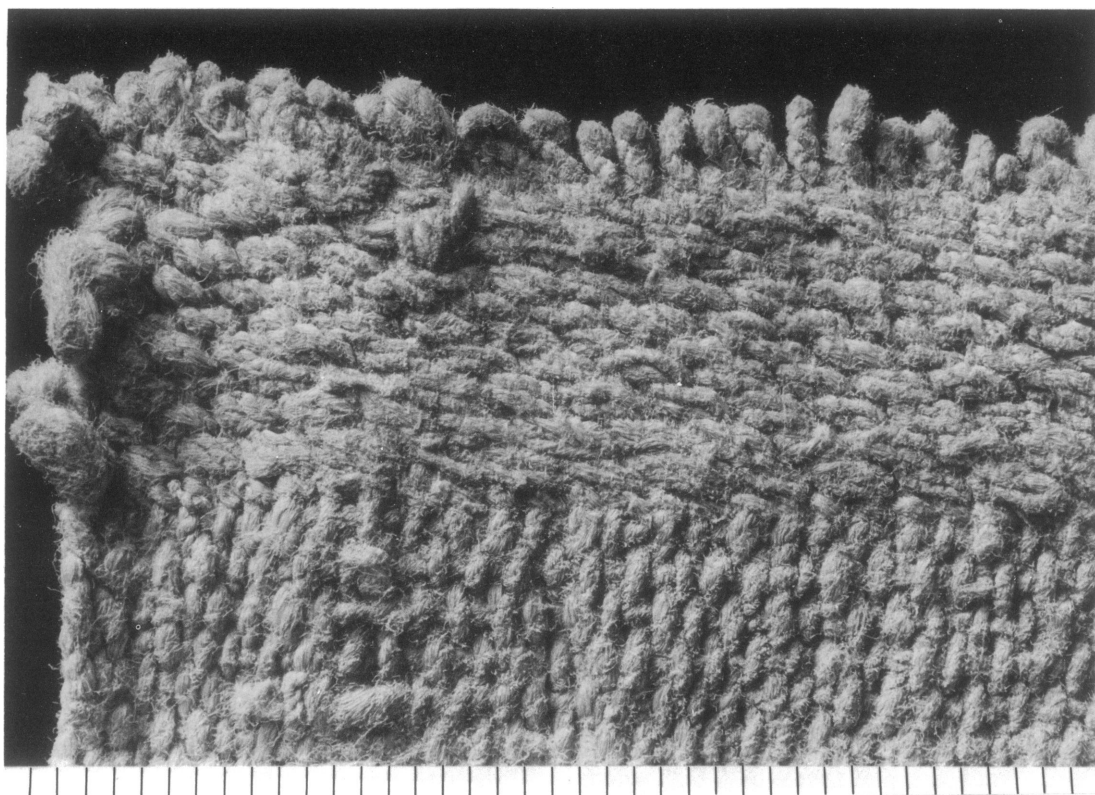


FIG. 137. Detail of woven textile with twined warp end finish. 41.1/9704, HP 3-G.

ever, two or four rows of twining are used most frequently. With few exceptions, the wefts in the twined end-finishes are handled singly. The twining twist direction is Z, with one exception.

The warp counts range between 24 and 64 and the weft counts vary from 6.7 to 21. There is one specimen (41.1/9017) from layer C with a higher count of 23 to 70 per 2.5 cm. Such a high count is typical of later ceramic-period fabrics and therefore it is possible that this specimen comes from the ceramic-associated layer above it. The counts of the majority of the woven fabrics is in the 40s for the warp and between 17 and 20 for the weft. The counts do not appear to change through time.

Specimen 41.1/9711 has evidence of an area of terminal construction with less compact wefts than within the body of the fabric. One plain weave  $1 \times 1$  fabric (41.1/9537)

has an area of terminal construction partially woven with paired wefts.

#### DESIGNS IN PLAIN WEAVES

A limited number of specimens among the plain woven fabrics have warp stripes. Eight have stripes made with color. Six have color created with natural brown cotton, of which two have some warps mixed with bast; one (41.1/9097) from layer D has blue-dyed warps; and one (41.2/1203 H2I2) had color, judging by the distribution of some warp end-loops that span over others at relatively even intervals. Striping by using cotton warps versus cotton plyed or blended with bast occurs in four more specimens.

Barred stripes of two different shades of cotton are found in three fabrics. The most unique of the three is the cylindrical bag (41.2/2548) which contained the two pyroengraved



FIG. 138. Cylindrical bag 41.2/2548, plain weave with barred stripes. It contained two pyroengraved gourds from burial 99.1/903, from layer O. Bottom is on right. Length is 20 cm.

gourds found with burial 99.1/903 (fig. 138). Bird described it in Huaca Prieta textile notebook 2:

The woven bag which contained the rotted carved gourds is at present unique among Peruvian textiles in the manner of its warping and construction. When found, its bottom was unfortunately too rotted to be saved, so we do not know how it was finished. When it was opened, the fabric formed a complete cylinder 24 cm in circumference by at least 20 cm in length, the latter measurement being the loom width. Obviously, in the final stage of the work, the weft was inserted with a needle or bodkin, and it is quite possible that all the weft was so handled. When preparing the warp for this specimen, the yarns were first set up exactly as for a strap or belt at least 1.5 m long by 3 cm wide. White (?)

and brown two-ply cotton yarns were used, so arranged as to form two barred warp stripes, each bounded with white on one side. In all, there are only 42 warps arranged: 8 white, 3 brown, 7 alternate white and brown, 3 brown—then a repeat in the same order. When divided into two sheds the four central white yarns produce short, transverse markings with an otherwise brown stripe. This group of 42 yarns was then wound spirally about either cord or stick supports placed about 12 cm apart. It is unfortunate that the bottom did not survive, but it must have had either an irregular step at the edge where the warps ended, or a straplike extension as at the top. The strap at the top is formed of the last 19 cm of 21 warps. The weft used for weaving continues from the main body of the fabric. Its end, as in various woven items, is finished with three rows of compact

twining. Tie cords were created by withholding groups of four warps which were then paired, crossed in an overhand knot, twisted by pairs, and then redoubled. The ends are carefully tapered and terminate with a single overhand knot. Four such cords were created, varying in length from 6.5 to at least 12 cm.

Bird described a second specimen (41.2/1594—layer M) with barred stripes:

This specimen has the greatest loom width of any of the woven fabrics—46.5 cm. The completed length, 44.7 cm, is somewhat less than the original warp length as no loops remain beyond the compact twining at the ends. From the presence of some frayed warp ends one cm long it is obvious that they extended this much, at least, beyond the compact twining. In addition to the width, several other features make this specimen noteworthy. First, in setting up the warp, care was taken to duplicate the structure of the stripes and to space them precisely. Beside each side selvage are 32 plain white cotton warps. Between the four pattern stripes are 64 white warps in each space. The stripes themselves have but 31 warps which is not accidental, but the result of planned distribution of colors as the bordering dark yarns are both in the same shed. Two exceptions where less than 31 warps occur in the stripe can be explained. In one instance, a warp yarn may either have broken in weaving, and because of this was left out of most of the fabric, or more probably one passage of warp was overlooked. The missing warp is a plain white one which should have separated two of blended cotton and bast plied with brown cotton. At the finished end these enter the twining. It is impossible to say why the weaver did not add another warp when the mistake was discovered. Rather than change the shed order for the rest of the fabric, the two blended bast yarns were handled as one. The second exception or break in a regular, uniform warp order is in the position of the last stripe set up. I say this advisedly, for it is next to the terminal selvage and the only assumption we have to make is that they worked in the same direction during weaving as during warping. This section of the pattern stripe has but three dark blended bast and cotton warps, while the other nine corresponding units have four. The alternate warp for this is also lacking, which suggests that there was not quite enough of the dark, blended bast yarn to complete the pattern. This would be precisely the point at which such a lack would be discovered. Of particular interest is the manner of handling the wefts. Along one selvage the suc-

cessive picks of weft are joined in just the same knots as commonly seen in the twined fabrics, and these knots clearly indicate which is primary and which is the terminal selvage. Quite obviously they prepared lengths of yarn equivalent to twice the width of the fabric, doubled them at the middle, and with the bight tied a simple overhand knot, leaving a loop about 4 mm long beyond the knots. One free end of the yarn was then run through a shed and drawn in until the knot was tight against the selvage warp. After changing the shed, the other half of the yarn was drawn through, and the two ends united with the customary overhand knot. There was no advantage to this procedure, and no necessity for it, as there was for the contemporary twined fabrics. It merely carries over into weaving a basic twining procedure.

The third fabric with barred stripes was found in Trench Lot 4 (41.2/2157). It is worthwhile mentioning that it is a narrow fabric 2.7 cm in width with an incomplete length of 129 cm. Such narrow loom products with barred striping were common among textiles of much later time periods. Twelve more fabrics have variations of natural shades of cotton, or some difference in the material used. They do not seem to be a deliberate attempt at striping.

#### WARP FLOAT CONSTRUCTIONS

Besides the plain weaves, there are 20 specimens with warp float construction. Eight are coded under category 9 in Code XII; nine are under category 10; one each is in categories 8, 11, and 18. Of these, the fabric with the double-headed bird design (41.2/1205 layer H2I2) is very significant (fig. 139). The fabric is incomplete in length, 28 cm. The width is complete, measuring about 10 cm. There is another very small fragment that came off the same textile. Both warp and weft are S-spun and Z-doubled cotton. The count is 57.2 by 16.5 per 2.5 cm. The majority of the floats span over three picks of weft. A single row of twining, about four warps, found across one end, seems to be a repair rather than a warp end-finish. This is the first representational design recovered in the Huaca Prieta fabrics by Bird.

Specimen 41.1/9476 from layer E was used as an example for the creation of category 9 of the code on weaving with warp floats. It

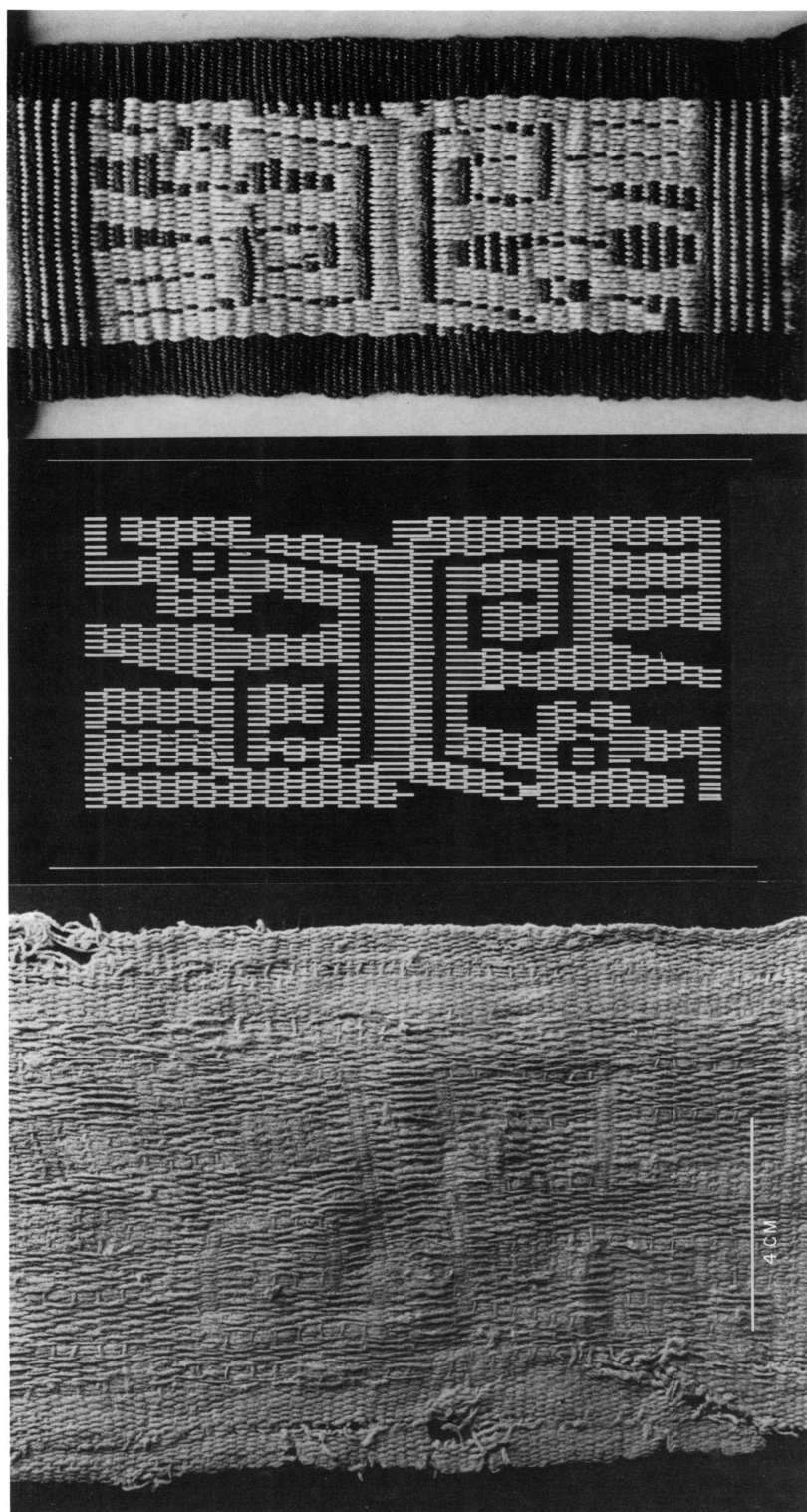


FIG. 139. Woven fabric 41.2/1205 with two bird figures created with single-faced warp floats (left). Center: plot. Right: model of fabric (by Adele Cahlander).

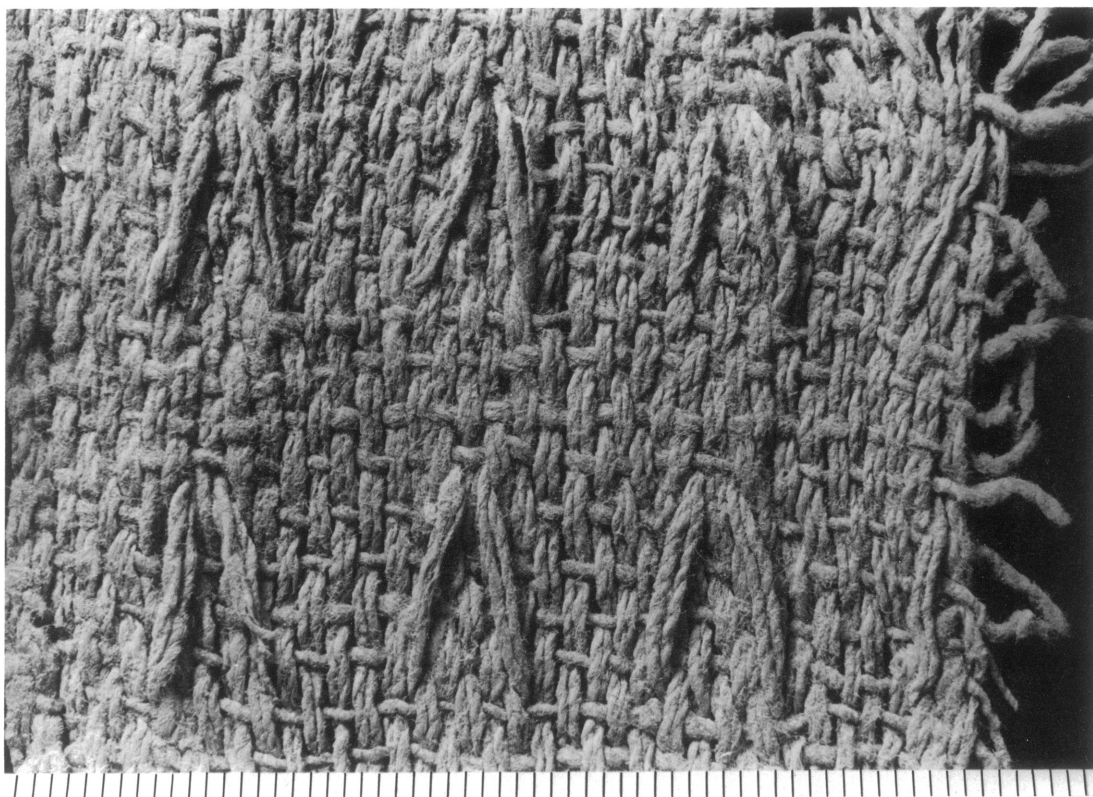


FIG. 140. Detail of fabric 41.2/9118 with diagonal warp floats on plain weave.

is a fragment 20 cm long and 15 cm wide. Bird wrote on the specimen file card, "Only 7 warps are not involved in the float system, versus 21 which float. The irregular sequence of floats indicates that some pattern or figure was created by floats." The complete design could not be recovered. The fabric has an overall application of red pigment.

It is interesting that four other fabrics with warp floats, not necessarily from category 9, have an overall application of red pigment: 41.1/9710 layer G; 41.2/1598 layer M (previously described); 41.1/9959 a to g layer H; 41.1/9960 layer H. Bird noted that in the last two specimens the pigment may have been applied to the yarn before weaving. Specimen 41.1/9963 from layer H also has traces of red. The overall red color of these specimens suggests that their floats have nothing to do with color distribution.

Category 10 is well represented by specimen 41.2/1078 from layer I. Its incomplete

length is 125 cm. The incomplete width is 9.4 cm. Bird suggested that this extremely long specimen was warped with a continuous-belt type warp, and then cut after construction. The warps are S-spun Z-doubled cotton, white and brown. The wefts are S-spun single cotton. The count is 64 by 25 per 2.5 cm. Two fragments have frayed warp ends 5 cm long. There is no evidence of any kind of warp end-finish. There are three warp-float stripes involving 17 warps. They are divided by plain weave  $1 \times 1$  of 51, 47, 43, and 50 warps. Specimen 41.2/2498 is another unusually long (110 cm) fabric. It is notable that five specimens of the floated-warp woven fabrics exceed 1 m in length. Their complete widths range between 9.4 cm and 12.5 cm.

Specimen 41.1/9964 from layer H is the only example in category 11. It is distinguished from category 9 by having only a few floated units on its reverse side.

Specimen 41.1/9118 a to d from layer D

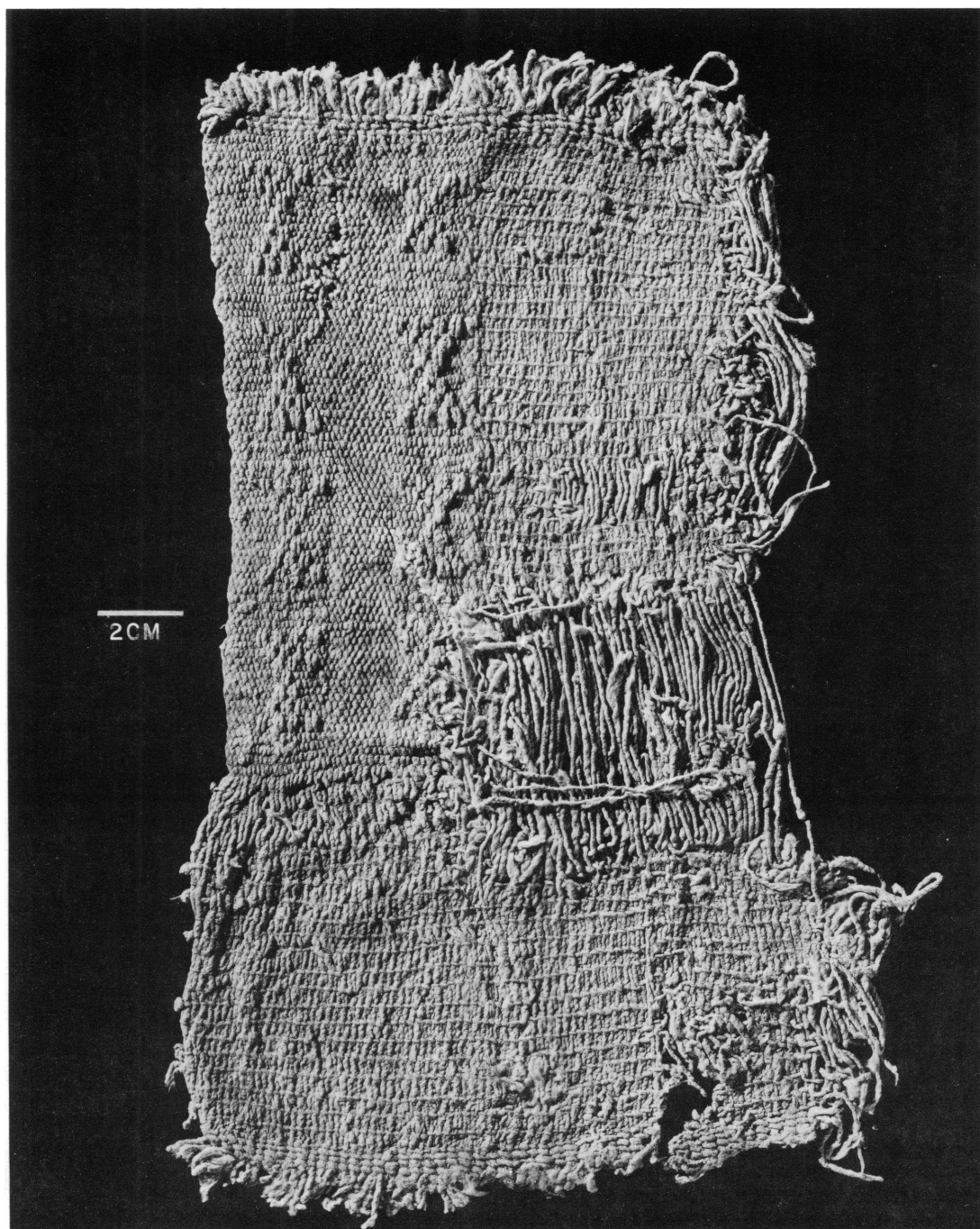


FIG. 141. Fabric 41.2/1599 has  $2 \times 1$  weaving (upper left) combined with twining.

is unique among the floated-warp fabrics (fig. 140). Supplementary paired warps float diagonally over four picks of weft over a  $2 \times$

1 ground fabric. Two floats form a V on both faces. At the apexes of the V pattern the weft pick is over three pairs of warps.

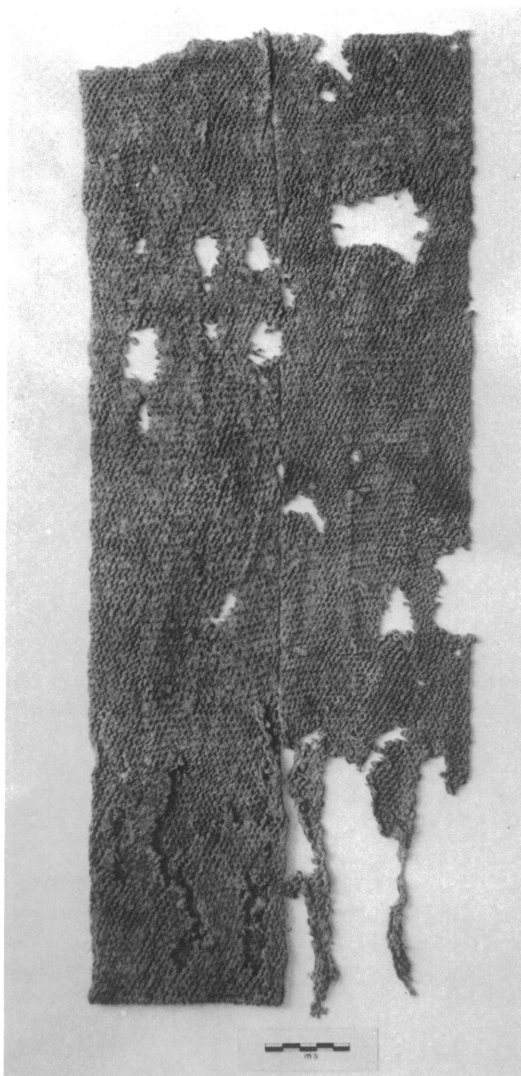


FIG. 142. Looped fabric 41.2/1451 is at least 125 cm long, possibly a belt.

#### TWINING AND WEAVING COMBINED

Three fabrics deliberately combine twining and weaving. Four others were similarly classified but they are predominantly twined with sporadic interruptions of twining twists between warps. It is difficult to determine if these were intentional.

The first of the deliberately twined and woven fabrics is specimen 41.1/9965 from layer H. It is predominantly twined, but has six narrow longitudinal areas where the wefts

are woven with paired warps. The second specimen is 41.1/9711 from layer G. It is a plain weave  $1 \times 1$  fabric with three bands of compact twining over single warps, and a twined end-finish. Red pigment was applied over the entire fragment. The third textile is specimen 41.2/1599 (fig. 141) from layer M. It is unique in the manner in which it combines twining and weaving. Bird described and analyzed the fabric in Huaca Prieta Textile Notebook 2:

[This specimen] combines the technique of twining and weaving to a greater extent than any other Huaca Prieta fabric. One corner area forming about one-eighth of the piece is completely woven and has a simple warp float figure on both faces of the fabric. Weft yarns emerge from this area and twine in pairs about the balance of the warps. The warps extending beyond the woven section, which run about two-thirds of their length, are united by twining. This combination thus employs the same wefts for both weaving and twining and has warps which are part woven and part twined. It offers a clue about heddling, or lack of heddling devices, and a careful analysis is warranted. . . . In the woven area, a short weft must have first been woven in from the [intact side] selvage leaving half its length for use in the next shed. After completing the weaving of the first two picks, the ends of the same short weft then were available for twining about the warps beyond the woven area. Lacking the opposite selvage we can only surmise that the two ends were tied off in the normal manner, with a knot outside the last warp pair. Actually, the warp in the woven area are compact enough to hide the weft completely. Theoretically, one could use a single continuous weft for such a construction but this is foreign to the twining procedure. Within the woven area are two or more repeats of a double triangular figure. Each row employs 27 warps with the floats in pairs passing over three and under one weft. The same figure is repeated on the reverse side, using the adjacent warps. In one pattern row, blue and red yarns alternate—with the blue used in the figure on one side, the red on the opposite. . . . One naturally wonders what, if any, heddling device might have been used.

Bird noted the difficulty of making such a fabric with a shed rod, necessary in heddling, and even doubted the use of pattern sticks, since there were mistakes in the warp floats. He concluded that "if this fairly well-executed fabric was done without a heddle, the

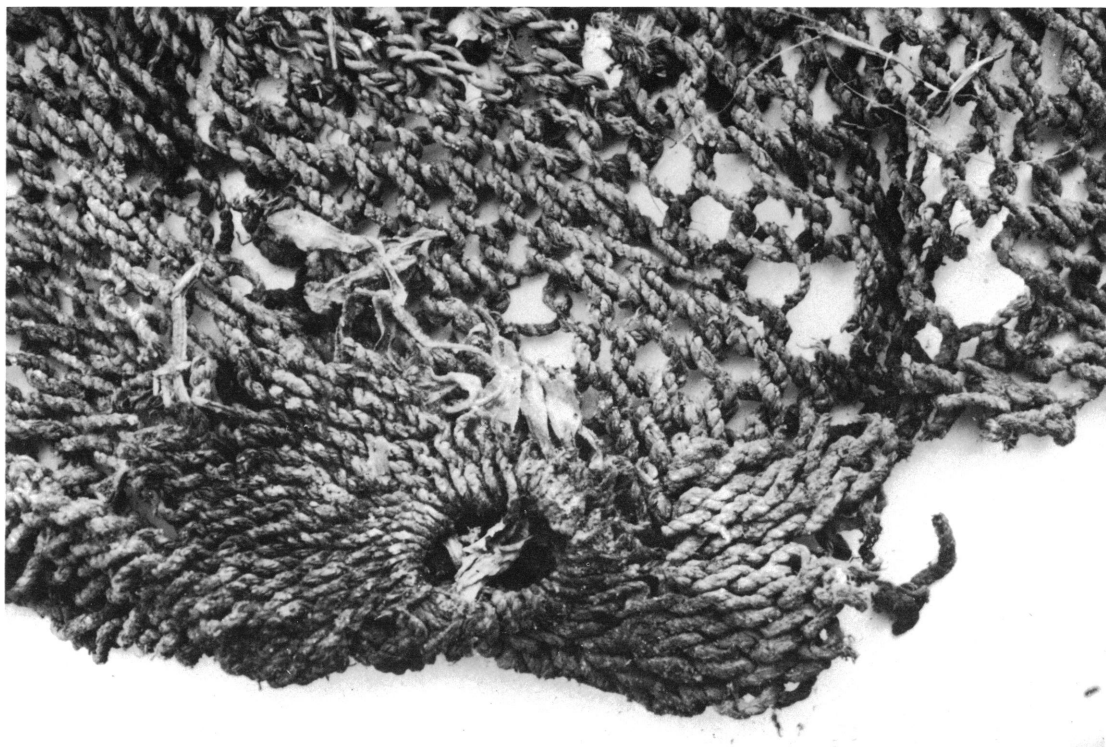


FIG. 143. Bottom of *junco* bag 41.2/2553 started on a central ring 1.5 cm in diameter. It was associated with burial 99.1/903 of Layer O.

same may be true of all their woven pieces.” This description and analysis was written before 1952. In 1952 Bird published the article “Before Heddles were Invented” which expresses the clear opinion that heddles were not used.

#### SUMMARY

To conclude this section on weaving, it is helpful to reflect on the relationship between twining and weaving and offer some suggestions to explain the popularity of twining over weaving in the Huaca Prieta preceramic fabrics. First, in table 10 of Chapter 9, one may note that the percentage of woven fabrics in comparison to textiles made with other techniques is low, averaging 4.6 percent, from the bottom to the top of Test Pit 3. There is no significant increase or decrease in the proportion, which is similar in Test Pit 2 (4.4%). Likewise, the percentage of twined fabrics remains about the same in both test pits (71.3%

and 70.7%). What explains the constancy of these two techniques in such similar proportions? Bird wrote of the probable isolation of Huaca Prieta community which produced very limited evidence for outside contacts. He noted that the community was very conservative in its customs (letter, 1976). This may be part of the explanation for the use over at least 1500 years of different textile techniques in unchanging proportions. Nevertheless, it does not explain why twining was considerably more popular than weaving. One might speculate that twining was an easier and more practical means of making a fabric than weaving, at least until heddles were invented. One might note that wefts are spaced in twined fabrics whereas in woven ones they are much more compact. Thus a woven fabric of the same size as a twined one required more weft insertions and wefts to complete. Spaced wefts are more practical in twined fabrics than in woven textiles, since twined weft pairs encircle the warps and are

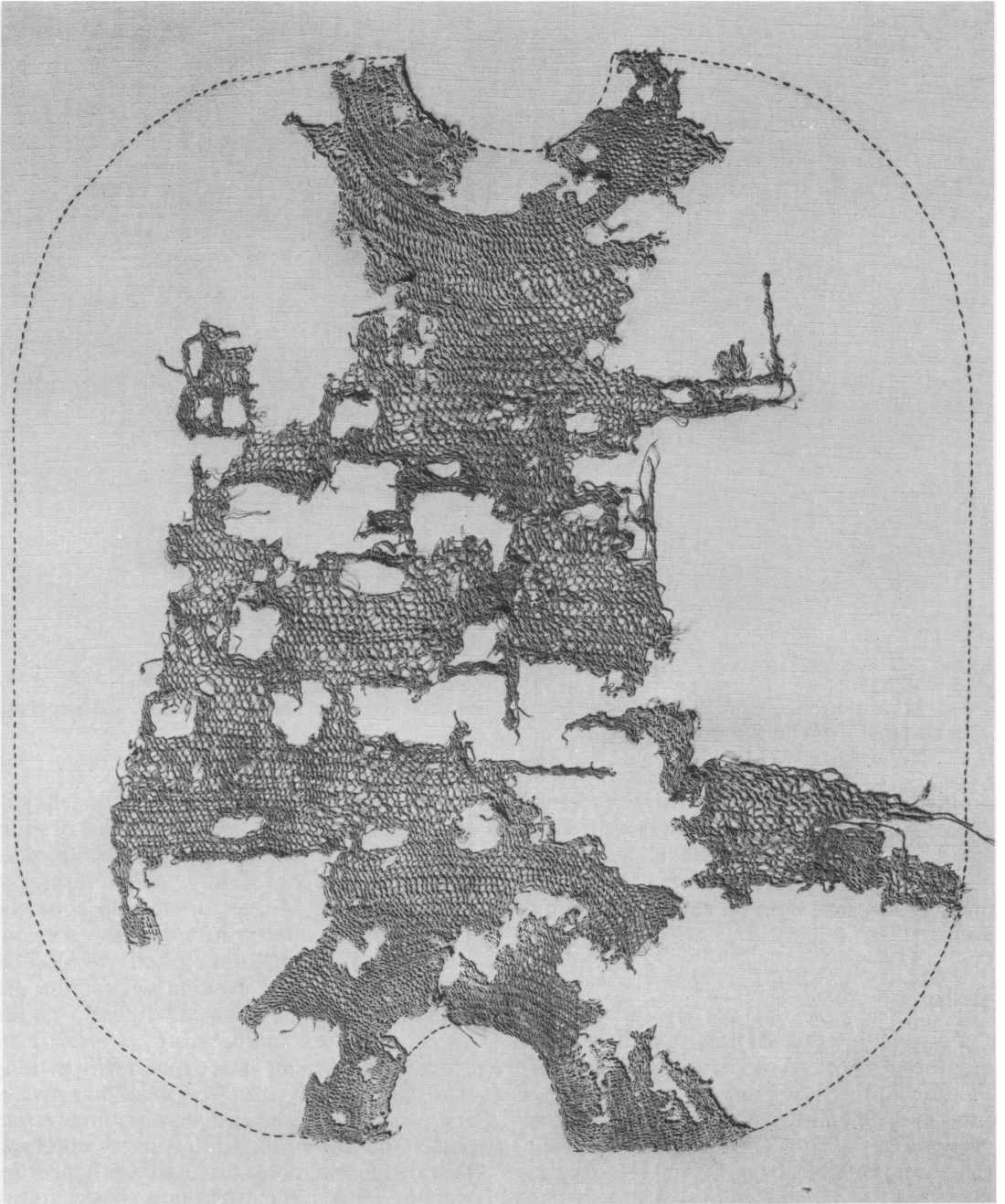


FIG. 144. Large looped open-ended carrying bag. 41.2/1445.

less apt to slip. Thus cultural tradition, and certain technical features, may explain the continued popularity of twining over weaving.

It has been noted that twining and weaving are not mutually exclusive techniques. As noted above, both techniques were created with finger manipulation, and both tech-

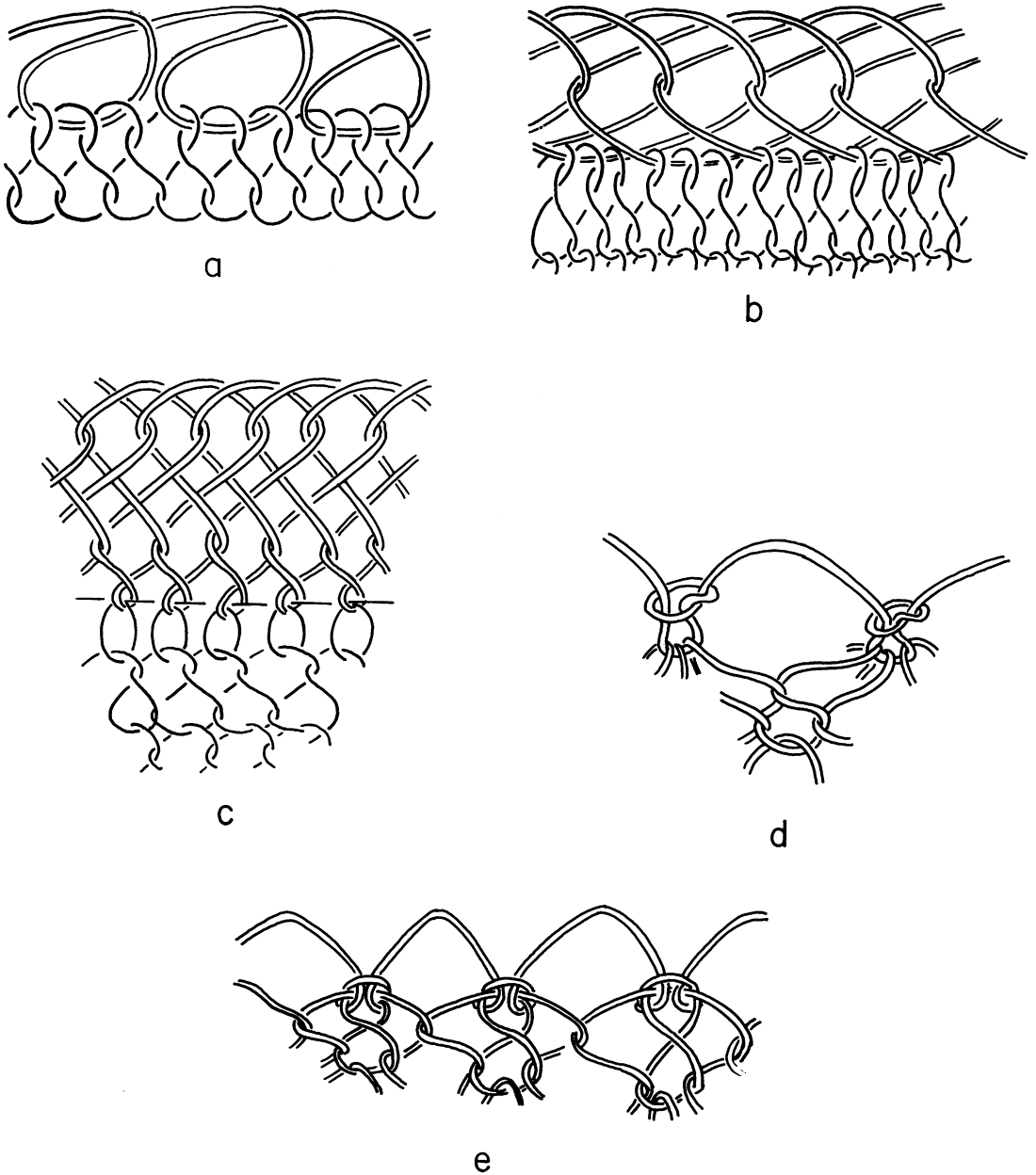


FIG. 145. Drawing of looped edgings. a. 41.2/2065, HP 3—side trench IJK; b. 41.2/1455, HP 3—J; c. 41.2/2442, HP 3—Sample 2, middle; d. 41.1/9552, HP 3—E; e. 41.2/2246, position uncertain.

niques are present in the body of a few specimens. Bird (1952a, p. 45) noted that in such fabrics the woven area was so restricted that one might classify them as twined fabrics where details were woven. Other similarities between twined and woven fabrics rest in the

areas of loom attachment, warp end-finishes, and the use of discontinuous wefts. Bird wrote (1952a, p. 45):

The method of loom attachment in the loom is identical [in twining and weaving] and virtually

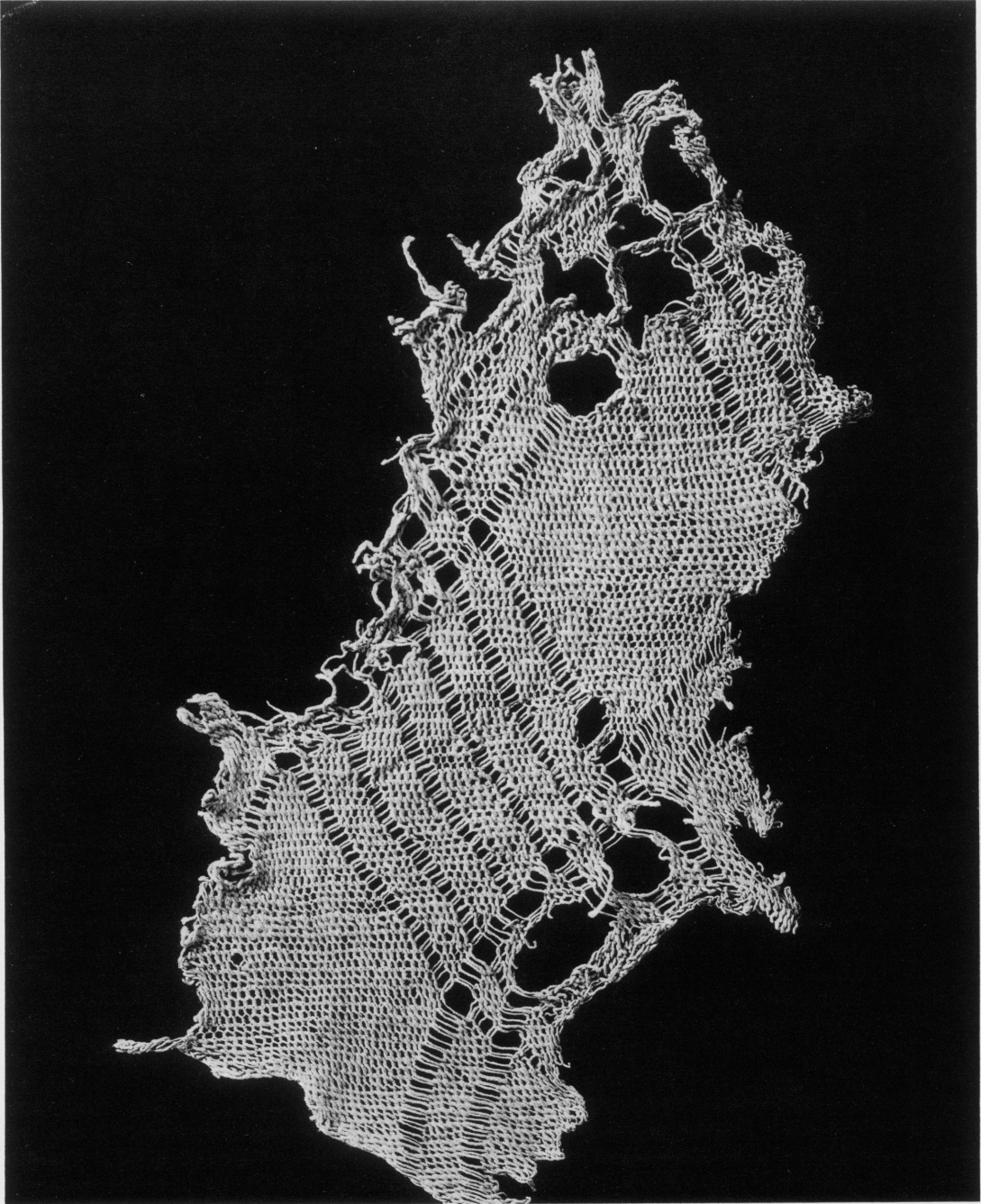


FIG. 146. Figure-eight looped fabric 41.2/9396, HP 3—D, with pattern achieved by extending the loops.

all show the same initial construction, with the warps set up in the looms as pairs and a few compact rows of twining to stabilize or fix their

ends . . . . Another consistent feature of the twined fabrics, the use of short weft yarns tied off after each passage across the warps, is some-

times also found in weaving where every two picks of the weft are tied together at the side selvage.

### LOOPING

Looping is a single-element construction in which a single yarn is interlocked in successive rows of loops. Bird (1952, p. 8) was inclined to consider this technique, in its simpler form, among mankind's first products using twisted fibers. The technique is still used by many different peoples. From ethnographic examples (Hinderling, 1952), we know that a spacer or gauge is usually used to make the loops a uniform size. With the possible exception of some plain sticks, nothing could be positively identified as a spacer in the Huaca Prieta collections. Judging from the even size of loops in the plain and patterned fabrics, some sort of gauge must have been used. In looping, a bodkin serves to advance the yarn or cord end, and there are a number of these in the collections (fig. 76). The gross count of looped fragments in Test Pit 3 is 780, representing 257 specimens. Twenty-four grams of scraps could not be analyzed. Test Pit 2 produced only one specimen.

Textiles made with this technique can be both rectangular and cylindrical. Thirty-four of the specimens are of rectangular construction of unknown function. One item, 41.2/1451 from Test Pit 3 (fig. 142), layer J, is 11.6 cm wide and at least 125 cm long. It could have been a belt. An advantage of looped fabrics is that they can stretch, and therefore are mainly used for bags and pouches. Twenty-nine specimens in Test Pit 3 were identified as bags. The bottoms of these are usually started with loops drawn together with a cord, or the loops start around a cord ring (fig. 143). The work progresses in a spiraling manner. Some of the specimens lacked bottoms but were identified as bags by characteristic changes of stitches at the mouth, or by having drawstrings at the top edge.

A unique specimen from the point of view of size and shape is the open-ended carrying bag 41.2/1445 from layer J (fig. 144). It is 95 cm in length and 81 cm wide. Bird described the textile in Huaca Prieta Textile Notebook 2:

The construction [figure 8 looping technique, Code IX, No. 41] is basically simple. First, a

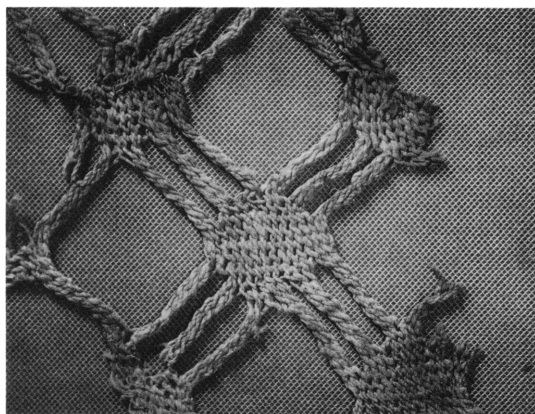


FIG. 147. Figure-eight looping creating open-work pattern. 41.1/9401, HP 3—D.

rectangular fabric measuring 75 cm in length by at least 81 cm in width was formed. This has 60 rows of the basic type stitch and is made of the usual cotton yarn or cord. The second step reduced the end widths by the use of what may be termed a binding stem stitch edging. Each successive stitch passes through three of the selvage loops and draws them tightly together. Extensions of this binding cord may have formed, or been attached to, carrying straps or cords. In its present condition, not enough remains to clarify this feature. It has been possible to spread the fabric flat. The surviving portions of the side selvages are used to project a minimum outline. However, when new, it could not have been spread out flat without having two layers of the fabric in places and the fabric bunched at the ends. Evidently, like virtually all the Huaca Prieta fabrics, it had seen hard service before being discarded, and had been repaired at various times. The repair yarns and stitches vary in size. At Huaca Prieta, six other fragmentary examples of the edging used to compress the end selvage loops, as with the large pouch, were recovered. They are restricted to the I and J layers and the I-J-K unit of the exposure trench. On this basis, such carrying pouches can be considered a diagnostic feature of the period marked by the formation of that portion of the debris. We must note, however, that the same edging stitch is also used for reinforcing and embellishing an edge without reducing its length.

The end-finishes of looped fabrics were not covered by a separate code. The fabrics with such a feature were retrieved through the Special Feature Code XXXI, item 32. Twenty-five fabrics have edgings (fig. 145). There are two different kinds. One uses knots to gather

several loops, probably for a drawstring. The other is more decorative.

The most common type of looping is the plain type (Code IX, category 41, of figure 8 looping). There are 187 specimens, including the one fabric from Test Pit 2. A unique and large item of this group, specimen 41.2/2044 from Exposure Trench K, is described by Bird in Huaca Prieta Textile Notebook 2:

The largest fragment in the entire Huaca Prieta textile collection measures 300 cm in width by 54 cm in length. Although it is in very ragged condition, it does provide us with some data impossible to obtain from smaller pieces and, at the same time, raises questions which, unfortunately, cannot be answered. The piece retains a portion of a common type of edge finish (fig. 145, b), but the other three sides are all incomplete. Thus the present dimensions are minimal. Even if these are close to the original size, one immediately wonders what function such a fabric could serve. The only analogy in Peruvian costume are the wrap-around short skirts of Paracas. Conceivably such a fabric, even if appreciably larger, could serve in this fashion, yet none of the skeletal remains encountered was wearing such a garment. The answer evades us at this time. Other questions relate to the problems of construction. Before considering them we should first review some of the measurable data. From the finished edge section down to the frayed opposite edge there are 108 rows of stitches at the rate of 5 rows per 2.5 cm. As with other examples from this site, the row width is very uniform, with the specimen varying in appearance only as the diameter of the yarn changes. Within the rows, the stitches occur at the average rate of 69 per 20 cm. At this rate there must have been approximately 1035 consecutive stitches per row, and a minimum of 111,780 needed to make a fabric of this size. By undoing a typical section of 10 stitches it was found that each stitch required 2 cm of yarn, indicating that the minimal 2-ply yarn required for production was 2253.6 m. A piece of this size could have been suspended or sustained in some way during construction, just as a much smaller one could have been suspended.

The patterned variant (Code IX, No. 42) of the plain type of figure 8 looping, where some loops are extended, is found in 39 specimens (fig. 146). Another patterned variant (Code IX, No. 43) is found only in one fragment, 41.1/9401 from layer D (fig. 147). It

is interesting to note that the same concept of an openwork pattern is made with the twining technique. A corner pattern in a rectangular fragment (41.2/2553 HP 3—position uncertain) (fig. 148) is the only fabric in which three types of looped stitches were used (Code IX, No. 60).

Other variants of the figure 8 looping technique as represented in categories of Code IX are found in the following quantities: ten in category 45, six in category 48, and one each in categories 46, 49, 51, 53, 54 (fig. 149), and 59.

Of the simple hitch looping, five specimens fall into category 30. The long specimen, which is probably a belt, and a pouch with a rounded bottom from layer O (41.2/2552) fall into this group. The pouch is possibly associated with burial 99.1/903. Category 31 has only one specimen. Of the simple hitch looping, a pouch from layer J (41.2/1335) is the sole specimen (fig. 150) for category 34. It is 11 cm deep and measures 12 cm across the top.

Of the 257 looping specimens, seven are made of pure S-spun Z-doubled *junco*. An example is the specimen 41.2/2553 from layer O (fig. 143) found with skeleton 99.1/903. It is made with the plain figure 8 looping. There are also nine specimens made entirely of S-spun Z-doubled bast. Some of these are small fragments and could be repair sections. Five specimens have, besides cotton, sections made with yarn that has some bast, either blended or plied with cotton. The yarn structure is the same as that used in other textiles. The remaining 236 specimens are made entirely of cotton. The yarn structure of the cotton is predominantly S-spun Z-doubled. Only 18 recorded cotton yarn structures deviate from the common 2-ply yarn. They are composite yarns of different kinds found from layers I to C. Only two instances are recorded where the cotton yarns are Z-spun S-doubled—one fabric in layer H, and one repair yarn in layer D. The distribution of composite cotton repair yarns is from layers K to C. Other repair yarns of cotton, or cotton blended or plied bast, are of the usual construction.

The density of the looped-construction fabrics was measured by the number of rows per 2.5 cm. Since the basic figure 8 stitch and

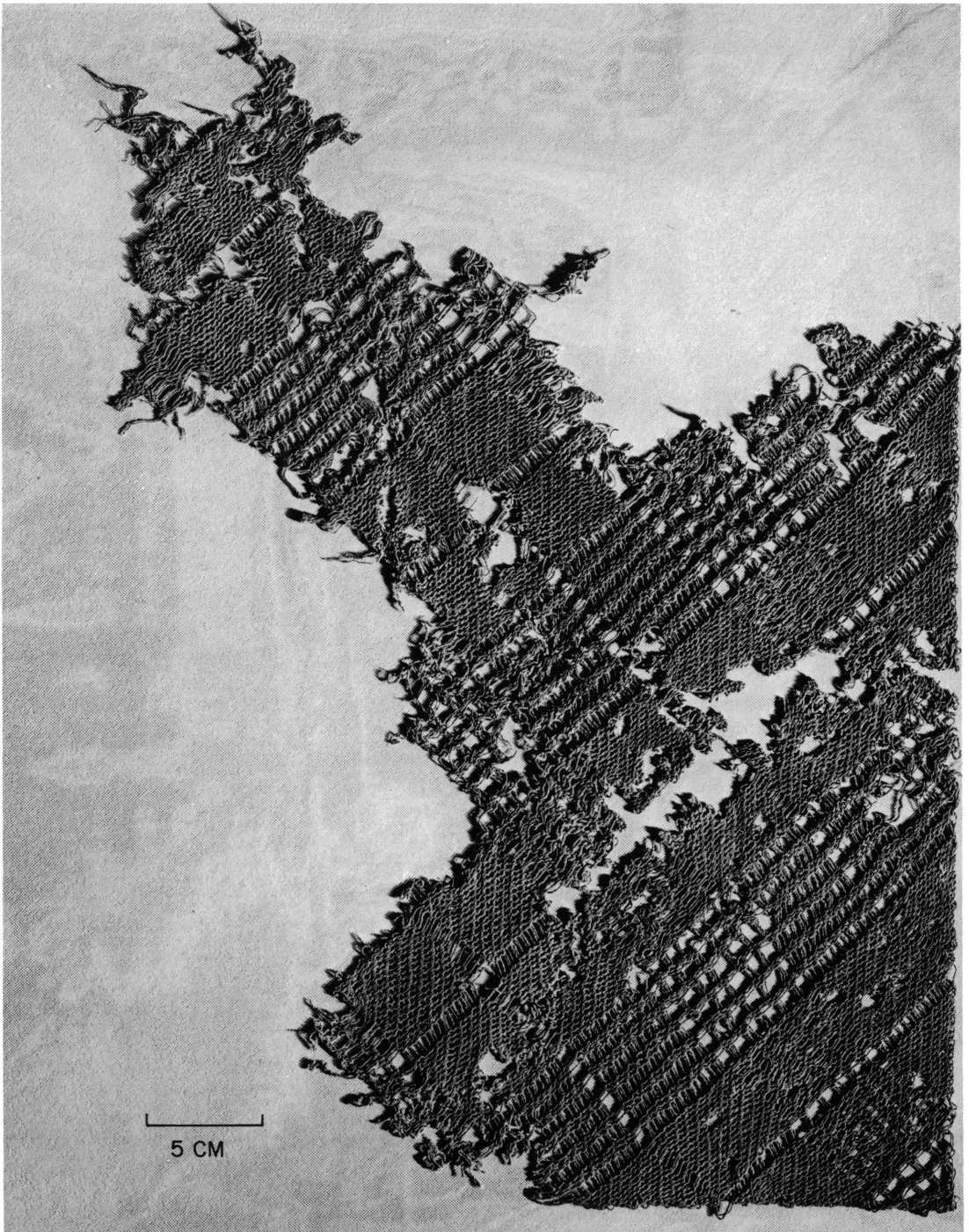


FIG. 148. Rectangular looped fabric with pattern achieved with three types of looped stitches. 41.2/2553, HP 3—position uncertain.

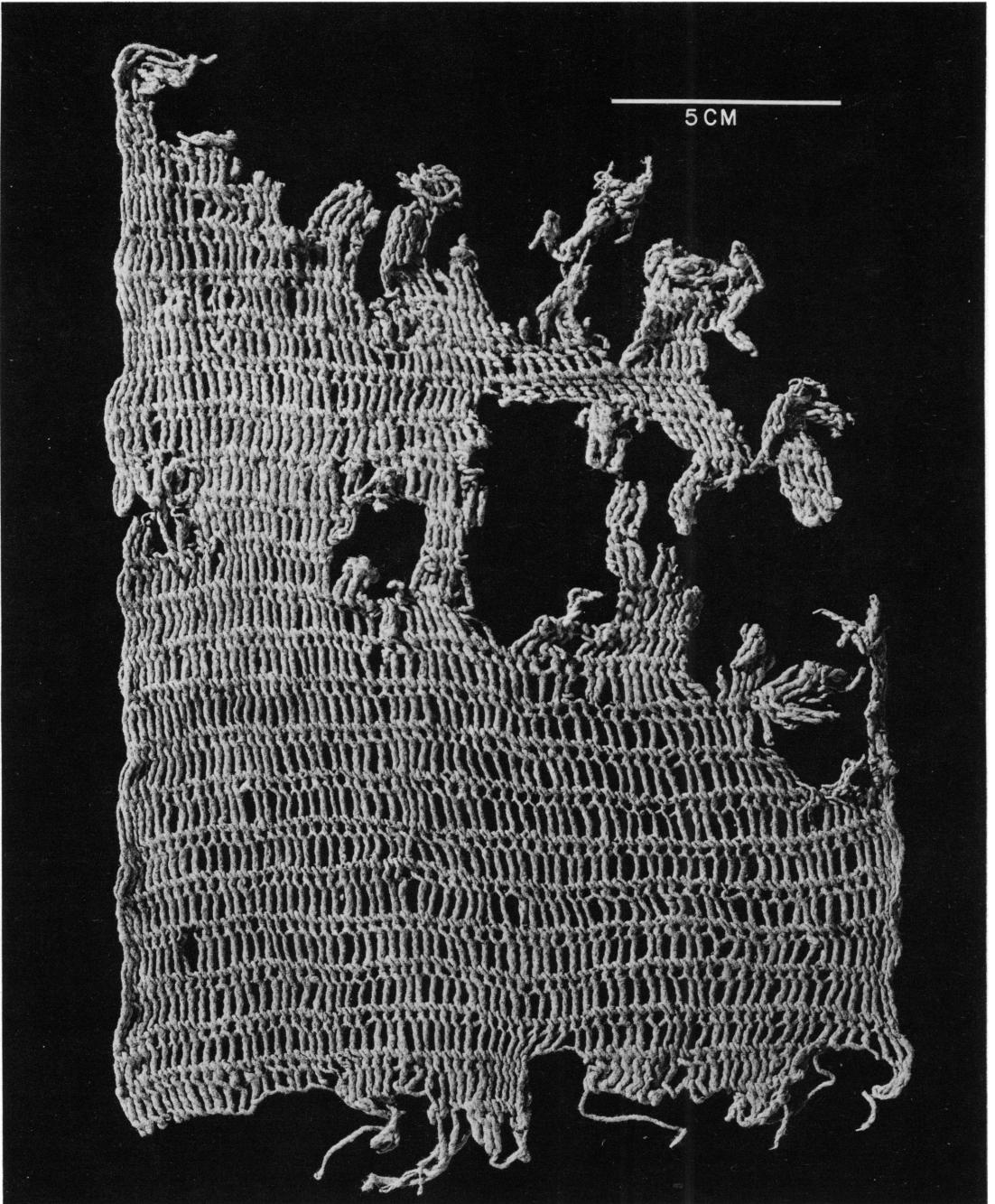


FIG. 149. Narrow looped fabric made with figure-eight looping technique variant. 41.1/9622, HP 3-F.

its patterned variant (Code XI, Nos. 41 and 42) was the most common technique used, only their number of rows warrants men-

tioning. It is from one to eight rows with an average of 3.9. The average of the patterned fabrics is slightly higher, 4.4 rows.

As with textiles done with other techniques, few looping specimens have any color remaining. Two fabrics have an overall application of red pigment. Twenty-eight have traces of red. Blue dye can be detected in three fabrics. One has only a smudge of blue; another is made entirely with blue yarn. The illustrated pouch (fig. 150) is made with blue and brown yarn, in no particular order.

Only one specimen combines twining with looping. A plain-twined fabric with multiple warp ribbing (41.2/2425 Sample 2, middle) has an openwork seam of figure 8 looping. The looping is obviously done with a needle. It runs through the warp end-loops of the twined end-finishes.

#### NETTING AND OTHER KNOTTED TEXTILES

The gross count of netted textiles in Test Pit 3 is 711, representing 373 specimens. Seventy-five g of scraps could not be analyzed. Test Pit 2 produced 49 fragments representing 25 specimens, and 2 g of scraps. Netted fabrics are characterized by a construction in which knots hold the yarns together. Part of Bird's interests in netting came from his interest in knots, gained from his extensive sailing experience. He used Ashley (1944) as the prime source on knots. Bird wrote in Textile Notebook 2 that knotted fabrics are classified as single-element constructions,

where the fabric is formed by the addition of successive rounds or rows of loops working with the end of the cord or yarn. The yarn is wrapped in a ball or about a stick. In the case of compact mesh, some type of needle must have been used. Differing from these single-element products are a few which were made by setting up a series of parallel elements.

Bird classified the Huaca Prieta netting and knotted textiles as fishnets, uncertain-function netting, pouches and carrying bags, and slings. They are discussed below in these groups.

#### FISHNETS

Fishing was an important feature of the economy of the prehistoric period. It is therefore not surprising that the majority of netted items are fishnets. They are recognized by the

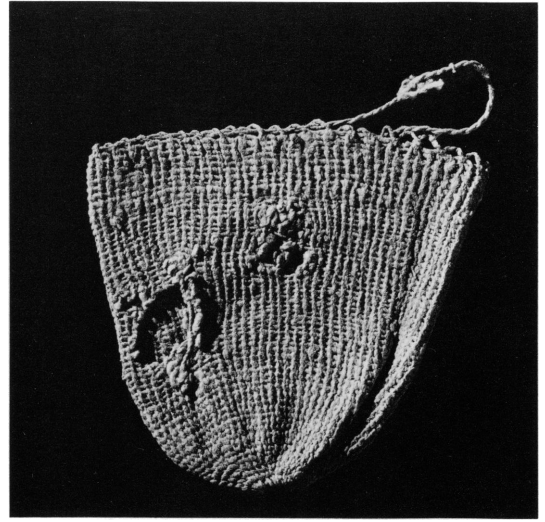


FIG. 150. Small pouch made with simple hitch looping. 41.2/1335, HP 3—J.

characteristic abraded, water-worn appearance fishnets acquire with use. On the basis of mesh size, they fall into two categories (fig. 151), large and small mesh (Code VII, Categories 11 and 12). For coding purposes, a mesh of 1 cm (measurement between knots) was chosen as the division between the two types because very few meshes measured between 1 and 2 cm. The varied sizes of the large fishnet meshes ranged as follows throughout the layers: The low measurements for each layer range from 1 to 3.5 cm. The high measurements range from 3.8 to 5.5 cm. Only eight of the large-mesh specimens have meshes below 2 cm in size. Four of them were scored in the small-mesh category on the basis of the knot (overhand) used. All 223 large-mesh fishnets from Test Pit 3 and 11 from Test Pit 2 were made with cowhitch knots.

The large-mesh specimens were probably used as seine nets. One, specimen 41.1/9852, was found in layer G with one stone sinker and eight attached gourd floats (fig. 171). That net is fragmentary. It is made of a firmly S-spun Z-doubled cord with 7.5 doubling twists per 2.5 cm. The mesh size is 2.8 cm. There is a repair section made with the same type of cord, and the mesh size is 3.3 cm. The net closely resembles a type of seine still used in the same region. If the spacing of the

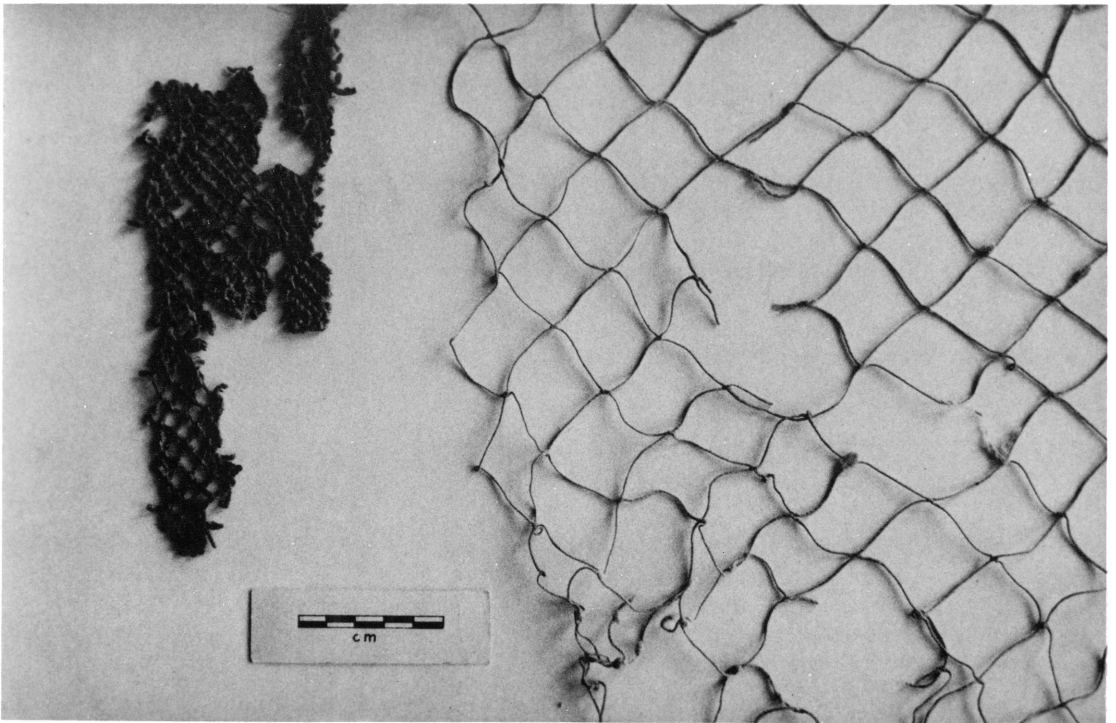


FIG. 151. Small-mesh fishnet (left) 41.2/1788, HP 3—N. Large-mesh fishnet (right) 41.2/1454, HP 3—J.

floats approximated the present-day spacing, this specimen would have been about 30.5 m long. Such nets are used today by four men who wade out into the surf at low tide, then drag the net directly back to the beach. They do not function as gill nets simply because the nature of the shoreline with the prevailing winds and surf make gill netting impractical (Bird and Mahler, 1951–52, p. 78).

One-hundred and eight small-mesh fishnets were found in Test Pit 3. None were found in Test Pit 2. They have the same water-worn appearance as the larger-mesh nets. According to Bird, they may have been used for catching small fish, shrimp, or crayfish. The latter are taken today during the time of the summer freshets when excess irrigation water is running in the channels leading to the beach. The small-mesh nets may also have been used for the capture of a large, edible sandflea common on the local beaches. The mesh size range among these nets is from 0.4 to 0.9 cm, with the average size being 0.7 cm. The overhand

knot is used predominantly in the small-mesh fishnets. Of the 108 specimens, there are only 13 exceptions where a cowhitch knot was used. One of these, 41.1/9625 from layer F is a fragment with a side selvage which has the direction of knots reversed in alternate rows.

Both types of fishnets are made entirely of cotton. The majority of large-mesh fishnets yarn structure is S-spun Z-doubled. There are five in Test Pit 3 and four in Test Pit 2 where the same kind of yarn is redoubled S. Only one specimen in Test Pit 2, layer G1, is made with a Z-spun S-doubled yarn.

The small-mesh fishnets have the majority of yarns S-spun Z-doubled as well. In Test Pit 3, other yarn structures are as follows. Five examples are S-spun Z-doubled but redoubled S. Z-spun S-doubled yarn occurs once. The same type of yarn, but redoubled Z, also occurs only once. There are two other examples of the same type of yarn made with three elements twisted Z. In Test Pit 2 there

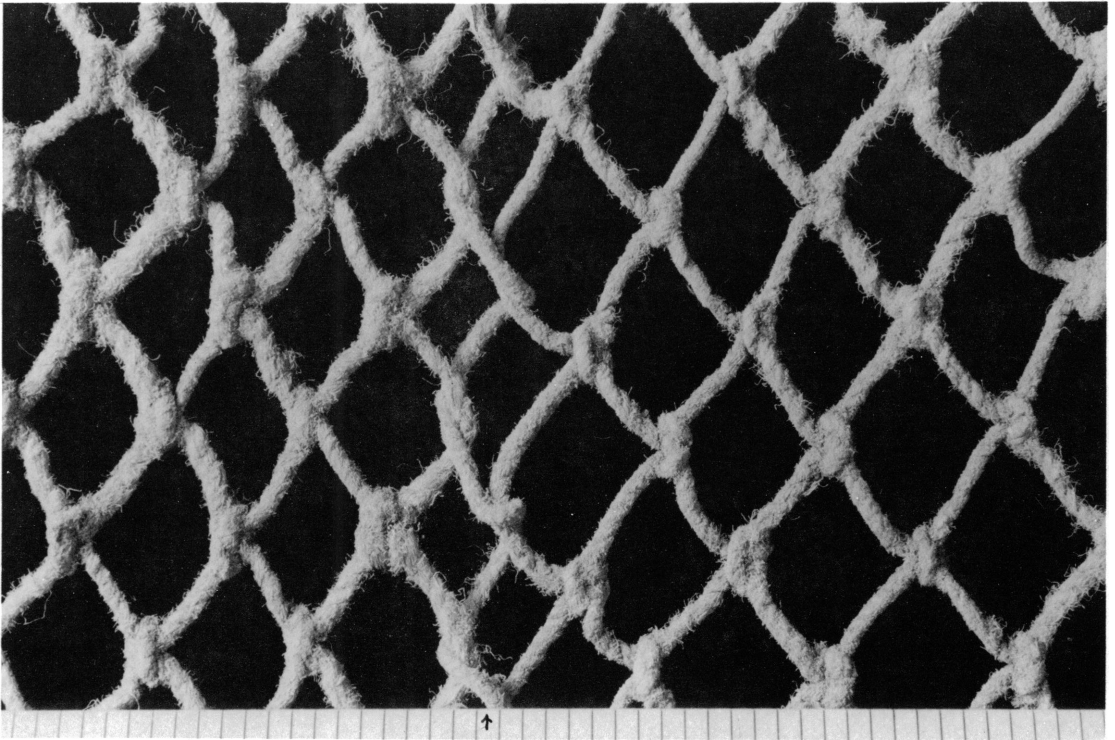


FIG. 152. Specimen with two nets joined with cord (see arrow). 41.1/9687, HP 3—F.

are 12 small-mesh specimens. Five are made of regular S-spun Z-doubled yarn. Seven are made with Z-spun S-doubled redoubled Z yarns.

It is noteworthy that all types of fishnets (large and small mesh) with Z-spun S-doubled primary structure of yarns occur in Test Pit 2 with the exception of one specimen from layer O in Test Pit 3. There are only 24 repair yarns reported in netting. Seventeen are of pure cotton and five are cotton blended with bast. They are S-spun Z-doubled; some have the same primary structure but are either redoubled or consist of multiple elements. Two repair yarns are of the reverse structure, Z-spun S-doubled. One is of cotton, and one is cotton blended with bast. They were found in the Sample 2, top, and layer M.

#### NETS OF UNCERTAIN FUNCTION

Nets of uncertain function are scored as unidentifiable in Categories 13 and 14 of Code VII, depending on the mesh size. Of these

textiles, 15 have large meshes. They are characterized by some of the following traits: no water wear, traces of red color, blue yarn, and/or construction with a very fine Z-spun S-doubled bast fiber. The mesh sizes of those with fine bast yarn are 2.5, 3, 5.3, and 7.5 cm. In Test Pit 2 a net with the same fine bast yarn was found. Because of its poor condition, the mesh size could not be measured. The function of these fine nets is puzzling. Fifteen small-mesh specimens are of uncertain function for the same reasons as the large-mesh specimens—lack of water wear, the presence of traces of color, or the use of fine yarn, in this case cotton. The specimen size (too small to be a fishnet) was also considered in classifying specimens in this uncertain-function category. For example, some specimens with complete widths not more than 10 cm or complete lengths less than 19.6 cm fall into this category.

Another characteristic of uncertain-function net specimens is a technical feature of one or more rows of interlocked meshes in-

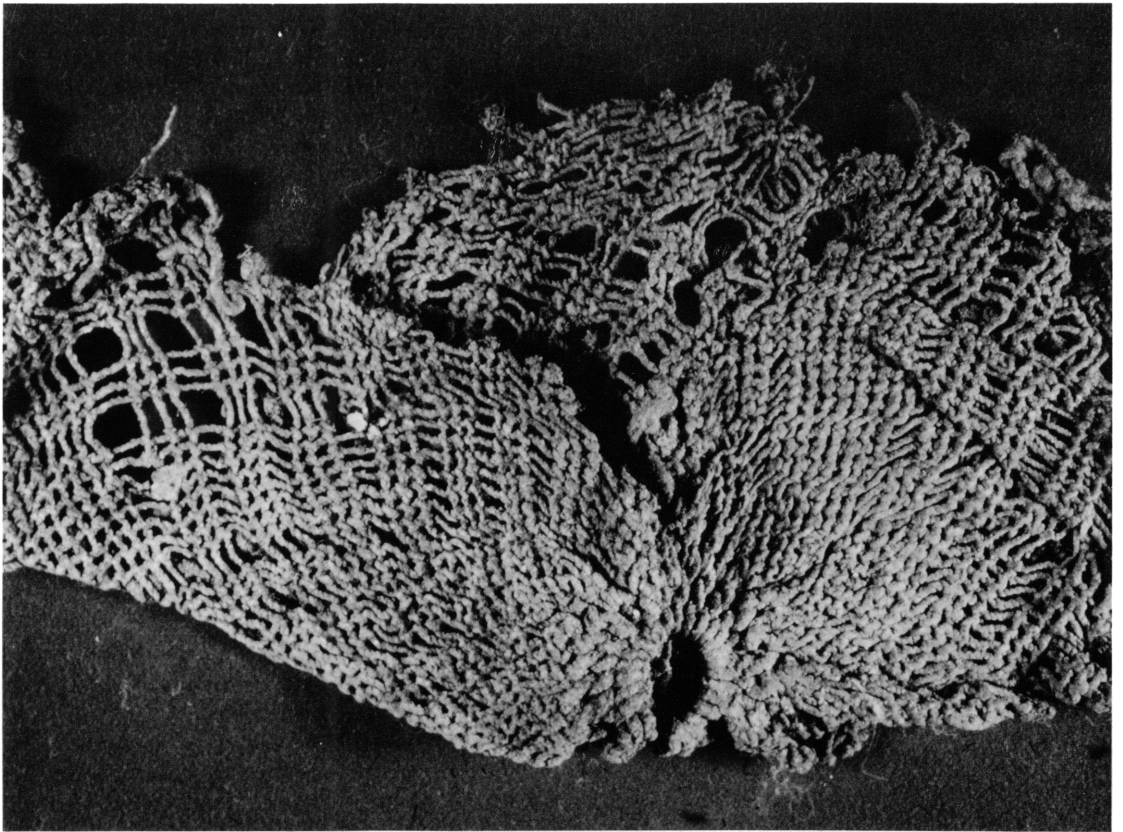


FIG. 153. Bottom of netted patterned pouch made of bast fiber. 41.2/1733, HP 3—M.

stead of knotted ones. This may indicate a color change not now detectable. Specimen 41.1/9869 from layer G of Test Pit 3 has a minimum length of 82 cm and it has nine rows of interlocking at alternating intervals of six and ten rows of netting. Ten interlocked rows at exactly the same distance are found in specimen 41.2/116 from layer H. It has a complete width of 67 cm and incomplete length of 70 cm. Since the two specimens have the same mesh size (0.5 cm), the same distance between interlocking, and adjacent layers of origin, it is possible that they belong to the same fabric, which would have been at least 152 cm long. This feature of interlocked meshes was found as well among two fishnets of large mesh and 11 of small mesh.

One unusual netted textile is a rectangular specimen 46 by 27 cm (fig. 152) in which two smaller complete nets are joined with a cord approximately at the center. Two other unique

specimens are made with multiple yarns, of which only one element is used to form the knot which secures the other yarns. One (41.2/1395) from layer L of Test Pit 3 has what appears to be a fringe.

#### POUCHES AND CARRYING NETS

There are five specimens positively identified as pouches, all from Test Pit 3. Pouch 41.2/1733 from layer M is a bottom fragment of a patterned pouch (fig. 153) started on a central ring. The pattern is achieved by extending the size of the meshes. It is of interest that it is made with pure bast yarn, as are some of the looped pouches. There is a similarly patterned cotton fragment, 41.2/1734 from the same layer. It could not be determined with certainty if the fragments belonged to a pouch or if they came from a rectangular piece. A patterned pouch bottom,



FIG. 154. Netted patterned pouch bottom of cotton yarns. 41.2/1336, HP 3—J.

41.2/1336 (fig. 154) from layer J is entirely of cotton and of the same construction. Pouch 41.2/1394 (figs. 155, 156) from layer J is described by Bird in Textile Notebook 2:

It is an almost-complete cylindrical bag 22 cm long and 26 cm in circumference at the mouth where it is slightly wider, perhaps due to stretching. Construction started at the mouth of the

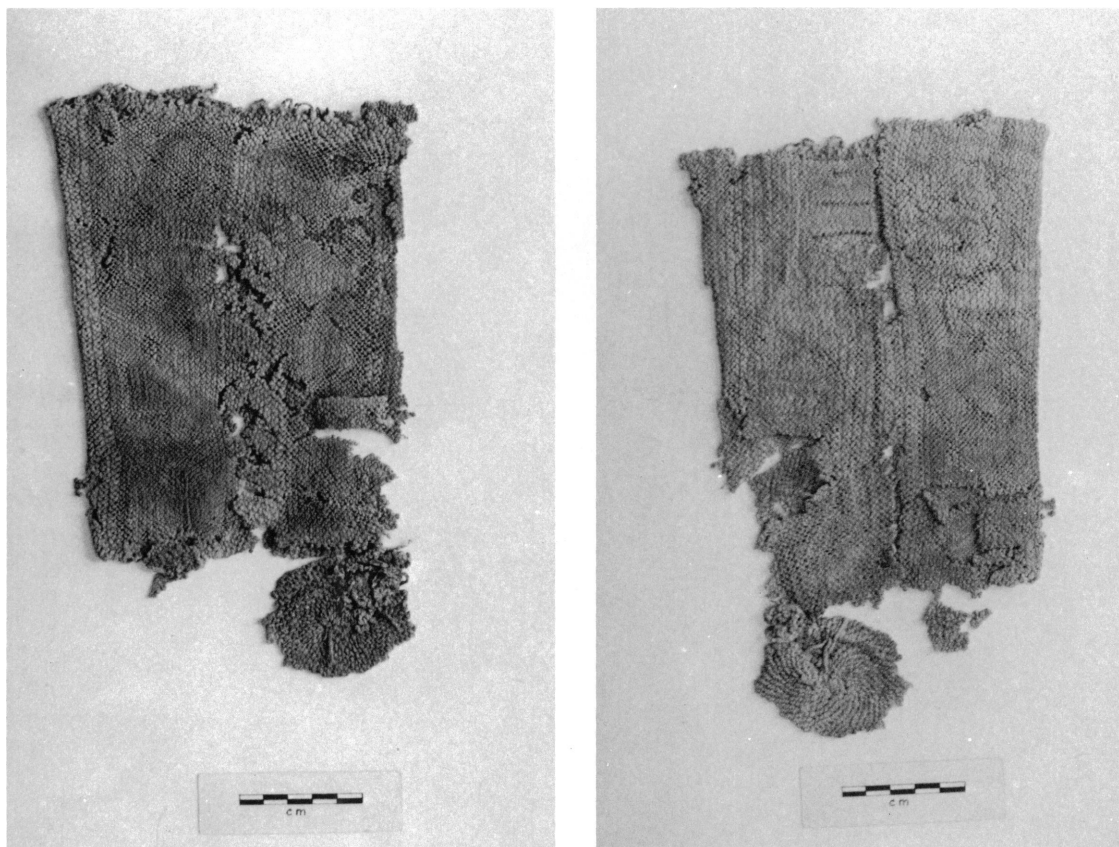


FIG. 155. Two sides of netted patterned cylindrical bag. 41.2/1394, HP 3—J.

bag, rounding off abruptly at the bottom. It is made with overhand knots placed compactly about loops between knots of the preceding row. A fine needle must have been used. Blue, white, red-pigmented, and tan yarn was used to create the geometric pattern in four panels.

The last of the pouches worthy of mention is a bottom fragment. An old large-mesh fishnet is gathered through loops with four stands of a bast cord which is tightened to form a ring (41.2/1975, GHI unit). It is a rare example of secondary use.

Bird, in *Huaca Prieta Textile Notebook 2*, wrote:

A multiple element net is made by transverse passages at spaced intervals with knots used at the intersections. A fairly complete example (41.2/1301), obviously an open-ended carrying net, is from layer H2I2. It appears to have been

made by first setting up a "warp." This is formed of two continuous or successive 2-ply S-spun Z-doubled cotton yarns, dyed blue, and spaced about 2.3 cm apart with a full "loom" width of 144 cm. The "weft" strands which are knotted to the "warp" are also pairs of 2-ply S-spun cotton yarns, some of which are brown and others blue. They seem to have been attached by starting at one edge and knotted across, making 50 square meshes, and carrying this crosswise strand down the side yarn for about 2.5 cm (the average length of the mesh) and then knotting back in the opposite direction from the first row of "wefts." A varied sequence of colors was used in the "wefts." When the knotting was completed, the warp end-loops were chain-stitched or looped together with four 2-ply cords so that all the warps were then attached within a space of about 44 cm. Only one end is reasonably complete; the surviving portion of the opposite end consists of a small unattached frag-

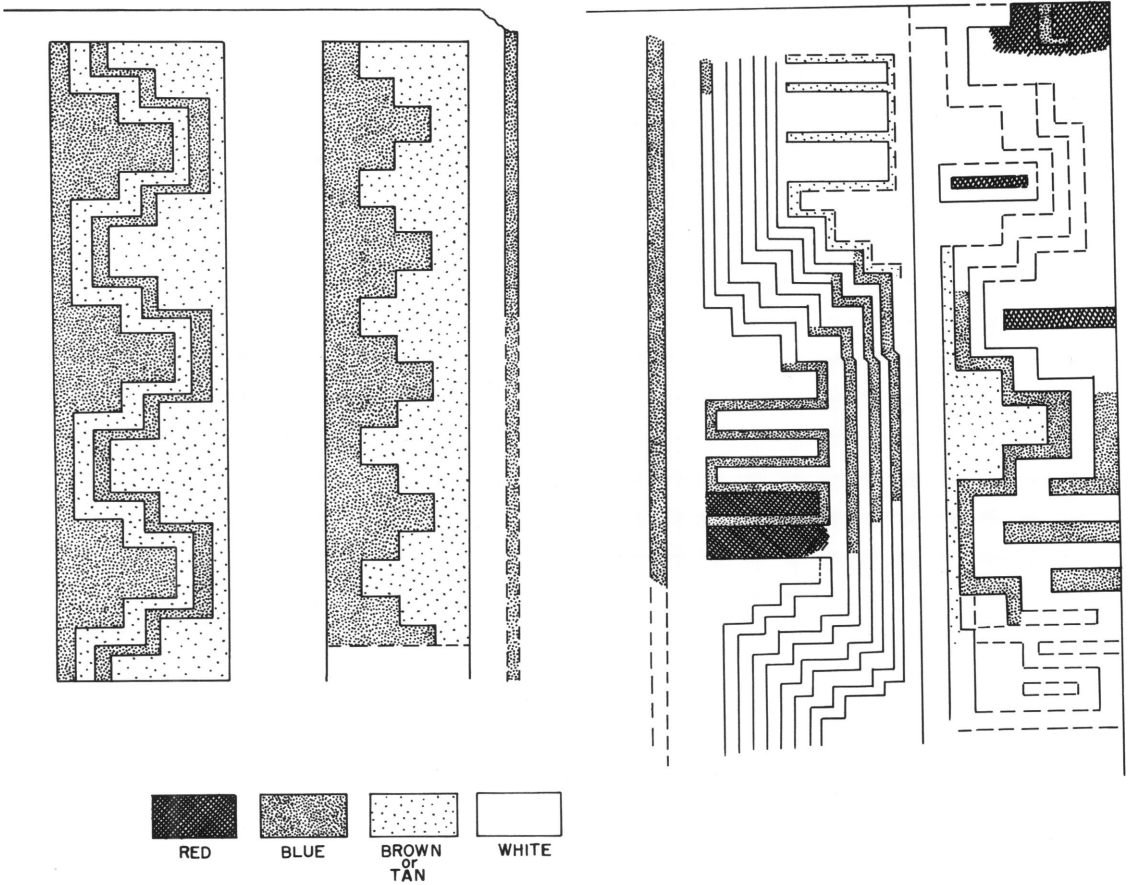


FIG. 156. Drawings of designs on patterned cylindrical bag. 41.2/1394, HP 3—J.

ment. The incomplete length of the specimen is 126 cm. Its width at the center is 144 cm. Its incomplete width at the end cord is 28.5 cm.

Another multiple element net (41.2/1407) is from layer J2. In this the mesh measures 19.5 by 20 cm. The transverse elements are tied to the verticals by clovehitch knots. The diameter of the cords (2 mm) almost rules out the use of such a net for fishing. The cords are woven somewhat as fishnets are. Yet, a net with mesh of this size would have to be very large to be effective for fishing. The knots might slip under the stress to which it would be subjected, and there would be no point in not using the fishnet knots and method of construction had it been intended for such use. In much later periods, judging from pictures on Mochica ceramics, nets were used for land game. However, no examples have been found and we know nothing about such nets. In this case there is scant reason to

think that this item might have served any such purpose.

A similar item, 41.2/1476, presumably from the selvage of a piece, has clove hitches at 12.5 cm intervals. The ends of the transverse cords have overhand knots to prevent unraveling. Among pieces of cordage from layers P and O, several sections with knots at either end look as if they might be bars or sides of large heavy nets. The spaces between knot centers vary from 4.5 to 24 cm. The cords are of bast, 0.2 to 0.4 cm in diameter. The knots were analyzed to determine if they might be nets of a type not otherwise found in the collection. Where knots were present at both ends, it was found that the orientation of the knots was the same at each end. This would be a feasible knot order for a single-element net construction where the active end of the cord is united successively with a row of loops. In view of this we cannot accept



FIG. 157. *Junco* sling with bast cord on upper edge. 41.2/1461, HP 3—J. 8.5 cm by 11 cm.

the knotted cords as a net type without further evidence.

#### SLINGS

Five items from Test Pit 3 were identified as slings, and two others as possibly sling centers. Their centers were made by open-mesh knotted cords (figs. 157, 158). They were not coded as knotted netting in the Code II on techniques. They were retrieved from Code VII, Categories 9 and 10. Three cords with loops at the end, presumably finger loops, were possibly parts of slings. All slings and sling parts came from between layers J and D of Test Pit 3. Three are made of S-spun Z-doubled *junco*. Of these, two items from layer F and the HI side trench have the reverse structure in their *junco* cord. Two items, layer D and E, are made entirely of cotton; one is made of a three-ply cotton cord. Another is made entirely of bast. The centers

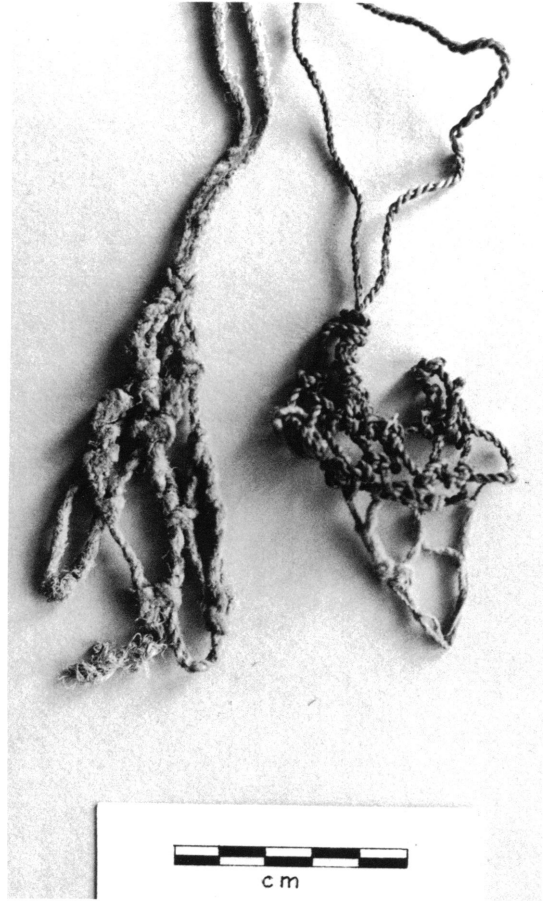


FIG. 158. Two sling centers. Left: half of center intact, 41.2/1196, HP 3—I. Right: "toy" sling, half of *junco* and half of cotton, 41.2/3069, HP 3—F.

are made mostly with cowhitch knots, although overhand knots are sometimes used in combinations with the cowhitches.

#### CORDAGE AND HANKS

Test Pit 3 produced 554 cord fragments; Test Pit 2 produced 147. All were analyzed for their material and structure, but their function is uncertain. About 24 fragments from Test Pit 3 and 8 from Test Pit 2 have knots, but this provided no additional clue concerning their use. Test Pit 3 has 59 cords of cotton, 163 of bast, and 330 of *junco*. The high number of *junco* cords may be due to their brittleness, which produced more fragments. Only two cord fragments are made of

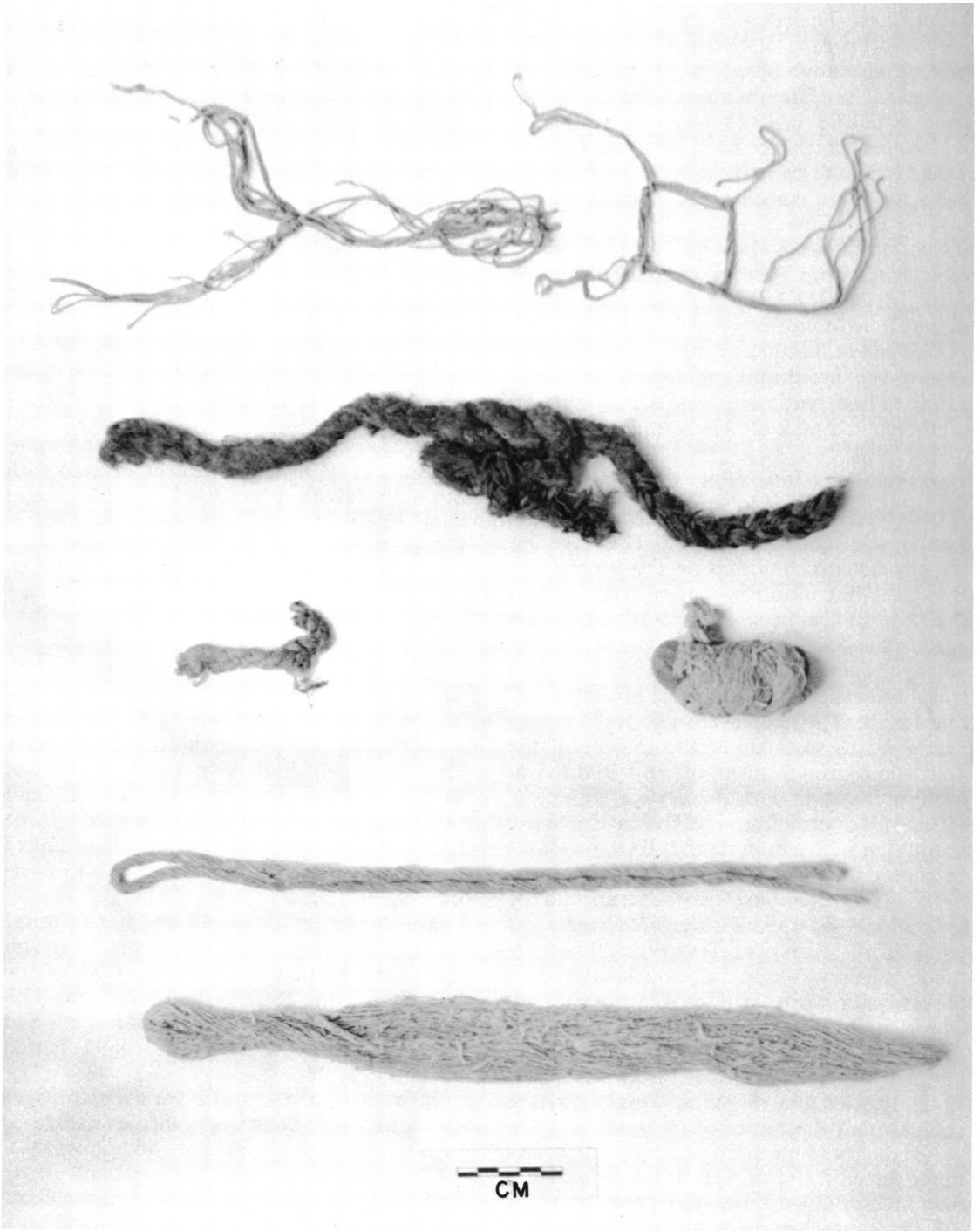


FIG. 159. Top row: bindings 41.1/9700A (left) and 41.2/2038 (right). Second row: braid 41.2/2547. Third row: braid 41.2/1325a (left) and hank around pebble 41.1/9697 (right). Bottom row: Hank of cotton yarn 41.1/9878B.

human hair. They come from Sample 2, middle. Test Pit 2 has 142 cords of cotton, five of bast, and none of *junco*.

Regardless of their material, the most common structure in both test pits is S-spun Z-doubled which occurs both alone (476 in Test Pit 3 and 89 in Test Pit 2), and as the basis for more complex cord structures (47 in Test Pit 3 and 20 in Test Pit 2). The opposite structure, Z-spun S-doubled is found in 31 cords from Test Pit 3 and 38 from Test Pit 2. In Test Pit 3, the concentration of this structure is found in layers R to J.

Bird noted that heavy rope did not appear among the preceramic materials at Huaca Prieta. Most cords are less than 4 mm in diameter; the bulk are close to 2 mm.

#### FISHNET FLOAT BINDINGS

In layer G of Test Pit 3, Bird excavated a fishnet with gourd floats (fig. 171). He describes the cord bindings on the gourds (nb. B, p. 37): "the bindings consist of cord about the base of the neck (2 turns) from which cords pass across the center of the bottom where they are knotted. Two floats have 7 cords in each of the 4 vertical groups. Only one has 4. The others are not well-enough preserved to say. About the middle of the float [there are] 2 turns of cord knotted at each intersection with the vertical groups."

Six other cords found at Huaca Prieta are knotted in such a manner that they may have been used to bind gourds. The bindings, however, do not resemble those found around the gourd floats (fig. 159). Two such knotted cords come from layer F of Test Pit 3. They are made of heavy Z-spun S-doubled cotton cord that is water-worn. Both have a central knot from which several groups of four cords radiate. One radiating group (41.1/9700A) has loops to which another cord is knotted, presumably in a lateral direction. This could have gone around the center of the gourd.

Another possible float binding (41.2/2038), found in unit HIJ of Test Pit 3, is made of S-spun Z-doubled bast. A rectangular mesh 3.5 cm square made with three strands of cord remains. At four of its corners other cords are attached. One might assume this fragment fitted the bottom of a gourd.

One binding from Test Pit 3 (position un-

certain) is made of Z-doubled *junco*. The arrangement of knotted cords appears to have encircled a spherical object. This specimen apparently is not water-worn, and has a small repair of cotton yarn.

Two bindings from Test Pit 2 are made of cotton. One is S-spun Z-doubled. The other is S-spun Z-doubled Z-redoubled. It may have been made for a small gourd or some other spherical object.

#### BRAIDS

Only five 3-strand braided fragments were found, all in Test Pit 3 (fig. 159). Four are made of *junco*. The widths of the braids are 1.0, 1.5, 1.5, and 1.8 cm. The longest braid (41.2/2547), is 40 cm long and tied in a knot. It comes from layer I and is associated with burial 99.1/900. A braid (41.2/1325b) 3 mm wide made of undecorticated bast fiber is found in layer H2I2.

#### YARN: HANKS, ADORNMENTS, BALLS, OR REELS

Test Pit 3 produced 106 yarn hanks (fig. 159); none came from Test Pit 2. With few exceptions, they are made of S-spun cotton yarn. One hank is of S-spun Z-doubled cotton yarn (layer M); four have a combination of the two types of yarns (layers G, I, H2I2, and IJK side trench). Layer K produced three hanks of Z-spun cotton. Only two hanks have bast blended with cotton (layer H and position uncertain).

The length of the complete hanks range from 16 to 141 cm. The numbers of turns on the hanks range from 8 to 84. One of the longest (41.1/9878B), from layer G, has 37.8 m of yarn. Some have ties and a few are tied to themselves. One hank (41.1/9697) is tied around a pebble.

Bird suspected that 12 yarn assemblages including two hanks were worn as necklaces or wrist bands (fig. 160). The two hanks (41.2/124A, B—layer H) seem to show body grease and dirt, but otherwise have the same characteristics as the other hanks. Of these two, one (41.2/124A) is 58 cm long and has 36 turns; the other is 52 cm long with 34 turns. Bird considered the other items possible adornments because of the opposite yarn

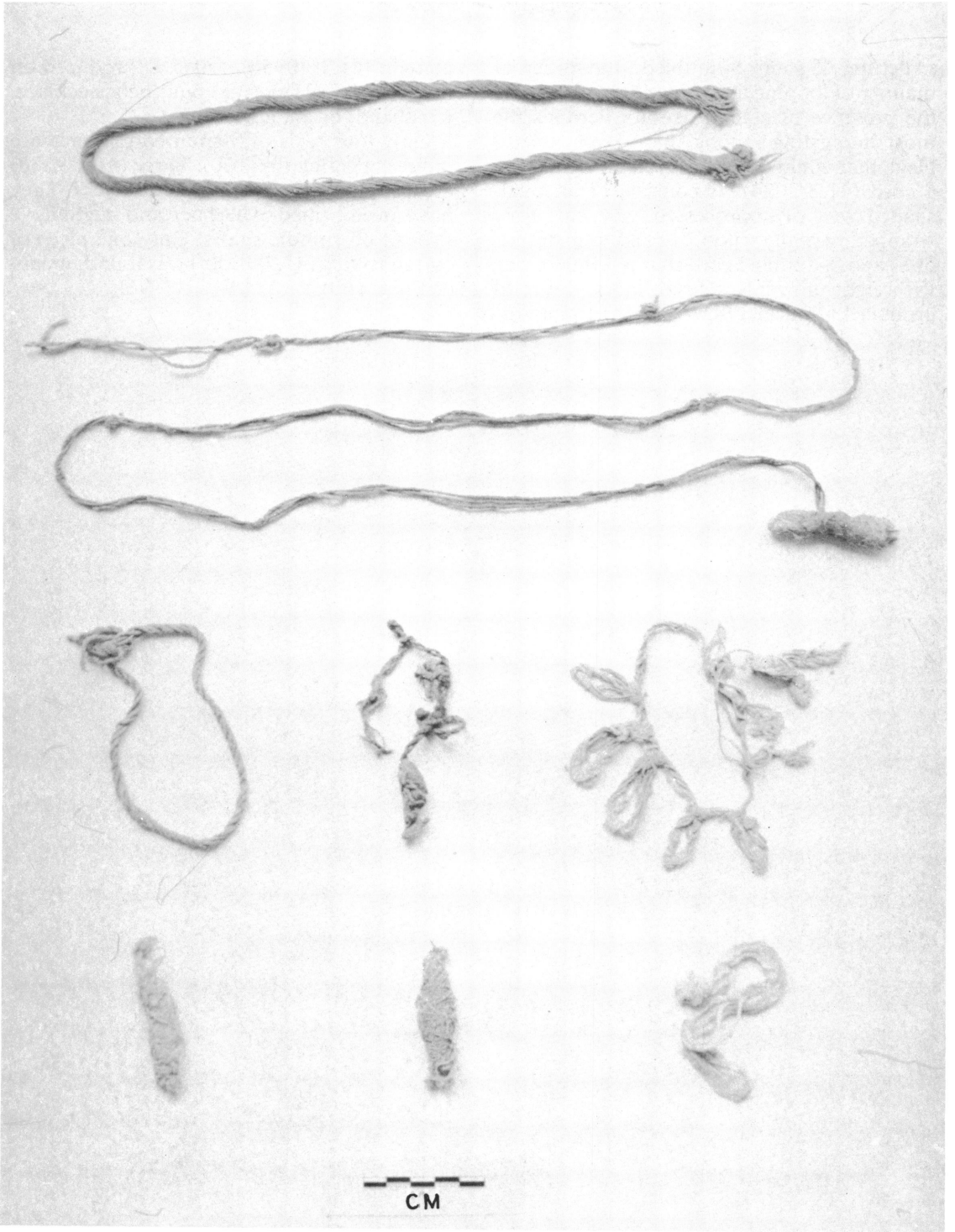


FIG. 160. Top row: hank possibly worn as necklace or wristband, 41.2/124A. Second row: cord with amulet 41.2/2094. Third row: bracelet 41.2/2095a (left), ornament 41.2/2095b (middle), necklace or wristband 41.1/9431b (right). Bottom row: two reels of cotton yarn 41.1/9238 (left and middle), cotton roving 41.2/1200f (right).

structure, Z-spun S-doubled, the different manner of looping and tying the strands, and the presence of color in some. Perhaps the most interesting among these is an assemblage that could be considered an amulet on a cord (41.2/2094). It consists of an oval-shaped wad of unprocessed, raw bast fiber wrapped partially with three and four strands of S- and Z-doubled cord that is 110 cm long with eight unevenly spaced knots. Layer M produced a bracelet (41.2/2095a) and an or-

nament (41.2/2095b). Layer D produced an item (41.1/9431b) that could be a necklace, wristband, or anklet.

Only four reels of S-spun cotton yarn are in the collection (fig. 160). Three (41.1/9238) are from layer D and one is from layer I. They have an elongated oval shape and might have slipped off spindle shafts. Only one piece of cotton roving (41.2/1200f) was found, in layer I (fig. 160).

## CHAPTER 12. ARTIFACTS OF FIBER, BONE, SHELL, WOOD, AND GOURD

This chapter deals with the preceramic artifacts found at the Huaca Prieta that are neither textiles, lithic implements, baskets, or matting. The categories described below were established by Junius Bird while cataloging at the American Museum of Natural History. The groupings are usually based on the materials from which the objects are made. Some of the categories are functional, particularly in the case of identifiable items such as bodkins and ornaments. These functional categories often have similar objects made from various types of materials. The section on wrapped stones might have been included in the chapter on lithic implements. All of the specimens discussed in this chapter are listed in the museum's 41.2 catalog. Therefore, only the four-digit specimen number will be used to refer to the objects. Unless otherwise noted, all layer designations pertain to Test Pit 3.

### SANDALS

A sandal (4324) from layer M is approximately 10 cm in length (fig. 161). The toe end is missing. It is made of coarse fiber cord. Bird described it as follows (nb. B, p. 77):

[There are] 3 wefts per 2 cm. The finish at the end is uncertain. The heel is square. Three cords come out of each side and come forward from the heel. [They are] apparently laid in with the weft at this point. These lead forward and enter the fabric between the first and second toes. A single cotton [binds] the six cords just over the instep. A cord is tied to each set of [these] 3 cords 3 cm above the edge of the sandal and passed back of the heel.

Another fragment (4323), 3 cm in width, may be part of a sandal. It was found in layer L. No other remains of sandals were found at the Huaca Prieta. Thus Bird believed (tape, 1973b) that sandals were not typical artifacts at the Huaca Prieta in preceramic times.

### BRAIDED, WRAPPED, AND COILED FIBER

A miscellaneous assortment of fibrous objects in small bundles, or worked into loosely wrapped artifacts, was found from layers C

to O (fig. 162). These specimens (4201, 4325–4335) are all of unknown function. None are identical. However, in layers G, K, and M several similar coils or rings of sedge material were found. Specimen 4201 from layer G is a button-like tight coil of reeds. Two *junco* stalks wrapped with cotton yarn (4332a) may be spinning implements.

### BODKINS AND NEEDLE

Bone and wood bodkins, used in the manufacture of textiles (fig. 163), were found in layers C, D, O, and in House 3 on top of the mound (4337 to 4341 a to d, 4347). Some are perforated. Three bone bodkins were found in A1 and A of Test Pit 2 (4629 a and b to 4630). Only one needle (4336), from layer D, was found at the Huaca Prieta. It is of thorn and threaded with cotton yarn.

### BONE

Eight bone artifacts (4631 a and b to 4634 a and b) were found in layers A to F in Test Pit 2. Sixteen were recovered from layers C to N in Test Pit 3. In general, worked bird bones, usually as tubes, predominate (fig. 164). There are several fragmentary mammal bones which show signs of working. They include a perforated bone "scapula" with red pigment on it (4355) and a worked tooth (4352). A mammal bone artifact with a Sechin-Cupisnique figure was found in a ceramic-period grave (see burial 99.1/867).

### ORNAMENTS

This category (fig. 165) includes a stone bead (4356) from layer C, a grooved stone pendant (4357) from layer D, shell pieces (4358 a and b), and an unbaked clay bead (4359) from layer G. A perforated gourd disk with cotton yarns (4360) comes from layer K. This may be similar to the perforated gourd disk illustrated in figure 174. A coral pendant on a cord (4361A) was found in layer O, and a tooth "bead" (4361B) came from layer Q. Test Pit 2 produced only one possible ornament: a shell disk (4636) from layer D.

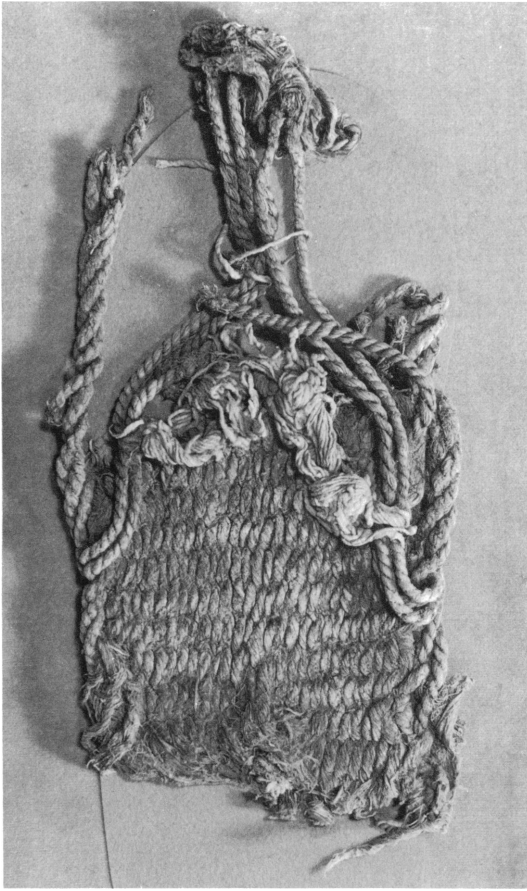


FIG. 161. The only nearly intact sandal found in the excavations at the Huaca Prieta.

#### SHELL

A number of shell fragments appear to have been ornaments (fig. 166). Two specimens (4635, 4636) from Test Pit 2, smoothed from use, may have been tools. A shell fragment (4654B) with two perforations from House 2 on top of the mound is associated with burial 889. Shells may have been used as paint cups. Two fragmentary specimens (4638 a and b) from Test Pit 2 (layer D) and 3 (4362, 4363) from Test Pit 3 (layers F and G) have red pigment or paint on their interiors. Two marine shells with reed attached (4375 a and b) from layer G might be sinkers for fishing, but could be ornaments. A mussel shell (4376) from layer F is filled, and tied, with twisted fiber.

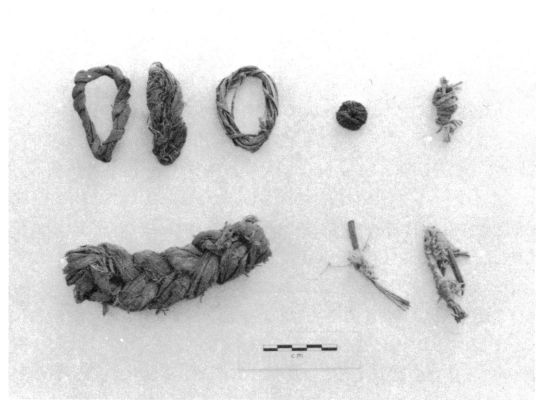


FIG. 162. Artifacts of braided, wrapped, and coiled fiber. Top row (left to right): two coils HP 3—M; a tight coil of rush, and wrapped bird bone HP 3—G. Bottom row (left to right): braid: HP 3—I, two pieces of *junco* wrapped with cotton yarn—possible spinning implements HP 3—L.

#### WRAPPED STONES

Eighteen stones wrapped with cotton cord or rushes (4367 to 4374 a and b) were found in layers E through L (fig. 167). Bird speculated that some may have been sinkers used for fishing. The stones are generally unworked, and never exceed 7 cm in length.

#### FISHHOOKS

Only three artifacts, all from the lower layers of Test Pit 3, are classified as fishhooks (fig. 168). One fragment of mussel shell (4366) comes from layer T. Two hooks are of thorn: one (3661a) is attached to a fiber cord and was excavated in layer O; the other (4363) is from layer Q.

#### WOOD

Approximately 35 artifacts of wood (4377 to 4390) were found in Test Pit 3 from layers M to C (fig. 169). Most are small sticks, some questionably worked. A number show signs of contact with fire. A peglike object (4377) comes from layer C. A paddlelike artifact (4378), 84 cm in length, was found in layer D and is the largest wood artifact in the collection. An object with a partial hole (4379) may be a fire drill socket. Some of the sticks appear to be intentionally pointed, as is the case of specimens 4380 a and b from layer J.

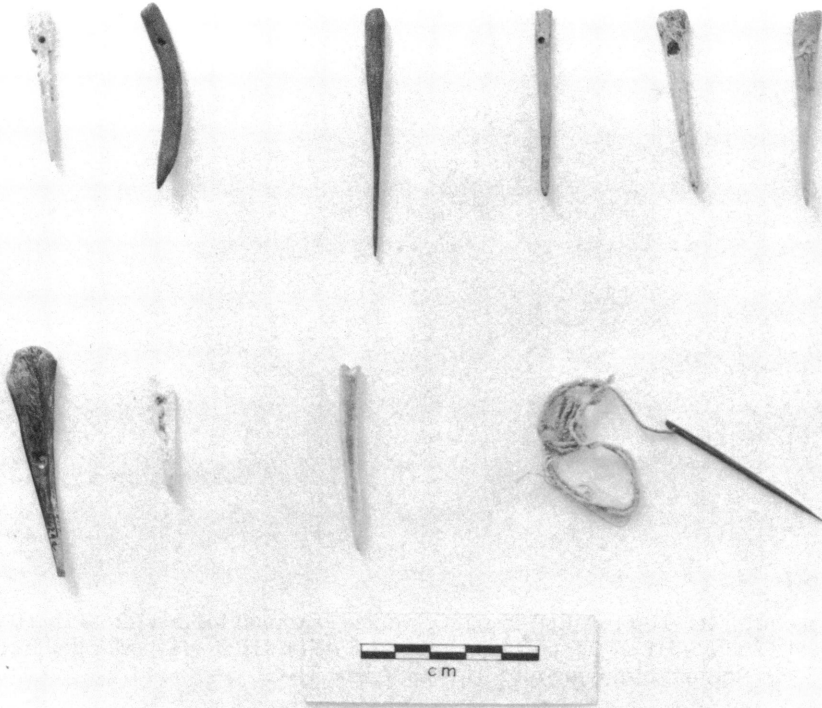


FIG. 163. Bodkins and a needle. Top row (left to right): bodkins 41.2/4338, 4337, 4340, 4341 a to c. Bottom row (left to right): bodkins 41.2/4629 a and b, 4630, and needle 41.2/4336.

#### WORKED GOURDS

The gourd artifacts from Test Pit 3 carry the catalog numbers 2554, 2555, and 4391–4538. Only eight worked gourds came from Test Pit 2 and they are numbered 4639–4642. The following is Junius Bird's commentary on the gourd artifacts (from Whitaker and Bird, 1949, pp. 3–6):

Among the 10,770 gourd shell pieces for which we have relative position data in HP 3, only 358 (3.3%) give some clue as to their use. An additional hundred bear some slight indication of having been cut or worked in some manner. This percentage is so low that it might well be misleading to limit the discussion to the gourd shells found with the layer M material. Thus the following is based on an analysis of the 358 specimens which are classifiable into four categories: containers, 72.4 percent; fishnet floats and float stoppers, 15.1 percent; discs of unknown use, 5 percent; and fragments of scoops or ladles, 7.5 percent.

**CONTAINERS:** Among these, open-mouthed bowls predominate, all made by sectioning the gourd

transversely. This, unlike a longitudinal cut, yields only one container per gourd. Usually the incision was made high enough so the bowl rims were incurving; very few were cut where the fruit reaches its maximum diameter. One rim fragment of this latter type, found in the top level of the preceramic debris, has an indicated diameter of 40 to 42 cm. Another, found midway between this and the M layer, apparently measured 34 cm in diameter. These sizes are exceptional; as a rule the bowls were under 22 cm in diameter, with a possible depth of 10 or 12 cm.

The short-necked type of *Lagenaria siceraria*, with the neck cut off, produced a constricted-mouth jar form. These vary considerably in size and rim profile. Cuts made further up on the neck of the long-necked *L. siceraria* (fig. 170) yielded a bottle form, but it is impossible to distinguish with certainty whether the fragments are from these bottle forms or from fishnet floats. The same type of gourd served as small spherical containers about 6 cm in diameter. Remains of two of these had been fitted with flattened circular covers cut from a much larger specimen.

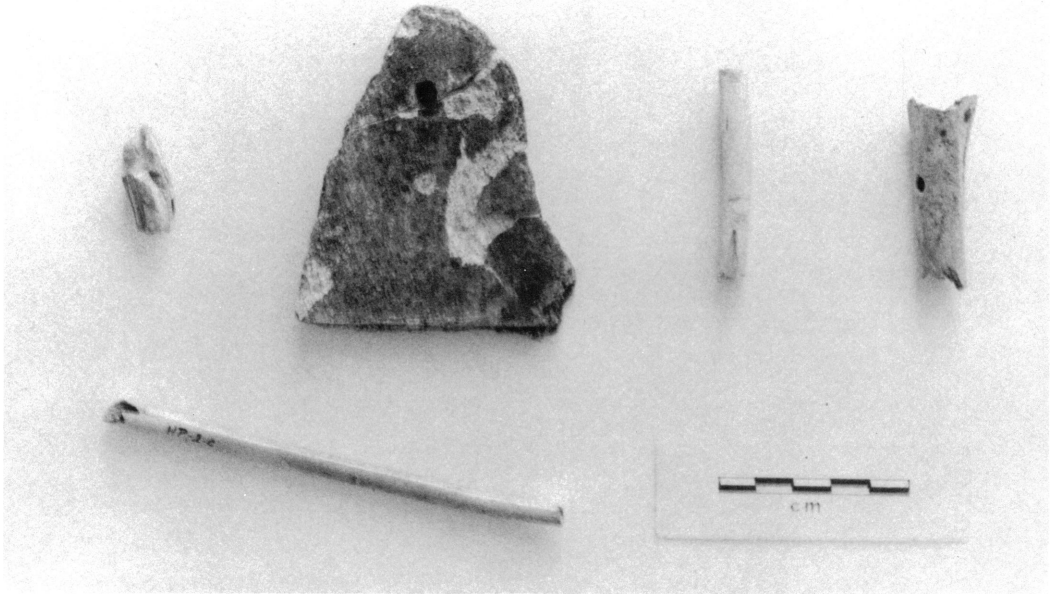


FIG. 164. Bone artifacts. Top row (left to right): worked mammal tooth 41.2/4352, HP 3-C; perforated red bone 41.2/4355, HP 3-D; bird bone tube 41.2/4344, HP 3-H; perforated bird bone tube 41.2/4345, HP 3-S. Bottom: bird bone tube 41.2/4632, HP 3-C.

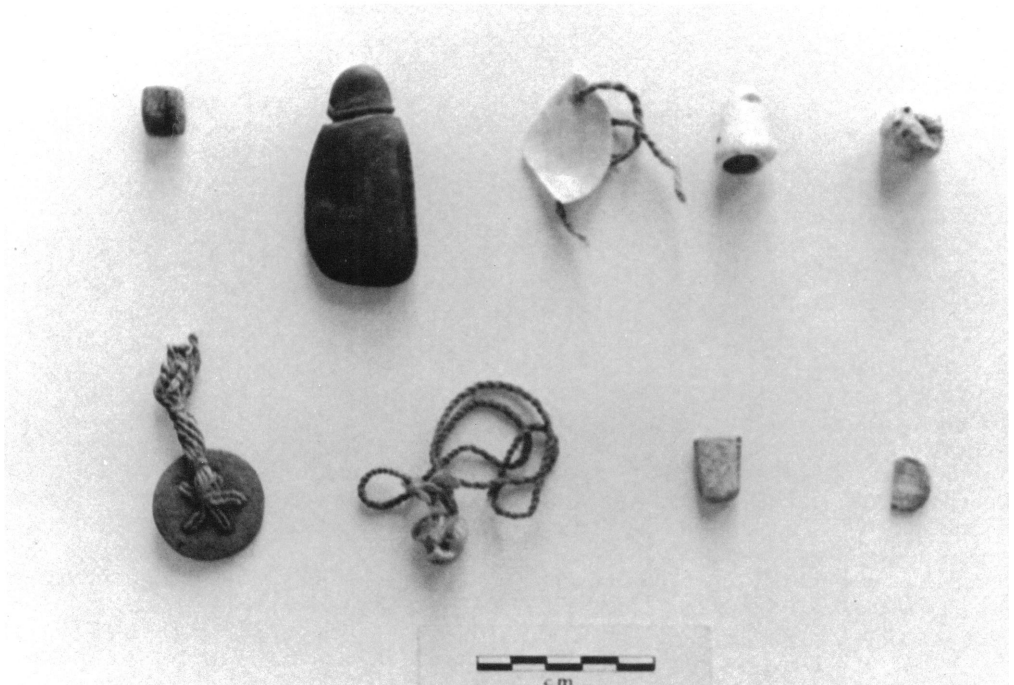


FIG. 165. Ornaments. Top row (left to right): stone bead, grooved stone, two shells, clay bead. Bottom row (left to right): perforated gourd disk with yarns, coral pendant, tooth bead, shell disk.

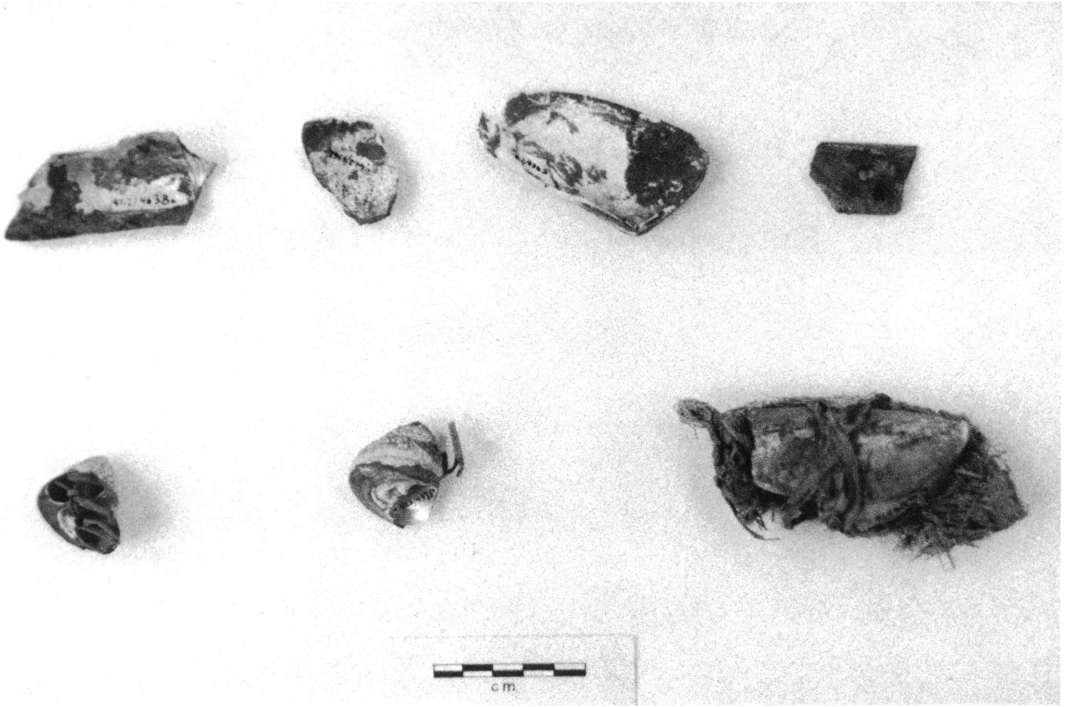


FIG. 166. Shell artifacts. Top row (left to right): paint cups from HP 2—D, paint cups from HP 3—F and G, perforated shell from House 2 on top of mound. Bottom row (left to right): two shells with rushes, mussel shell filled and wrapped with rushes.

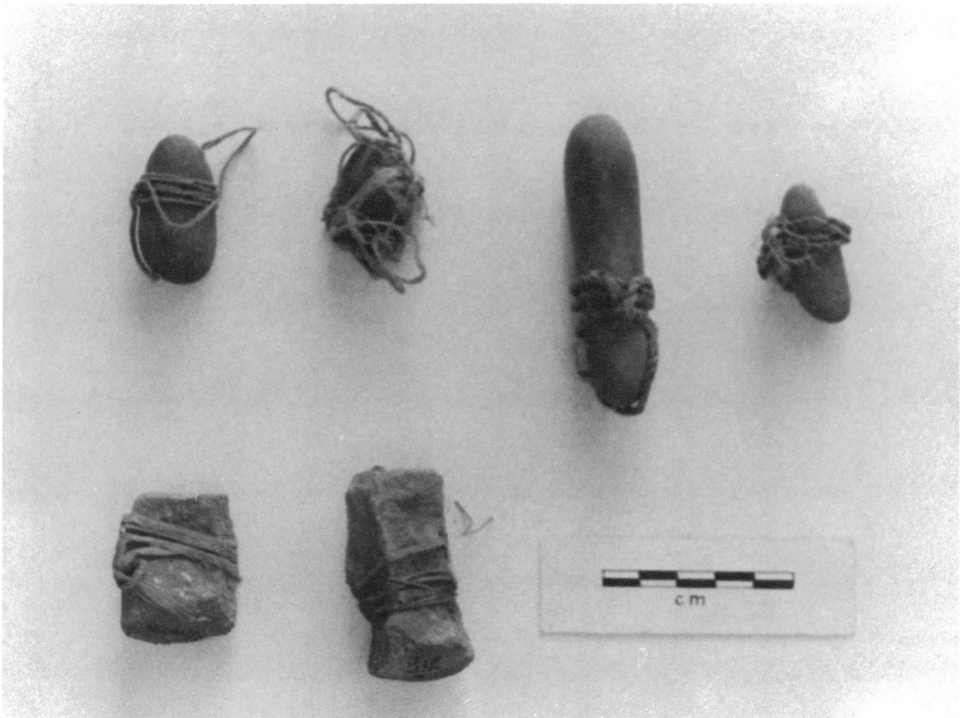


FIG. 167. Wrapped stones. Top row (left to right): 41.2/4369 a and b, HP 3—F; 41.2/4374 a and b, HP 3—L. Bottom row (left to right): 41.2/4373 a and d, HP 3—L.

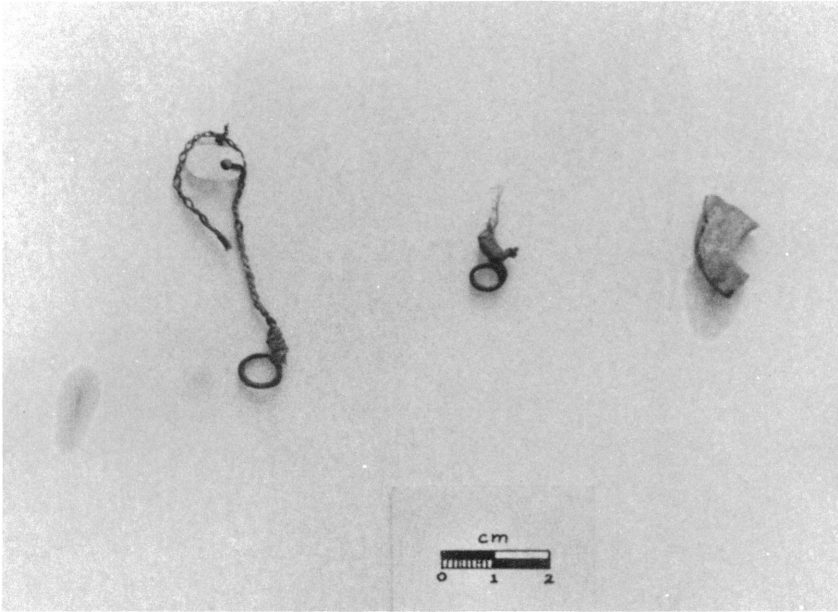


FIG. 168. Fishhooks (left to right): hook of thorn with cord; hook of thorn; broken hook of shell.

The only other objects here classed as containers are a few fragments, also of the long-necked *Lagenaria siceraria*, which have had part of one side

removed to form a dipper. The relative frequencies of these and the other types of containers are as follows:

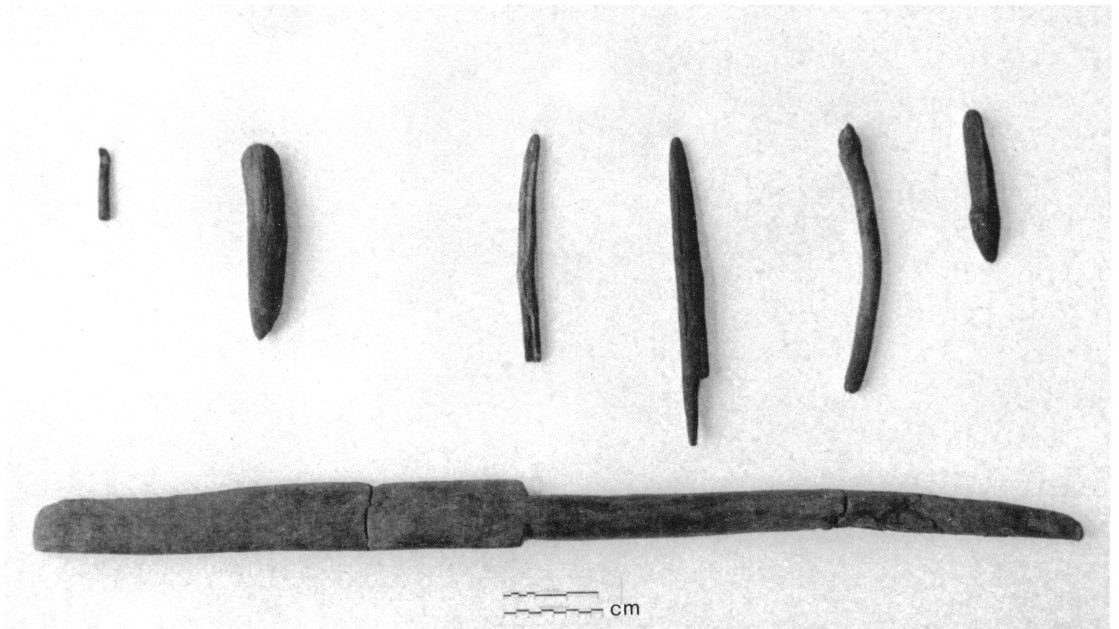


FIG. 169. Wood artifacts. Top row (left to right): possible fire socket, peg, two pointed sticks, two sticks. Bottom row: paddle-like object.



FIG. 170. Fruits of bottle gourd. A. Virtually intact fruit from HP-5. B. Fruit used for fishnet float from HP 3-G.

	Percent
Bowls, incurving rims	80.4
Bowls, flaring or vertical rims	6.9
Jar form, constricted mouth	5.4
Bottle form	4.3
Small spherical containers	1.1
Dippers	1.9

**FISHNET FLOATS:** The fortunate discovery of a large fishnet with eight floats attached (fig. 171) and still intact positively identifies these objects. All have the tip of the neck cut off and the seeds removed, though a few still remained in the one sent to Dr. Whitaker. The openings are plugged with gourd shell discs from 10 to 22 mm in diameter. Such small discs occur from top to bottom of the mound, sometimes still in place in a float-neck fragment. Gourd floats are still used along this coast, but none of the long-necked forms were observed, nor are the seeds removed as in the past.

**DISKS:** Disks larger than those used in the floats (fig. 172) occur in the upper third of the midden. Plain, smooth-edged disks vary in diameter from



FIG. 171. Fishnet, gourd floats, and stone sinker excavated from HP 3-G by the retaining wall. Bird described the cords on the gourds (nb. B, p. 37): "the bindings consist of cord about the base of the neck (2 turns) from which cords pass across the center of the bottom where they are knotted. Two floats have 7 cords in each of the 4 vertical groups. One has only 4. The others are not well enough preserved to say. About the middle of the float [there are] 2 turns of cord knotted at each intersection with the vertical groups."

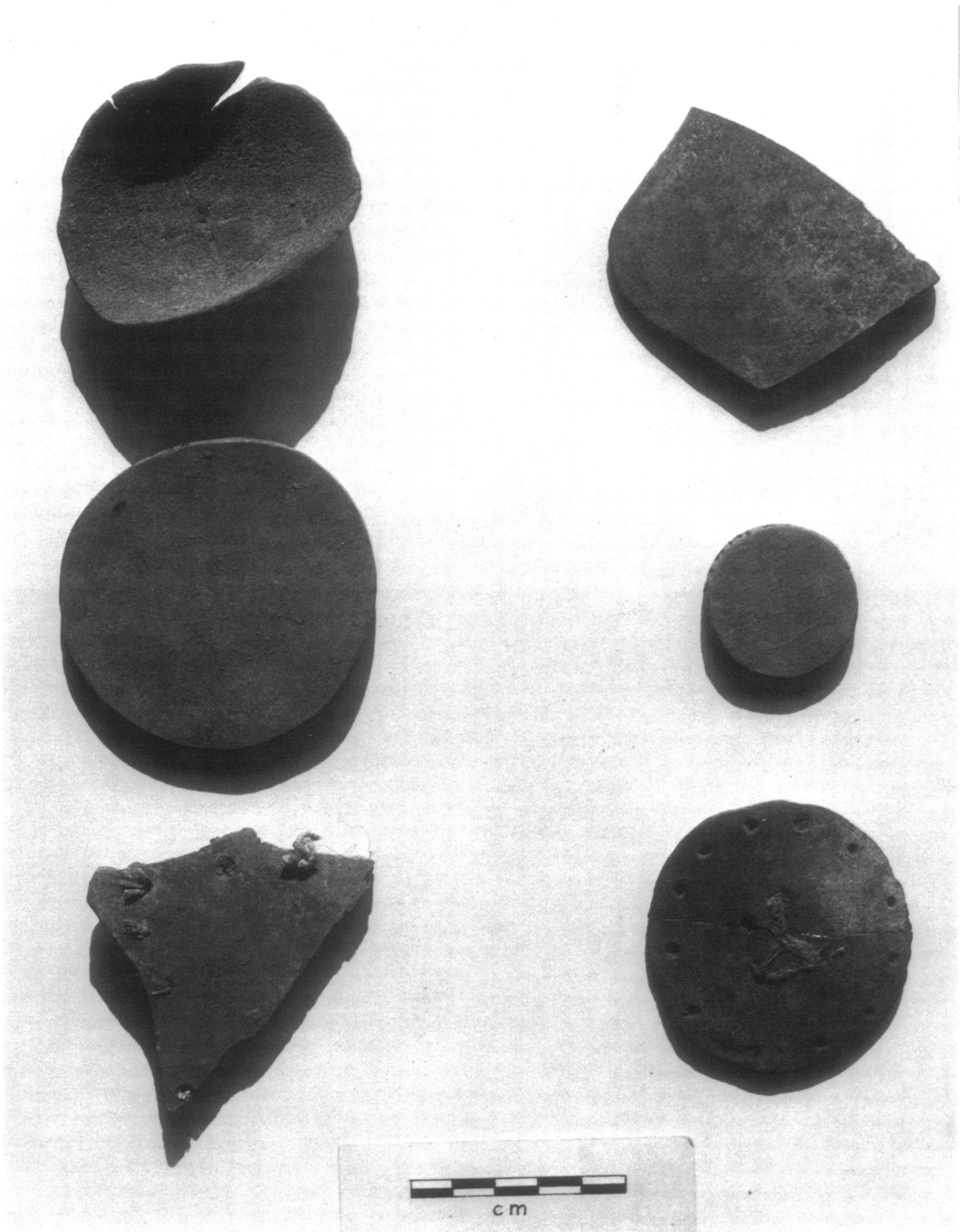


FIG. 172. Worked gourd artifacts. Top row (left to right): small scoop 41.2/4408, HP 3-E; scoop fragment 41.2/4519, HP 3-E. Middle row (left to right): large disk 41.2/4469, HP 3-J; small disk 41.2/4469, HP 3-J. Bottom row (left to right): perforated gourd fragment with repair lacings 41.2/4518 HP 3-E; perforated gourd disk 41.2/4468 HP 3-J.

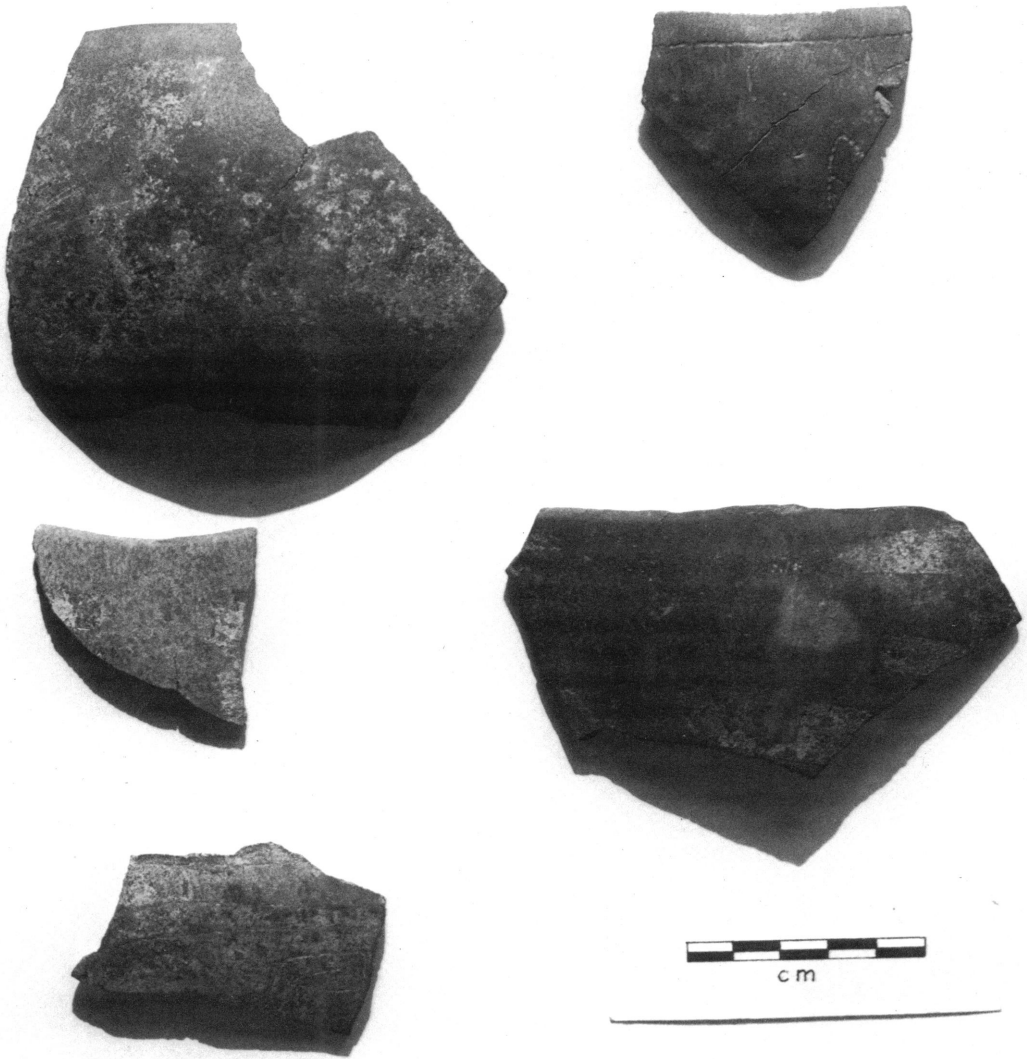


FIG. 173. Decorated gourds. Top row (left to right): epidermis removed from rim 41.2/4411, HP 3—J; rim with engraved lines 41.2/4485, HP 3—M. Middle row (left to right): fragment with epidermis removed in zones 41.2/4462, HP 3—J; fragment with epidermis removed in zones 41.2/4462, HP 3—J. Bottom: Fragment with engraved lines 41.2/4515, HP 3—E.

3 to 7 cm. Rough-edged disks with one, two, or three perforations near the margin are slightly larger. Another well-finished example has 12 small punctures at the margin and four holes at the center in which cords remain.

SCOOPS OR LADLES: Various fragments of rough-

ly oval and angular objects with worn or smoothed edges can perhaps be classed as ladles (fig. 172). The absence of complete specimens and the lack of uniformity among the fragments make a clear description difficult. Apparently any broken gourd fragment of sufficient size was suitable as a make-

shift spoon for stirring or serving food. One occasionally sees such pieces in use today and though they are not cut to a specific pattern they are nonetheless real utensils.

**DECORATIVE TECHNIQUES:** In the entire lot of shell fragments, all from containers, only 13, or one in 830, were decorated (fig. 173). With such a low rate of occurrence, it is surprising to find several distinct methods of decoration.

Crudest are those with lines and marks made by scratching off the epidermis when it was fresh and soft. In nearly all the incurved rim bowls, the epidermis has been removed just below the lip for a distance varying from 3 to 15 mm, but I hesitate to class this as a decorative feature. Fine-line incising in the hard shell was used for diagonal cross-

hatching in two instances. Five pieces show pyroengraving in tantalizingly incomplete fragments of decoration. Two show rather skillful carving of geometric stylized faces. [See photographs (figs. 42, 43) and descriptions in account of burial 903 from Test Pit 3, layer O.] In these, both the design and the quality of work lead us to believe that they are not casual or experimental products, but rather that the method of decoration may have some traditional background. If this is true, then the rarity of decoration is still more of a puzzle.

**REPAIR OF BROKEN GOURDS:** Broken containers were sometimes repaired by lacing the cracks with cotton cord (fig. 172). Examples are so poorly executed as to suggest that gourds were so abundant that skillful repairing was unnecessary.

## CHAPTER 13. BOTANICAL MATERIAL

The plant materials at Huaca Prieta provide a substantial record of the use of a number of early domesticates on the Peruvian north coast. Wild plants were also used, and some were as prevalent as the cultigens. The preceramic plant material was extracted almost exclusively from Test Pit 3. There, the preservation of organic materials was generally good from the top down through layer Q. The lower layers, R through U, had generally poor preservation, a condition replicated in Test Pit 2, where the layers are considered contemporaneous with the lower part of Test Pit 3.

The botanical specimens from Test Pit 3 form a large collection of perhaps more than 20,000 specimens. Bird wrote (in Whitaker and Bird, 1949, p. 2) that "the quantity of perishable material exceeded all expectations." The most abundant remains are of cucurbits (squash and gourds) which amount to more than half of the collection. Other species found in considerable quantity were *Bunchosia armeniaca*, *Canavalia plagioperma*, *Canna edulis*, *Capsicum baccatum*, *Gossypium barbadense*, *Lucuma bifer*, *Phaseolus lunatus*, *Scirpus* sp., *Typha angustifolia*, and a number of yet unidentified seeds, pods, grasses, twigs, culms, and fibers. Still other species, such as *Sapindus saponaria* (two examples), were found in limited quantities.

As with all materials excavated at Huaca Prieta, Bird recorded the layer, and layer subdivision, from which botanical specimens came. The quantity was noted by the number of specimens, fragmented or not. The great size of the collection obligated Bird to discard some highly repetitious items. For example, after the field analysis, 1500 gourd shell fragments were discarded from the 1615 excavated from layer M. Likewise, only a sample of several hundred twigs and sticks were saved from a total original count of over 5000. Some of the specimens were used for radiocarbon dating and therefore no longer exist. Bird categorized the plant remains in the field, often using information from the workmen. A collection of comparative modern specimens was made near the site.

Bird submitted botanical specimens to a

number of experts. For more than 30 years the bulk of the collection traveled away from its home base at the AMNH. Thomas W. Whitaker analyzed the cucurbit material in the late 1940s. The cotton was reviewed by the British cotton group on Trinidad, and was studied more than two decades later by S. G. Stephens. Margaret Towle published on the *Lagenaria* seeds in 1952. About half of the collection went to Hugh Cutler at the Field Museum in Chicago in 1949. That set of materials accompanied Cutler to the Missouri Botanical Garden, and in 1958 was transferred to the Botanical Museum of Harvard University. In 1960 the other half of the Huaca Prieta vegetable materials were shipped from the AMNH to Margaret Towle at Harvard. There, Lawrence Kaplan and Jonathan Sauer examined the bean specimens. Homer Pinkley identified several species, and Paul Manglesdorf, Alexander Grobman, and others examined the Gallinazo maize. In 1966, Barbara Pickersgill and Charles Heiser studied the peppers, and the cucurbits were shipped back to Hugh Cutler. Towle sent small sets of materials to various experts such as B. Francis Kukachka of the USDA's Forest Products Laboratory in Madison, Wis. In 1983, the Huaca Prieta botanical materials were returned to the AMNH. Several hundred maize cobs are being studied by Robert Bird in Columbia, Missouri.

Eight articles were published which are based wholly or in part on analyses of the plant material. These publications are cited below in the descriptions of the material for each species.

This chapter will not present new analyses of the Huaca Prieta botanical materials. It may serve as a guide to facilitate future work. It attempts to draw together the work already achieved, and gives a general description of the collection, with some comments on the amount of material available for each species and its distribution in the excavations. Botanical specimens were also excavated in the ceramic-associated debris (Test Pits 1, 4, 5, 6, and layer A of Test Pit 3), but will not be dealt with here. These collections are not as large as those from the preceramic deposits,

possibly because they were removed from a considerably smaller volume of debris. Test Pits 1 and 5 produced the great majority of ceramic-period specimens. A number of species appeared in the pottery-bearing refuse that were not present in the preceramic remains: *Zea mays*, *Arachis hypogaea*, *Inga feuillei*, *Acacia* sp., and *Persea americana*. The maize has been the subject of a number of analyses (Bird, R., 1978; Bird R. and J. Bird, 1980; Manglesdorf, ms; Manglesdorf and Camara-Hernandez, 1967; Nickerson and Hou, 1953). Some of the ceramic-associated species have not undergone detailed study, but comments on these are often found in the publications dealing with the preceramic plants. Unless otherwise indicated, all the species described below are also present in the ceramic-period excavations at the base of, or north of, the mound.

Numerous references to the Huaca Prieta botanical materials are found throughout Margaret A. Towle's *The Ethnobotany of Pre-Columbian Peru* (1961—see index). She had access to the Huaca Prieta collections for many years when they were stored in the Botanical Museum of Harvard University. Those collections arrived only shortly before the publication of her ethnobotany volume, and were not fully studied. Thus, in her Introduction (1961, p. 10) she announced that she would write a "comprehensive report" on the Huaca Prieta botanical materials in collaboration with Bird, but that report was never written.

The identification of prehistoric plant material is not always easy. Often diagnostic parts are not preserved, or the number of specimens is limited and/or fragmented. A number of types of specimens remain unidentified, or are known only through a local name. The identifications are particularly difficult in the case of specimens which no longer maintain their original botanical form. Thus the composition of some types of decomposed, chewed, or pounded fibrous wads and "barkcloth" remains unknown. Bird was particularly interested in the identification of fibers because they were so important in the textiles. Nevertheless, certain types of fiber remain unidentified.

There is little sound evidence for the in-

roduction of new species during the preceramic occupation at the Huaca Prieta. However, *Capsicum baccatum* appears to have improved by selection through that period, as does cotton. Some layers (M and O) produced a much richer yield of botanical specimens than others.

In the descriptions of the various species, the number of specimens is given in terms of scores, hundreds, or thousands since exact counts are futile, given the fragile and fragmenting nature of so much of the material. The distribution of the species in the excavations is defined as the range spanned by the upper and lower layers in which the species was present. The authors of the scientific nomenclature used here may be found in Towle (1961) and in the published works based on Huaca Prieta botanical remains. The identified species are discussed first. They are ordered by families following the Engler and Prantl system of plant classification:

Typhaceae (Cattail Family)

*Typha angustifolia*

Gramineae (Grass Family)

*Calamarostis* sp.

*Gynerium sagittatum*

Cyperaceae (Sedge Family)

*Cyperus* sp.

*Scirpus* sp.

*Eleocharis* sp.

Bromeliaceae (Pineapple Family)

*Tillandsia* sp.

Cannaceae (Canna Family)

*Canna* sp.

Leguminosae (Pulse Family)

*Canavalia plagioperma*

*Phaseolus lunatus*

Malphiaceae (Malphigia Family)

*Bunchosia armeniaca*

Malvaceae (Mallow Family)

*Gossypium barbadense*

Myrtaceae (Myrtle Family)

*Psidium Guajava*

Sapotaceae (Sapodilla Family)

*Lucuma bifera*

Asclepiadaceae (Milkweed Family)

*Asclepias* sp.

Solanaceae (Nightshade Family)

*Capsicum baccatum*, *C. moschata*, *C. maxima*

## Cucurbitaceae (Gourd Family)

*Cucurbita ficifolia*, *C. moschata*, *C. maxima*

*Lagenaria siceraria*

The descriptions of identified botanical species are followed by a section on unidentified materials grouped by their form (e.g., tubers, fibers). That section is followed by a list of species which occur in very limited quantities. The following specialists at the New York Botanical Garden identified some of the species: James Luteyn, Rupert Barneby, Peter O'Connor, Tetsuo Koyama, and Douglas Daly. Robert Bird wrote a number of the descriptions of the species specimens and carefully reviewed this chapter.

A table of the distribution of subsistence plants in Test Pit 3 is based on counts which are not exact since most were made in the field (see table 21). (The table does not include plant materials used for artifacts or craft or other "industrial" purposes.)

In the descriptions below, photographs are included for only some of the species, usually those not published and illustrated elsewhere.

## IDENTIFIED MATERIALS

## TYPHACEAE (Cattail Family)

*Typha angustifolia*

The cattail specimens (local name, *jinea*) were found in the preceramic layers of Test Pit 3—flower stalks, fiber, and possibly tubers. The last are an uncorroborated identification of some fairly large, flattened tubers with two ranks of branches marking the widest diameter and leaf scars in zigzag ca. 4 to 8 mm apart. Presumably these tubers were used as food. Originally some *Tillandsia* stems were counted as cattail tubers. *Typha* tubers are apparently absent from the ceramic-period debris. Bird speculated that some of the fibrous stems provided bast for textile production.

Catalog nos.: 41.2/4552; 41.2/7906 a to h

## GRAMINEAE (Grass Family)

*Calamagrostis* sp.

This grass was identified in layers D through Q in Test Pit 3. About 1000 specimens were found. Locally known as *gramma bobo*, its use in preceramic times is uncertain.

Catalog nos.: 41.2/4552; 41.2/7917 a and b

*Gynerium sagittatum*

This large grass (locally, *caña brava*) is characteristic of swampy areas. About 1000 specimens were found in Test Pit 3 from layers A through R.

## CYPERACEAE (Sedge Family)

*Cyperus* sp.—see *Scirpus* sp.

*Scirpus* sp.

The fibrous culms and leaves of this bulrush (local name, *jinea*, also *junco*) were used at the Huaca Prieta for making cordage, ropes, baskets, and matting. The collection contains more than 1000 parts of its tubers, known locally as *papas de junco*, both carbonized and noncarbonized. They seem to have been used as food. Many chewed wads seem to be *Scirpus*. They were found from the top through layer P in Test Pit 3. In Test Pit 2 they were found in layers D through F (fig. 174).

Several hundred small sedge tubers, some carbonized, were found in layers G through P1 in Test Pit 3, most abundantly in I1. They were identified in the field as *cocos* (nut sedge—*Cyperus* sp.), but because this is very uncertain, and because they look like small forms of *Scirpus* tubers, they are discussed here. They are further distinguished by often having long, tough stolons attached, as may be the case with *Scirpus*.

Catalog nos.: 41.2/4647; 41.2/4552; 41.2/7901 a to 41.2/7910 a to i

*Eleocharis* sp.

The stems of this sedge were found in Test Pit 3 down through layer O. The specimens consist mainly of chewed wads (fig. 175). The plant is known as *pisa* locally.

Catalog nos.: 41.2/4552; 41.2/7911 a to z

## BROMELIACEAE (Pineapple Family)

*Tillandsia* sp.

Numerous specimens of carbonized stems with closely packed leaf bases were found in Test Pit 3 down to layer Q. The form is a rough cylinder with a woody core ca. 9–16 mm across. Occasional roots form ranks. These were originally classified as cattail tubers, and carry the *Typha* catalog numbers

TABLE 21  
Subsistence Botanical Remains  
Test Pit 3 (HP 3)

Layers	Scirpus sp. (cypeus sp.)		Canna sp.		Canavalia plagioperma		Phaseolus lunatis		Bunchoisia armenica		Psidium javanica		Cucurbita		Cucurbita		Cereza seeds
	tubes	Leaves	Tubes	Seeds	Pods	Seeds	Pods	Seeds	Pods	Seeds	Pods	Seeds	Pods	stems	rind	seeds	
I C	4 <sup>a</sup>	- <sup>b</sup>	- <sup>b</sup>				1		2	1	3		13	4		1 <sup>a</sup>	2
D	47 <sup>a</sup>	1	6				27		16		4		4	10		3	5 <sup>a</sup>
E	34 <sup>a</sup>		25	1			17		19		3		3	6	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>
II F	12	2	6	1			5		12		1		2	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	12
G	54	3	2				28		16	2	1		6	30	3	1	16
III H	93	5	2	2			26		5				30	3	- <sup>b</sup>	- <sup>b</sup>	9
H <sub>2</sub> L <sub>2</sub>	13	7	2				4		9		1		8 <sup>a</sup>	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	6
I	180	9	15	2 <sup>a</sup>			14	3	49		2		1	30	14	- <sup>b</sup>	24
J	71	17	23	6			13		28	1	2		4	48 <sup>a</sup>	3	1 <sup>a</sup>	18
IV K	36	2	27 <sup>a</sup>				3		64		4		7	90 <sup>a</sup>	15	- <sup>b</sup>	523
L	112 <sup>a</sup>	2	43	1			18		16	1	1		25	12	- <sup>b</sup>	- <sup>b</sup>	204
M	87		68	36			87	7	13	1	20		3	4	6	18	544
V N	12		26	1			3	4	- <sup>b</sup>		2		15	2	- <sup>b</sup>	- <sup>b</sup>	157
O	151 <sup>a</sup>	3	57	7 <sup>a</sup>			14	1	66	2	50		11	21	26	1 <sup>a</sup>	400
VI P	331		30	4					14		16		9	3 <sup>a</sup>	4	- <sup>b</sup>	282
Q	11	2	6	1	2 <sup>a</sup>		1		16	1	14		4	4	- <sup>b</sup>	- <sup>b</sup>	247
R	5								3 <sup>a</sup>	1	1		1 <sup>a</sup>	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	17
S	2																
T	1																
W.T. Lots 1-5								7	1				1				
Sample 2 Middle	18		2	2			2	2	1								
Totals	1274 <sup>a</sup>	54 <sup>a</sup>	340 <sup>a</sup>	56 <sup>a</sup>	10 <sup>a</sup>	262	34	368 <sup>a</sup>	10	122	64						2526 <sup>a</sup>

<sup>a</sup> Minimum count, exact quantity uncertain.

<sup>b</sup> Present, quantity not recorded.



FIG. 174. *Scirpus* sp. Stolens (top left), chewed wads (top right), small tubers (bottom left), and stolons identified as cocos (bottom right).

at the AMNH. Very similar specimens were common at La Paloma site (Glendon Weir and Robert Bird, personal commun., 1983).  
Catalog nos.: 41.2/4552; 41.2/7906 a to h

#### CANNACEAE (*Canna* Family)

##### *Canna* sp. (probably *edulis* or *indica*)

Specimens of various parts of *canna* (locally, *achira*) were found in Test Pit 3 down through layer Q. Several hundred parts and fragments compose the collection, mainly the leafy coverings of the edible fibrous tubers plus some complete tubers, leaves, and a considerable number of chewed tuber wads (fig. 176). The chewed wads are often difficult to differentiate from other chewed fibrous material.

The tubers are cylindrical, large (up to 85 mm long by 48 mm wide), and dense with a granular interior. Inconspicuous leaf scars 8 to 17 mm apart encircle them, and triangular bracts may surround the apex. Modern *canna* tubers are known to have a sweetish taste when boiled. The rhizome's exterior was apparently removed before chewing. The fibrous wads were left after chewing had extracted the tuber's starchy content. This species was probably cultivated (Towle, 1961, pp. 33–34).

Several examples of *canna* leaves wrapped around cactus thorns are also in the collection.



FIG. 175. *Eleocharis* sp. Stem bases (top) and chewed wads (bottom).

Catalog nos.: 41.2/4552; 41.2/7900 a to hhh

#### LEGUMINOSAE (Pulse Family)

##### *Canavalia plagioperma*

Several dozen pods and seeds were found in Test Pit 3 from Layers E through Q. Known in Spanish as *pallar de gentiles*, it is found in association with the more abundant *Phaseolus lunatus* in both preceramic and ceramic contexts at the Huaca Prieta (Towle, 1961, p. 45, citing Kaplan manuscript). Sauer and Kaplan examined the *Canavalia* specimens (1969, p. 420, and figs. 4 and 5) and identified the species as domesticated *C. plagioperma*. When Sauer and Kaplan published their analysis, the Huaca Prieta excavations yielded the oldest and longest sequence of *Canavalia* in Peru.

Catalog nos.: 41.2/7924 a to f; 41.2/7941a

##### *Phaseolus lunatus*

A few hundred lima bean pods, their fragments, and a few seed fragments were found from the top down through layer O (Q) of Test Pit 3, the same distribution as *Canavalia plagioperma* sp. (Kaplan, 1968). In ceramic-period debris they were associated as well

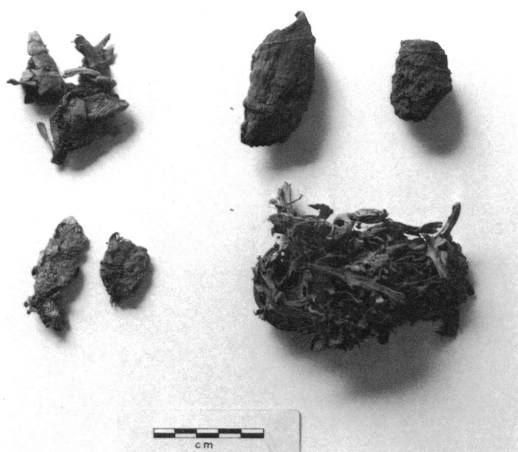


FIG. 176. *Canna* sp. Coverings (top left), tubers (top right), chewed wads (bottom left), leaves with cactus thorns (bottom right).

with *Phaseolus vulgaris*. The bean pods belong to the large-seeded Inca type (Towle, 1961, p. 53, citing L. Kaplan).

Catalog nos.: 41.2/7923 a to c; 41.2/7941b

#### MALPHIGIACEAE (Malphigia Family)

##### *Bunchosia armeniaca*

Several hundred seeds of the edible fruit of *Bunchosia armeniaca* (fig. 177), known locally as *ciruela del fraile*, were recovered from Test Pit 3, layers D to R. The specimens are entirely noncarbonized. Dimensions of seeds from Test Pit 3, layer O, are roughly the same as for Cupisnique seeds: 15.6 to 24.6 mm long, 8.2 to 13.9 mm wide, and 4.7 to 11.0 mm thick (for small samples).

Catalog nos.: 41.2/7912 a to z

#### MALVACEAE (Mallow Family)

##### *Gossypium barbadense*

Remains of preceramic cotton were found in Test Pit 3 from the top down through layer R. It was also found in Test Pit 2 in layers C through G3. Several hundred specimens consist of wads of brown and white lint (some compressed like felt), seeds, bracteoles, bolls, and twigs. Six of the lint specimens had been colored with red pigment. It is possible that some of the "barkcloth" specimens are made wholly, or in part, of cotton fiber. At the time of its excavation, the Huaca Prieta cotton was



FIG. 177. *Bunchosia armeniaca*. Seeds.

the earliest recovered in Peru (Towle, 1961, p. 64).

The Huaca Prieta cotton was first discussed in print by Sir Joseph Hutchinson (1959, pp. 25–28, 30–32) who noted its close resemblance to *C. barbadense*. He also noted that "there was nothing in the material to suggest the presence of an Asiatic cotton." The proposition that an Asiatic cotton was introduced into America as a cultivated plant (Hutchinson, Silow, and Stephens, 1947) was one hypothesis Bird intended to investigate at the Huaca Prieta (Bird and Mahler, 1951–52, p. 74). One conclusion from the analyses of textiles from the Huaca Prieta was that the early fabrics were made mainly of cotton.

A detailed analysis with charts and photographs of the Huaca Prieta cotton was published in 1975 by S. G. Stephens. His abstract is reproduced below:

An analysis of cotton remains from Huaca Prieta on the north Peruvian coast, dating from circa 2,500 B.C. to circa 750 B.C. indicates that they were probably primitive forms of *G. barbadense* L. and similar in most features to those previously examined from sites in the Ancón area of the central coast (Stephens and Moseley, 1974). As in the Ancon materials, there is a tendency for seed size, boll size and fiber to increase from the earlier to later levels. Most of the Ancon

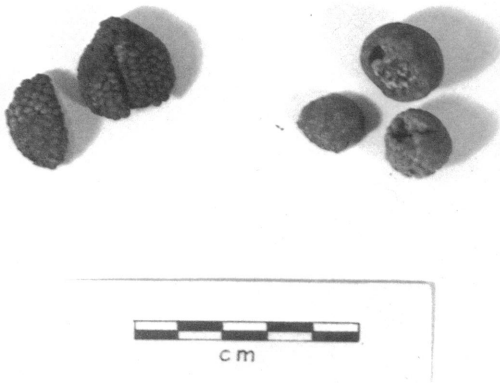


FIG. 178. *Psidium Guajava*. Fruits with seeds.

materials belonged to the Preceramic Period, while at Huaca Prieta both Preceramic and Initial Periods are represented. Only fuzzy seeds were found among the Ancon materials and among the Preceramic materials recovered from Huaca Prieta. Tufted seeds first appear during the Initial Period at Huaca Prieta; it is the prevailing type among present-day cultivars, and may have been favored under human selection because their fibers are much more readily removed from the seeds by hand. It is believed that fuzzy seeds represent the more primitive condition; it is the prevailing type among present-day wild forms of *G. barbadense*. It remains a question whether the tufted seeds at Huaca Prieta originated as mutants in the locally cultivated fuzzy seeded types, or whether they were new forms, introduced along with pottery and other crop plants from elsewhere. None of the cotton materials so far examined from Peruvian coastal sites show affinities with cottons still extant in the Amazon Basin, and no wild, or apparently wild, forms of *G. barbadense* have yet been found east of the Andes.

Catalog nos.: 41.2/4539 to 4543; 41.2/4643 to 4646; 41.2/7902 a to qq

#### MYRTACEAE (Myrtle Family)

##### *Psidium Guajava*

Guava fruits, whole and fragmented, with seeds, compose less than a score of specimens which were found in Test Pit 3 in layers C through R (fig. 178). None was carbonized.



FIG. 179. *Lucuma bifera*. Shells and seeds.

Catalog nos.: 41.2/7913 a to h

#### SAPOTACEAE (Sapodilla Family)

##### *Lucuma bifera*

This edible fruit was found in the preceramic layers of Test Pit 3 down through layer R (fig. 179). The specimens consist of more than a hundred broken shells of the seeds, and several dozen whole seeds or cotyledons. Known locally as *lucuma*, the tree's fruit usually contains about two seeds. Some of the collection's seeds are carbonized.

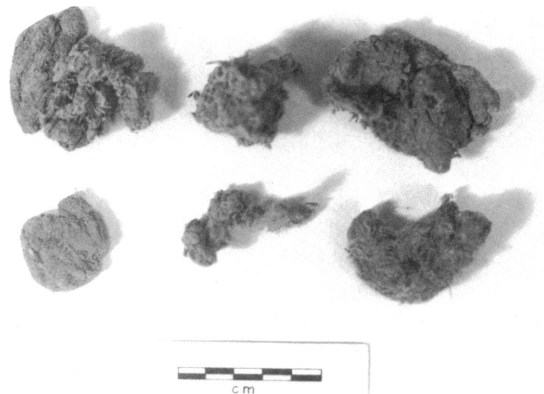


FIG. 180. *Asclepias* sp.? Wads.



FIG. 181. *Capsicum* sp. Pods, seeds and calyxes.

Catalog nos.: 41.2/7903 a to cc

#### ASCLEPIADACEAE (Milkweed Family)

*Asclepias* sp. ?

More than 100 specimens of a fibrous material and wads were recovered in layers A to G of Test Pit 2 and layers C to R of Test Pit 3 (fig. 180). These were tentatively identified in the field as species of *Asclepias*, known locally as *chivo* or *amarra judea*. Bird speculated that milkweed may have provided some (?) of the bast used in the textiles. Several hundred pod fragments were also found.

Catalog nos.: 41.2/4552; 41.2/4647; 41.2/7899 a to ss

#### SOLANACEAE (Nightshade Family)

*Capsicum baccatum*, *C. chinense*, *C. frutescens*

Chile peppers (locally, *aji*) were found in Test Pit 3, layers D through Q. Less than 100 fruits and seeds, and a few calyxes, comprise the collection (fig. 181). Pickersgill examined the specimens' seed width and calyx form and concluded (1969, pp. 55–56, 59) that the examples in layers P and Q were domesticated *C. baccatum* var. *pendulum*. In upper layers the seed width decreased, and a new species appeared in the pottery-bearing deposits north of the mound. Pickersgill wrote (1969, p. 59):

Two explanations of these changes are possible. One is that over the centuries *C. baccatum*, initially brought into the area as a cultivated plant, escaped and became established around the settlement as a weed, reacquired the primitive characters of small seeds and deciduous fruits,

and was collected by the inhabitants of Huaca Prieta along with their cultivated peppers. The alternative, more likely explanation is that, at about the same time that Chavín-influenced pottery was spreading on the coast, a new species of pepper (*C. chinense* or *C. frutescens*) was introduced. It was less highly evolved than the types already in cultivation since it still had small seeds and deciduous fruits, but the two species persisted in cultivation, with neither replacing the other, until the present day.

Pickersgill concludes (1969, p. 60):

Detailed examination of the pepper material from Huaca Prieta showed that *Capsicum baccatum* was present throughout the period of human occupation and was gradually improved by selection. Seed size (and hence probably fruit size) increased, and deciduous, easily shed fruits were replaced by persistent fruits retained on the plants when ripe. In the levels immediately preceding those containing pottery, another species of pepper, *C. chinense*, was found. This species was not as advanced a crop plant as *C. baccatum*, for it still possessed deciduous fruits and small seeds. The center of diversity of *C. chinense* today is east of the Andes, and its domestication was probably connected with the development of agriculture in the tropical forests, an occurrence suggested by discoveries at Yarinacochoa and Kotosh.

Catalog nos.: 41.2/7904 a to z

#### CUCURBITACEAE (Gourd Family)

*Cucurbita ficifolia*, *C. moschata*, and *C. maxima*

Squashes and gourds by the thousands make up the largest category of plants found in all layers of Test Pit 2 and down to layer R in Test Pit 3. Most specimens are shell fragments. Separation of the taxa is incomplete, even though considerable attention has been paid to them (Whitaker and Bird, 1949; Whitaker and Cutler, n.d.). To summarize, *Cucurbita* shells are usually 0.5–3 mm thick, *Lagenaria* varies from 3.5 to 9 mm. More certain separation depends on histological differences which are obvious when thin sections are viewed microscopically. A warty form of *C. moschata* shell appeared in the ceramic refuse in Test Pit 5, layers A, B, and D (Cupisnique, Pre-Cupisnique, and Guañape refuse) and in preceramic levels. The stems (pedicels) of *Lagenaria*, *C. ficifolia*, and *C. moschata* are often similar and were only



FIG. 182. *Ceresia*, tentatively *Capparis angulata*. Seeds.



FIG. 183. *Mondaco*. Pods.

partially separated by Whitaker and Cutler, but it should be possible to separate the many hundreds of recovered stems by using histological traits. Among Cutler's notes there is mention of *C. maxima* stems represented in Test Pit 3, layers C, G, and O—confirmation is needed. Seeds have proved the most diagnostic element in separating cucurbit taxa, well illustrated by Whitaker and Bird (1949). *Lagenaria*, *C. ficifolia*, and *C. moschata* seeds are reported in most layers of Test Pit 3 down to layer R. A number of cucurbit vine segments are reported.

Catalog nos.: 41.2/7935 a to zzzzz; 41.2/7936 a to bb

#### *Lagenaria siceraria*

Gourds are the most abundant botanical species found in Huaca Prieta (fig. 170). They have the same layer distribution as *Cucurbita*, and the same plant parts were found. Whitaker (in Whitaker and Bird, 1949, p. 14) concluded for a few large subsets:

To summarize, the most important facts brought out by examination of the cucurbitaceous materials from Huaca Prieta are: 1, there is abundant material of *Lagenaria siceraria* present in both horizons; 2, in the pre-ceramic, pre-maize horizon there are seeds of the broad-seeded form of *L. siceraria*, typical of collections of this species from the Old World . . .

Towle published an analysis of coastal Peruvian *Lagenaria*, commenting on the Huaca Prieta seeds (1952, pp. 171–173, 180–181) among others. She also commented on the

question of *Lagenaria*'s worldwide distribution. Notes by Cutler and Whitaker (n.d.) record shell thicknesses, sketches, etc. The preceramic gourds varied from 3.5 to 8.8 mm. The stem-proximal or neck area ranged from very elongate to flat.

At the Huaca Prieta, gourds served a number of purposes. They were important as containers and utensils in lieu of pottery. They also served as floats for nets. Bird's analysis of gourd utilization (in Whitaker and Bird, 1949, pp. 3–7) is reproduced, with illustrations, in Chapter 7 on artifacts.

Catalog nos.: 41.2/4538 a to f; 41.2/4647; 41.2/4552; 41.2/7934 a to bbbb; 41.2/7936 a to bb.

#### SPECIMENS IDENTIFIED BY FORM

Some of the plant material from the Huaca Prieta could not be firmly identified as to family or genus although a number of specialists examined them. More than 2500 round seeds, locally, *cereza* (fig. 182) with an average diameter of one centimeter were found in Test Pit 3 down through layer R. None are carbonized (catalog nos.: 41.2/7905 a to z). More than 30 fragments of pods identified locally as *mandaco* (fig. 183) were found in Test Pit 3 down through layer P (catalog nos.: 41.2/7918 a to q).

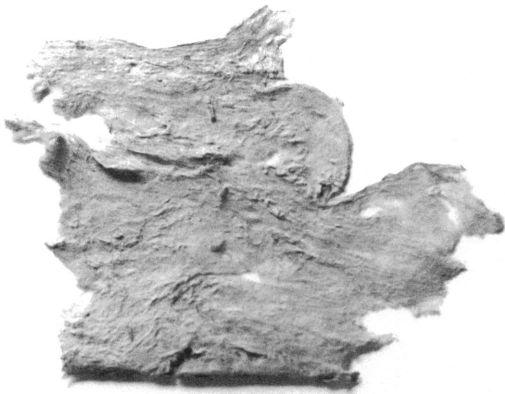
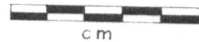


FIG. 184. "Barkcloth."

Bird paid considerable attention to fibers—a complex array of unspun cotton, chewed wads, bark cloth, and amorphous masses of other materials. It is very difficult to identify what plant species are involved. A set of samples was used by Bird to establish norms for classification, but preparation of known fiber sources and of fibrous tubers is needed before further work is attempted. A material identified in the field as "barkcloth" (fig. 184) comprises more than 300 specimens, many of which are not classified with certainty. It is possible that the barkcloth fragments were made from a variety of different nonbast materials including leaf fiber, algae, and/or cotton (Kucachka, 1966). Charles Rhyne (in letter by Harold Robinson, 1966) at the Smithsonian Institution determined some samples to be algal, either *Chaetomorpha* or *Rhizoclonum*. The "barkcloth" was found in most layers of Test Pits 2 and 3 (catalog nos.: 41.2/4544–4545; 41.2/7908 a to zz).

The Huaca Prieta collection includes 45 small boxes of unidentified fibrous material, chewed wads, and bast substance (catalog nos.: 41.2/4547 to 4552). It is probable that many of these specimens are decomposed, chewed, or pounded parts of species mentioned above. About 20 small boxes contain unidentified sticks and twigs from all layers

FIG. 185. *Salix* sp. Leaves and stems.

of the excavations (catalog nos.: 41.2/7937 a to cc).

The tubers merit further study. Three types have been tentatively identified as *Canna*, *Scirpus*, and *Typha*, distinguished by size, interior texture, leaf scars, and number of ranks of leaves and accompanying branches (see descriptions above). Possibly the smaller *Scirpus* tubers can be shown to be *Cyperus*, as originally thought.

#### SPECIMENS IN SMALL QUANTITY

A number of preceramic plant remains (41.2/7907, 7909, 7915, 7919 to 7921, 7925–7933) are found in very small quantities, often less than four specimens. They have been very tentatively identified by local Spanish or English names, and sometime their scientific name. All were found in Test Pit 2 or 3. They are: kelp and/or seaweed, horsetail (*Equisetum* sp.), *cola de zorro* (*Echinochola crusgali*), *flor de agua*, *uña de gato* (*Mimosa* sp.), *quinal*(?), *chaquira del Indio*, *choloque*, soapberry (*Sapindus saponaria*), *simbolo*, and willow (*Salix* sp.) (fig. 185). A few specimens identified as *frijol de garbanzilla* (perhaps *Cajanus cajan*), *yerba luisa* (*Cymbopogon citratus*), and *tamarindo* (*Tamarindus indica*) are questionable, since they are generally considered to be Old World in origin.

#### CONCLUSIONS

Bird considered that some of the species found at the Huaca Prieta were cultivated,

and therefore the inhabitants of the site could be considered America's earliest farmers (1948b, 1948c). At the time of the excavations, no solid evidence for earlier agriculture had yet been found in the Americas. The cultivated species are the cucurbits (gourds and squash), legumes, chile peppers, cotton, and canna(?). Bird wrote (1948b, p. 302) that one could debate if all the plants were cultivated or "whether some were at that time growing wild. The fact that they were regularly used by the inhabitants of a well-established community, and that none grow wild in the area today, suggests they were all cultivated." Subsequent botanical analyses have demonstrated that the above species may be considered domesticates. They may have been cultivated only after they were introduced from elsewhere.

Other species, definitely wild, but used for food, were the tubers and rhizomes of the cattail and sedges. These are all marsh species, and their presence suggests a nearby marshy environment (see Chapter 2). Fruits, generally classified as wild, were lucuma, guava, and *Bunchosia armeniaca*. Where they grew is uncertain.

The evidence for agriculture, both for subsistence and craft use, is clear at the Huaca Prieta. This does not mean that the preceramic population of the mound was wholly dependent on agriculture. Bird noted (1948a, pp. 56-57; 1948b, p. 302; 1948c, p. 180) that maritime exploitation was also of great importance. He did not attempt to stipulate whether sea or land resources were more significant.

#### COPROLITES AND ABDOMINAL SPECIMENS

Callen and Cameron published an analysis (1960) of Huaca Prieta coprolites and the intestinal contents of one burial. The dried feces are thought to be from humans, but it is possible that some may be from dogs. The coprolites were found in layers D, E, G, H, H2I2, L, M, O, and P of Test Pit 3. The burial with the intact intestinal contents came from layer G of the same pit.

The fecal material was reconstituted with a new technique to return the desiccated material to a more original texture and appearance. They were soaked for 72 hours in a 0.5

percent aqueous solution of sodium triphosphate. The mixture was then sedimented and the precipitate was examined for food remains, parasite eggs, and foreign bodies. The reconstitution process permitted the identification of small fragments of plant and animal tissue, and even brought back the smell.

After a detailed discussion of the coprolite analysis, Callen and Cameron concluded (1960, p. 39)

The plant remains that can be definitely identified, therefore, are cucurbit, chile peppers, and two types of bean. The identity of the other plants eaten, consisting almost entirely of single cells, could not be established. Some of the cells suggested endodermis cells, others were filled with starch granules (which react to iodine), all of which may have come from a *Canna* rhizome, as Bird has reported the dried remains of this plant in the huaca. The presence of excessive numbers of fibers (not cotton) in some of the coprolites suggests that fibrous roots, such as those of the common cattail, the rush and the "nut-grass" sedge (which have also been found among the dried remains) had formed part of the diet. Undoubtedly some of the material was of root origin, being xylem vessels of a type associated with fleshy roots or rhizomes or tubers; as these were apparently always roasted or at least charred, they could not be identified.

Callen and Cameron also studied the intestinal contents of burial 99.1/897 from layer G (Test Pit 3), but which is associated with layer F. Twenty-eight packets were recovered. They were considered to represent the food consumed by an individual during the 48 hours before death. This was the only burial at the Huaca Prieta with intact intestinal contents. The summary of Callen and Cameron's analysis (1960, p. 39) follows:

Upon examination it was found that 18 of them contained some vegetable material and 16 contained some evidence of seafood or fish. Seven of the 18 contained plentiful vegetable remains, suggesting recent consumption, and probably come from the stomach or duodenum or both.

In 12 packets the contents consisted almost entirely of a granular material, probably local sand. Had this sand just filtered in or been carried in by coprozoic insects, or had this individual accidentally swallowed a good deal of sand, or had the sand been administered as a cure for some illness? "Dirt eating" or "Pica"

is still not uncommon in certain diseases—such as hookworm anaemia—in tropical peoples, and it may have been practised here also. In three packets there were some unrecognizable charred remains mixed in with the sand.

The presence of plentiful food remains in a large part of the digestive tract suggests that the subject had died rather unexpectedly, and the fact that much of this food was peppers suggests that death occurred in February or March, when these fruits are obtainable. The contents of the packets also clearly show that this individual had eaten two, and sometimes three, kinds of fruit at one sitting, never one alone, and that a mixed diet of fruit and seafood had probably been consumed at the same time. The presence of pieces of mussel and snail shells, crab claws, and sea-urchin shell, in otherwise completely

digested material, suggests a considerable hardness in food habits.

It seems fairly clear that the diet of these early American inhabitants consisted mainly of beans, cucurbits, peppers, various roots, mussels, and other sea organisms. Fish apparently did not form the large part of the diet that one might conclude it did from Bird's remarks on fishing. Clams, snails, sea urchins and crabs, as well as sundry fruits in season, seem to have been more in the nature of delicacies than staple foods. Traces of meat have been found in only a few coprolites—probably also as a delicacy. Cooking of food seems to have been of the roasting type, with the exterior often charred, and the interior varying from raw to cooked. The exterior charred portions appear to have been eaten.

## CHAPTER 14. SHELL AND BONE

The shell and bone remains at Huaca Prieta are far less common than botanical specimens. The analyses indicate that mollusks, crabs, fish, and birds played a continued role in the diet of the preceramic inhabitants. Mammal remains are considerably fewer, and may have been only occasionally significant. There is no firm evidence for domesticated fauna.

It may be notable that more than four-fifths of the bird, fish, and mammal bones are from below layer I in Test Pit 3. This might indicate a lessening dependency on animals for subsistence after the formation of layer J.

### BIRD REMAINS

A preliminary analysis of 382 bird bones from Huaca Prieta was done in 1984 by Diana Matthiesen, who is preparing a more detailed study. She thanks Wayne Hoffman and Jane Wheeler for helpful discussions. The Florida State Museum, University of South Florida, and Pierce Brodkorb are thanked for the loan of comparative specimens.

Test Pit 2 produced 139 bones (36 in layers A, B, C, and D; 103 in layers E, F, G, and H). Test Pit 3 produced 243 bones (27 from layers C to I; 216 from layers L to S), table 22. Matthiesen (1984) reports:

There are no substantial differences in taxa between pits or between levels. The distribution of post-cranial skeletal elements is not remarkable, but the number of well-preserved crania is rather more than typical for middens; the stork bill even included its horny sheath. Quite a few specimens show cut marks, and some show signs of burning.

All taxa are non-migratory except for the wader and some of the gulls and terns, which are resident during the northern winter. A few specimens in several taxa are immatures (incomplete ossification) or laying females (medullary bone), so some indication of seasonality should be possible.

The avifauna from Huaca Prieta is overwhelmingly coastal and mostly marine. Cormorants, boobies, and pelicans constitute 80 percent of the specimens, and the remaining taxa range from pelagic waters to lagoons, beaches, marshes, and rivers.

### MOLLUSKS

The preceramic inhabitants of Huaca Prieta harvested and ate mollusks, and their shells remain as the evidence. They are present in most of the layers of Test Pits 2 and 3. Approximately 70 shells were recovered from Test Pit 2, and about 250 were from Test Pit 3. Most specimens are intact. Huaca Prieta is not a shell midden, and some layers apparently produced no shell at all (A and B in HP 2; F, L, M, and N in HP 3). Some fragments were too small to be recovered in the screening process. Mr. Walter Sage III of the Invertebrates Department of the AMNH aided with the identifications. The systematics are drawn from A. Myra Keen's *Sea Shells of Tropical West America* (1971). All the Huaca Prieta shells are cataloged under only two numbers: 41.2/4648 (HP 2) and 41.2/4556 (HP 3). Some crab parts and sea urchin fragments accompany the shells.

The shells have been identified as to genus, and only occasionally to species. They are:

Bivalves—*Mytilus*, *Dosinia*, *Protothaca*, *Donax*, and *Anadara* or *Cardiomaya*  
Gastropods—*Diadora*, *Fissurela*, *Tegula*, *Crepidula striolata*, *Natica*, *Sinum symba*, *Bursa*, *Ocenebria*, *Thais*, *Concholepis*, *Nassarius*, and *Mitra*

All are shoreline saltwater mollusks and appear to be edible. Only one or two show signs of having been in fire.

In general, the larger shells (over 3 cm in maximum width) are some of the most common in the collections: *Protothaca* (80 specimens), *Mytilus* (46 specimens), *Fissurela* (11 specimens). Of the smaller shells, the *Tegula* (11 specimens), *Crepidula* (75 specimens), *Mitra* (21 specimens), and *Thais* are well represented. All other genera are represented by less than ten fragments or whole shells. In general, the same mollusks found in Test Pit 3 are also in Test Pit 2.

The most common shells (*Protothaca*, *Mytilus*, and *Crepidula*) are not found below layer K in Test Pit 3. They are, however, found in layers D and E of Test Pit 2, strata thought

TABLE 22  
Bird Bones Identified to Family

Taxa	n	Percent
Phalacrocoracidae, cormorant	142	37.2
Sulidae, booby	83	21.7
Pelecanidae, pelican	69	18.1
Laridae, gulls/terns	32	8.4
Spheniscidae, penguin	21	5.5
Passeriformes, songbird	5	1.3
Scolopacidae, wader	4	1.1
Procellariidae, shearwater	4	1.1
Diomedidae, albatross	3	0.8
Ardeidae, heron	3	0.8
Ciconiidae, stork	2	0.5
Anatidae, duck	2	0.5
Rynchopidae, skimmer	1	0.3
Pelecanoididae, diving petrel	1	0.3
Aves, indet.	10	2.6
Total	382	

to equate with the lower layers of Test Pit 3. The absence of any shell in layers L, M, and N may be due to a loss or misplacement of specimen boxes at the AMNH. An early chart based on field data suggests that those layers also contained some shell. Layer I has the most shell material, with over 100 specimens, mainly *Crepidula* and *Protohaca*.

Given the large size of Test Pits 2 and 3, shell forms only a very small part of their debris. It is apparent that the prehistoric inhabitants did not exist primarily on shellfish. Bird learned that the *Mytilus* (*choro* or mussel) is often found in the sea several meters deep, and diving is probably necessary to recover it. This may have led to the increased incidence of ear exostoses in the Huaca Prieta population (see contribution by I. Tattersall in Chapter 6). Bird also noted (1948b, p. 302) that shellfish now are not abundant at Huaca Prieta, and that once there may have been a nearby reef or shelf of conglomerate rock favoring their growth.

At Huaca Prieta, seashells were used as beads, pendants, paint cups, and possibly fishhooks (see Chapter 12). The *Thais* shells may have been used for purple dye, since shells of the related *Muricidae* family produced the Tyrian dye of the Mediterranean peoples (Keen, 1971, p. 548). Bird contributed to research (Saltzman, Keay, and Chris-

tensen, 1963) indicating that the mollusk *Concholepas peruviana* could be a source of purple dye used in Paracas textiles. Three specimens of *Concholepas* were found in Test Pit 3 at the Huaca Prieta.

One small freshwater shell in the collection is adventitious.

## CRABS AND OTHERS

Small fragments of saltwater crabs were found in most layers of Test Pits 2 and 3. Less than 100 parts, mainly chelipeds, carapaces, and forelimbs are present. The fragments are generally too small for accurate genus and species identification. Both spider (family *Maidias*) and stone (family *Xanthidae*) crabs appear to be present. Thus, at least two species, and probably more, are found in the debris. Harold S. Feinberg of the Department of Invertebrates of the AMNH suggests that a carcinologist could make more specific identifications.

Crabs were not only eaten by the residents of the Huaca Prieta, but depicted in their textile art (see Chapter 10 on condor-type construction). The crabs are classified with fish bones in the American Museum catalog with nos. 41.2/4557 and 41.2/4649. A few fragments are stored with the mollusks.

Sea urchin spines are very common in the excavated layers of the Huaca Prieta. A few sea urchin shells are found in layer E of Test Pit 3. Acorn barnacles are found in several layers, occasionally attached to shells. A fragment of starfish is present, as are four fragments of sea turtle (layers J and O). Six fragments of batoid (ray) teeth are found, 5 in Test Pit 2, 1 in Test Pit 3.

## FISH

Several hundred fish bones were recovered from Test Pits 2 and 3. They are cataloged with nos. 41.2/4557 and 41.2/4649. More than four-fifths of the material comes from below layer I of Test Pit 3. Most of the bone specimens are too small or fragmentary for accurate species or genus determinations. Bird found that local informants identified some of the fish bones as *toyó*, a local name for a small shark.

Dr. Lavett C. Smith of the Ichthyology Department of the AMNH examined the col-

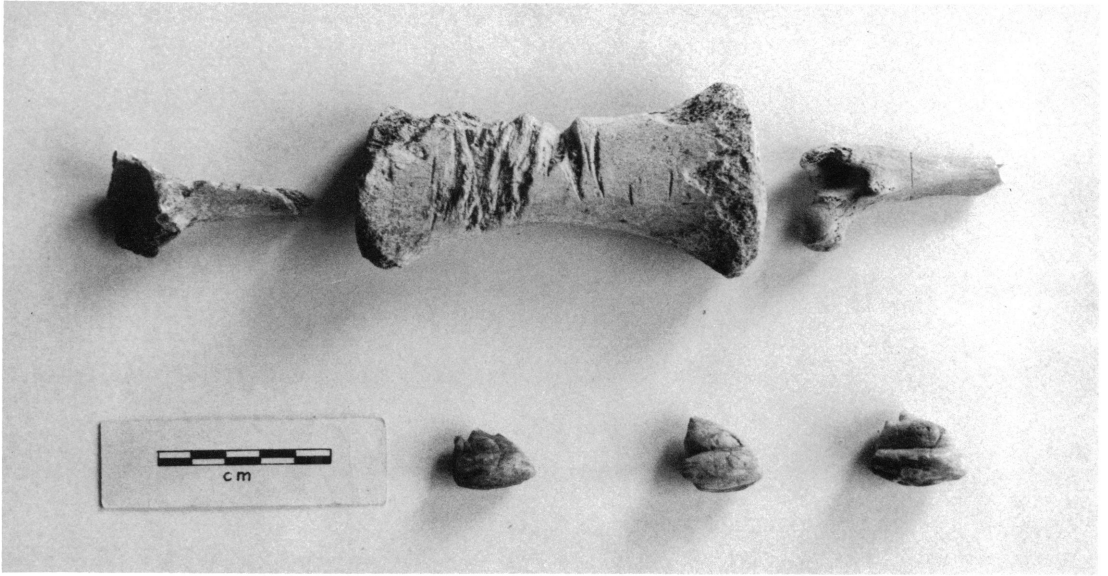


FIG. 186. Mammal bones with butcher marks (top). Fish hyperostoces, "tilly bones" (bottom).

lection and identified several vertebrae of rays or sharks. A number of bone growths, hyperostoces, commonly known as "tilly" bones, are also present (fig. 186). Smith notes that these are possibly associated with the fish genus *Chaetodipterus* of the Pacific coast of South America. Approximately 20 "tilly" bones are present in Test Pit 2 and the lower layers of Test Pit 3. The considerable occurrence of these bones suggests that they were saved, perhaps for some purpose. One such bone from layer I is drilled from both sides, but the hole is incomplete.

The limited amount of fish remains in the upper layers of Test Pit 3 suggests that fishing for subsistence was less important during the latter part of the site's preceramic occupation.

### MAMMALS

Thomas Amorosi and Dr. Thomas H. McGovern make the following report (1984) of the mammal remains, table 23:

The mammalian remains encountered in the preceramic excavations at Huaca Prieta were identified at the American Museum of Natural History, and the Faunal Laboratory at Hunter College, City University of New York. The identified and unidentified specimens per taxon by stratigraphic unit are presented in table 23.

The systematics are drawn from T. E. Lawlor's *Handbook to the Orders and Families of Living Mammals* (1979). All mammalian remains are cataloged under the American Museum numbers 41.2/4651 (Test Pit 2) and 41.2/4558 (Test Pit 3). A complete listing of the identified bone elements is archived in the Junius Bird Laboratory of South American Archaeology.

The identified remains have been assigned to *Rattus* sp. (either Black or Norway rat), *Canidae* (dog and/or fox), *Pinnipedia* (seal), *Artocephalus* sp. (southern fur seal), and *Cetacea* (small whale and/or dolphin). Three cranial, seven long bone, one vertebra, one rib, and nine unidentified bone fragments were assigned to a terrestrial mammal class. Other fragmentary bone—one cranial, two flat bone, and seven unidentified—were assigned to a pinniped-size class of mammal.

It may be noteworthy that mammalian remains were not found above layer K. Some tentatively identified seal bones were mentioned in J. Bird's fieldnotes, but these remains could not be located at the AMNH. The presence of rat, *Rattus*, sp., a right femur missing the distal epiphysis, in layer O of Test Pit 3 is European and not prehistoric. Its presence suggests a disturbance that was undetected during the excavation, or an error in the sorting or labeling procedure. The other mammalian remains represent species exploited during preceramic times. There is evi-

TABLE 23  
Mammalian Specimens per Taxon by Stratigraphic Unit

Taxon	Test Pit 2 Layers		Test Pit 3 (HP 3) Layers						
	A, B C, D	E, F G, H	K	L	M	N	O	P	R
<b>Identified</b>									
<i>Rattus</i> sp.	—	—	—	—	—	—	1	—	—
<i>Canidae</i>	—	—	—	—	—	—	1	—	—
<i>Pinnipedia</i>	—	1	1	2	1	1	3	1	1
<i>Arctocephalus</i> sp.	—	—	—	8	—	—	2	—	—
<i>Cetacea</i>	1	—	—	—	—	1	—	—	—
<b>Unidentified</b>									
Terrestrial Mammal	7	4	—	10	—	—	—	—	—
Aquatic Mammal	—	—	—	10	—	—	—	—	—
Number of identified specimens:			25						
Total number of unidentified fragments:			<u>31</u>						
Mammalian assemblage total:			56						

dence of butchering on three specimens (fig. 186), and burning on one specimen, belonging to *Canidae*, *Pinnipedia*, *Arctocephalus* sp., and *Cetacea*. The bone sample is too small to make

any definitive statements as to any pattern of butchering. The cetacean remains are the probable result of isolated beached animals utilized by the inhabitants.

## CHAPTER 15. CHRONOLOGY

*Background comment by John Hyslop, 1984:*

From the moment excavations began at the Huaca Prieta through the many years of artifact analysis, Bird was concerned with the stratigraphy and the possible changes through time that could be observed in the remains. Bird's distribution charts of artifacts, artifact traits, and subsistence materials were, however, never analyzed and drawn together into a general commentary.

This chapter is an attempt to integrate these data. It was created with less guidance from Bird than any other chapter. The basic framework for

This chapter summarizes the evidence for the vertical distribution of artifacts and artifact traits in the stratigraphy at Huaca Prieta. These distributions, and their interrelationships, provide evidence about cultural change during the occupation at Huaca Prieta. This span time of about 1500 years is not marked by great transformations. Nevertheless, a review of the evidence reveals both significant and minor alterations taking place at different stratigraphic levels. Much of these data have already been presented in preceding chapters, and the reader will find this chapter most useful if it is read after the earlier ones (particularly those concerned with stratigraphy and textiles), and the Textile Code (Appendix 1). In reading this chapter, the reader is advised to make frequent reference to the illustrations of the mound's stratigraphy (Chapter 4) the tables describing the chronological distributions of artifacts and traits (see list of tables, p. 5), figures 187 and 188, and the Textile Code.

This discussion will proceed by elaborating the cultural evidence in combinations of layers from the lowest (earliest) deposits upward. These groupings of layers, called "combinations," are, with minor changes, defined by Bird (notes, n.d.) in a three-page manuscript written sometime during the 1950s or 1960s (fig. 187). Bird created these combinations on the basis of the structure of the excavated debris, and by some other features, particularly the layers' relationship to the retaining walls on the south side of Test Pit 3. A comparative evaluation of the artifacts and subsistence evidence indicates that these combinations form useful groupings, since the divisions between the groupings are often the

this discussion, the sequence of layers, and their grouping into "combinations," is by Bird. Otherwise, the authors, Stuart Rockefeller and myself, are responsible for the approach and interpretive comments presented here. A few observations in the section concluding this chapter are somewhat speculative, and might be considered to diverge from Junius Bird's more concrete approach. Valuable evaluation and criticism has been supplied by Mrs. Milica Skinner, Mr. William J. Conklin, and Ms. Nora Rogers.

points at which types of evidence appear, disappear, or begin notable increases or decreases. The combinations of layers in stratigraphic order from bottom to top, as discussed in the text, are:

Combination VI—Layers T to P, Test Pit 3, and all of Test Pit 2

Combination V—Layers O to N, Test Pit 3

Combination IV—Layers M to K, Test Pit 3

Combination III—Layers J to H, Test Pit 3

Combination II—Layers G to F, Test Pit 3

Combination I—Layers E to C, Test Pit 3

Bird indicated that his "combinations" might be altered later due to distributions of cultural evidence that might appear in the analysis. This prerogative has been taken only once. Layer M has been included in combination IV, and removed from combination V. Also, Bird set up no combination for the lowest layers (all of Test Pit 2 and layers T through P of Test Pit 3). These have been labeled combination VI.

A small amount of textile information in this chapter has not been presented in the preceding chapters. These data are available in complete charts in the Junius B. Bird Laboratory of South American Archaeology at the AMNH. Figure 188 presents the changing proportions (in percentage) of traits in the twined fabrics for the layers of Test Pit 3. This figure is based on tables 8, 10–12, 17, 19, and 20 (see list of tables, p. 5).

COMBINATION VI—Layers T, S, R, Q, and P of Test Pit 3 and all of Test Pit 2

This combination of layers resulted from the earliest preceramic occupation at Huaca

Combinations	Layers of Test Pit 3(HP3)
I	C D E
II	F G
III	H H212 I J
IV	K L M
V	N O
VI	P Q R S T
BASE OF MOUND	

★ Pottery-associated layer  
+ Sterile cobblestone layer

All layers of Test Pit 2 (HP 2) equate with Combination VI.

FIG. 187. Stratigraphic layers and their "combinations."

Prieta. Bird felt that all of Test Pit 2, and the lowest layers of Test Pit 3, were of the same age since they rested on the rock conglomerate beneath the base of the mound. No radiocarbon dates come from these layers of Test Pit 3, but a hearth at the bottom of Test Pit 2 produced a corrected date (#598) of  $2977 \pm 258$  B.C. (table 2). It is possible that Test Pit 2 might better equate with layers O to K (combinations V and IV) of Test Pit 3

since a corrected carbon date (#316) of  $3080 \pm 290$  B.C. was produced from layer M of Test Pit 3. Moreover, some artifact configurations, such as the presence of twining, in Test Pit 2 suggest that Test Pit 2 might be better correlated with these higher layers, where twining is first found in Test Pit 3. Other similarities between Test Pit 2 and layer combinations IV and V in Test Pit 3 are a high percentage of netting, the nearly exclusive use of cotton, low weft counts in twining, the presence of side selvage knot Type B, and the prevalence of split-pair and transposed-warp movements to the near exclusion of plain twining.

It may be forever impossible to know exactly where Test Pit 2 is related to the lower layers of Test Pit 3. Whatever the case, this discussion will equate Test Pit 2 with the lowest layers of Test Pit 3, as did Bird, who gave considerable weight to their similar stratigraphic positions.

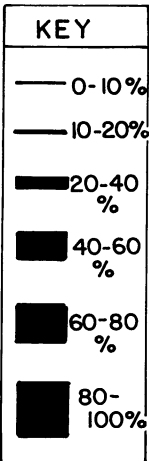
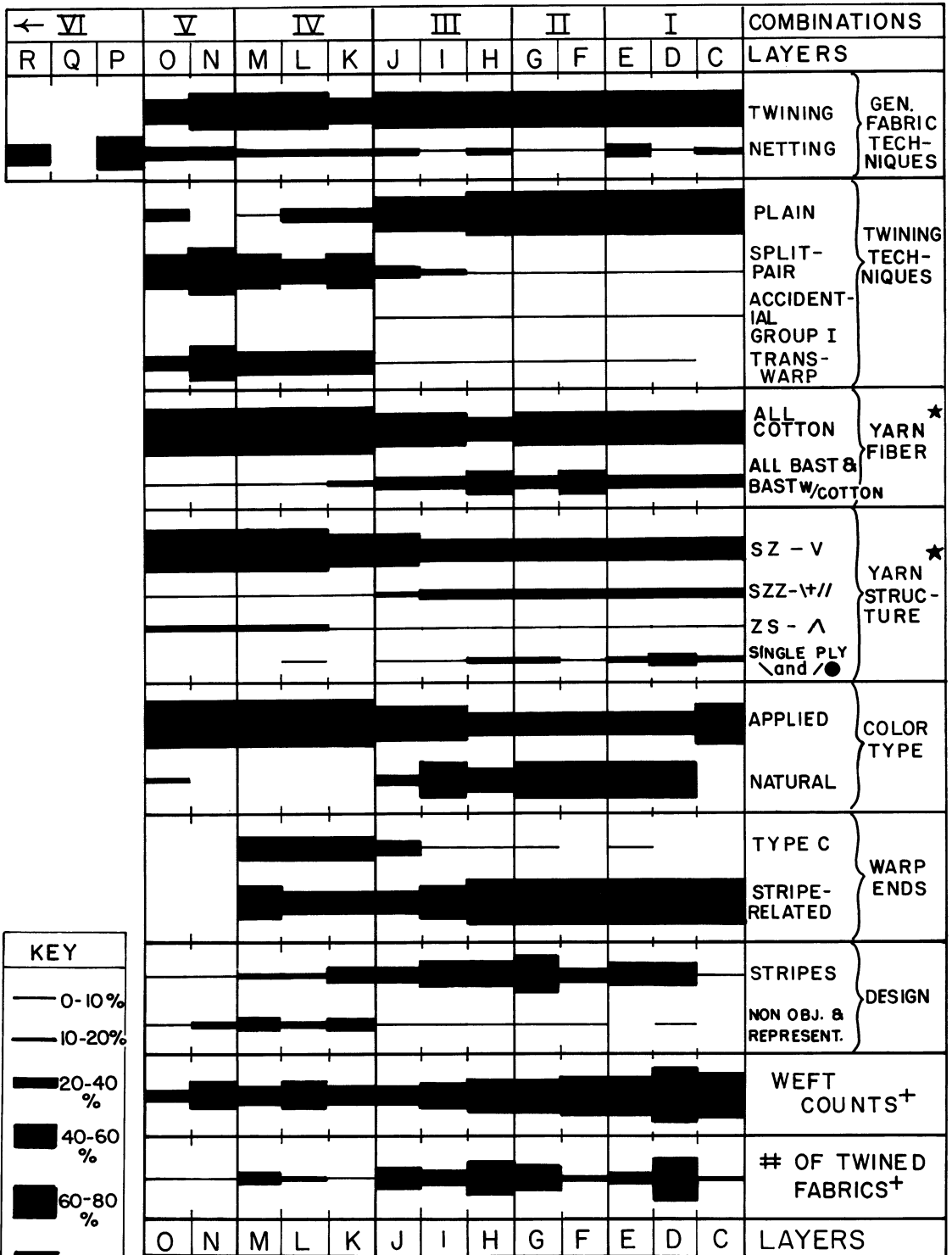
There is little evidence for architecture in combination VI. Hearths are present in both test pits, but there is no evidence for post-holes or cane structure. In layer Q, Bird noted some mortar that may have indicated cobble construction. Shallow burials with flexed bodies are in both excavations. Those in Test Pit 2 are associated with some textile and mat fragments. Similar burials are found in several layers of Test Pit 3.

In both test pits, the preservations of organic materials at these levels is not good. This is particularly noticeable in Test Pit 3 below layer R. Nevertheless, much of the subsistence botanical remains (beans, cucurbits, canna, cattail, peppers) are already present (table 21).

Several artifacts are unique to these lowest layers. Each test pit produced a stone sphere at the bottom layer. A thorn fishhook and a shell fishhook are found in Test Pit 3.

Perforated (repaired) gourd fragments begin to appear in layer Q. The complete lithic assemblage found in upper layers is present in combination VI (tables 4 and 5). The considerable number of flakes, flake tools, cores,

FIG. 188. Drawing depicting proportional increases and decreases of traits in the Huaca Prieta twined fabrics. Only aspects of the textiles which exhibit notable changes through time are selected for presentation here.



★ Data for warps, wefts produce same general trends  
 ● Broad line —; 5 to 10% narrow line —; 1 to 4%  
 + Not expressed as percentages

and core tools is not exceeded in upper combinations of layers, even though the volume of debris is greater in those layers due to the outward pitching of the walls of Test Pit 3. Fish, birds, a few mammal bone remains, and small mollusks are found as well.

In these layers of Test Pit 3 looped, netted, and woven fabrics (no twining) are present in very limited quantities (11 specimens) while in Test Pit 2, 45 textile specimens include 17 examples of twining (Code II; table 10). In both test pits, netting comprises more than half the specimens. In all upper combinations of layers, twining predominates. Condor-type warp movement (Code XII, Group V) is found in Test Pit 2, but without completely recoverable designs (table 20).

Cotton is especially important in textiles from the lower layers (Code XVII; tables 8 and 9). Fabrics in combination VI are made entirely of cotton. Whatever bast is found occurs only in cordage. The use of cotton fiber in the wefts of baskets and mats occurs only in the lower layers. Of 52 baskets, only two have cotton wefts. One is from layer Q; the other from layer O. Of 72 mats found in the mound, only three have cotton wefts. One is from side trench OQ, the others from layer D of combination I.

#### INTERPRETATION

In this earliest phase at Huaca Prieta there is no proof of all-year sedentism, but such may be suggested by several cultigens. It is questionable whether permanent dwellings were constructed, since the hearths are not associated with firm evidence for domestic architecture. The lack of hearths above layer R in Test Pit 3 suggests that it was the uppermost layer upon which people lived. The layers above appear to be made up entirely of debris from habitation farther south on the mound. Nets, fishhooks, and fish bones are evidence for the importance of fishing. Nets are the most common textile.

#### COMBINATION V—Layers O and N

In layer O there is a great increase in the number of organic remains, both vegetable materials and textile specimens. N is the "top" of the combination because its upper surface marks the construction of the first retaining wall on the south side of Test Pit 3. Also, at

the N-M division there are a number of breaks in the artifact distributions.

Combination V has no evidence for any sort of architecture or hearths, although Bird did note an adobelike dirt. There are no carbon dates from these layers. Burial 903 in layer O is the most elaborate preceramic grave at Huaca Prieta, and there is some suggestion that one of the gravegoods, a pyroengraved gourd, is stylistically related to early ceramic art in Ecuador (see commentary on gourds with burial 99.1/903, Chapter 6). All the basic subsistence botanical remains found in upper combinations are present in layers O and N. Fish, bird, and small mollusk remains are present in some quantity.

A thorn fishhook is found in layer O. No other fishhooks are found in upper layers. Layer O produced the only basket with a representational design. This basket has condors created with blue cotton wefts, the uppermost appearance of cotton wefts in baskets.

The number of textiles found in the debris increases significantly in combination V. Here we also find the first twining in Test Pit 3, and the first designs in textiles. The earliest patterned textile (from layer O) bears stripes, condor and snake motifs, and geometrical designs, created through complex warp manipulations and color variations. Primary and terminal selvage knots (Code XXIII; table 13) make their first significant appearance (there is one possibly earlier instance from Test Pit 2), due to the fact that there are few textiles below layer O. Split-pair twining and transposed-warp manipulation predominate in Combination V to the near exclusion of plain twining (Code XI; table 11).

S-spun Z-doubled cotton is the almost exclusive yarn structure, although a few cases of Z-spun S-doubled yarns occur (Code XVII; tables 8 and 9). Bast as a component of yarn fiber makes its first, limited appearance. In this combination, bast appears only in an unusual yarn construction in which the cotton is spun S, the bast spun Z, and the two doubled Z. This construction is used increasingly in upper layers, and remains the dominant way of plying a cotton yarn with a bast yarn.

#### INTERPRETATION

The layers of combination V have the first evidence of geometric and representational

art in textiles. These artistic forms also appear for the first time on gourds and baskets. The twined textile motifs are created through the complex manipulation of blue-dyed, red-pigmented, or natural tan or white warps. It is noteworthy that a most original and skillful textile (41.2/2551) is found with burial 903 in layer O. It has no simpler predecessors for its motifs, or complexity, in lower layers. It is uncertain to what extent new textile traits in combination V are due to lesser preservation of organic remains in layers below it.

The subsistence evidence in combination V is much the same as in the lower combination.

#### COMBINATION IV—Layers M, L, and K

This combination of layers is the debris behind retaining wall 1. The N-M division marks the time when that retaining wall was built. Two radiocarbon dates, one from layer M and one from layer K, give corrected ages of  $3080 \pm 290$  and  $2654 \pm 317$  B.C., respectively. There is no evidence of burials, or of architecture other than the retaining wall. The artifacts reveal this to be a time of some innovation.

Wood artifacts appear for the first time in layer L. The only two remains of sandals, possibly brought from elsewhere, are found in layers M and L. The number of flakes and cores decreases. Layer M is particularly rich in organic debris, but the number of bird bones drops considerably in layer K, and the fish bone remains drop in layer M. Large mollusks start appearing in K. One might speculate that there is a relationship between the drop in lithic implements and the drop in bone remains. All varieties of botanical specimens continue with no noteworthy changes.

Layer M produced 177 textile specimens, a number far exceeding that of any lower layers. Split-pair twined fabrics (Code XVII) begin a lengthy decrease in proportion to fabrics of other twining structures. Correspondingly, there is a large increase in the presence of plain-twined textiles, an increase which will continue through the next combination. Many technical changes appear in the fabrics. Some of these traits may be appearing here for the first time due to the large number of specimens in layer M. Related to this increase is the appearance of warp ribbing (Code XI,

Type 5), a trait achievable only in plain twining. No other combination produces such a large sample of transposed-warp fabrics. Condor-type (Group V) is the most common warp movement. Woodland-type (Group IV) makes its first appearance in layer L.

In combination IV there is a proportional increase in the presence of bast in the yarns (primarily warps) of twined and woven fabrics. This explains a simultaneous (although small) increase in S-spun Z-spun Z-doubled yarn, although in this combination we also find the first occurrence of S-spun Z-doubled yarn in cotton-bast mixes. S-spun Z-doubled cotton yarn continues as the most popular yarn in all fabrics, although a variety of other yarn structures begin to join it in warps (not wefts). Never very popular, Z-spun S-doubled yarns become an increasingly small percentage of the total yarn types in both twining and weaving. In the wefts of woven fabrics and in repair yarns (Code XVIII) this yarn construction never appears above layer M.

Applied color (dye or pigment) is used almost exclusively for the coloring of fabrics (Code XIX) in combinations VI, V, and IV. In layer K, however, fabrics bearing applied color begin to decrease in proportion to the total number of fabrics. This decrease continues through layer F.

In combination IV it becomes apparent that the average weft count in twined fabrics is increasing (table 12). This trend continues to the uppermost layers. It is uncertain why these weft counts increase over time at Huaca Prieta. One possibility is that the increase is related to the rise in popularity of plain twining.

In twining, the layers of combination IV provide evidence for the beginning of an increase in varieties of selvage knots (Code XXIII, primarily Types E and K appear). Although several warp end types (Code XXV, Types C, G, H, and L, table 17) first turn up here, this increase in variety of warping systems is probably due to the fact that M is the first layer in which a considerable sample of warp ends were found. Warp end finish (Code XXVI; table 14) Types R and S disappear in M, apparently replaced by Types O and P which first show up in layer L. Type M also first appears in layer L. Types H, I, and N first appear in Layer M. Rolled and bunched edge repairs (Code XXVIII) appear in layer M, and the use of joins (seams), by means of

which two or more pieces are sewn together, appears first in K. In twined warp-end finishes, wefts are handled in pairs or a combination of singles and pairs for the first time (Code XXVI; table 14).

Finally, combination IV produces more representational and complex geometric (nonobjective) design in textiles than any other combination above or below it (Code XXXII; table 19). However warp stripes in twining, which eventually replace these more complex designs, begin increasing as well. Warp stripes created by a combination of techniques accompanied by color contrast (Code XXXII, Type K), and those detected through decomposition (Type B), also begin in these layers (Code XXXII; table 18).

#### INTERPRETATION

The layers of combination IV provide evidence for a florescence in textile technology and artistry that was begun in combination V and is rarely equaled in upper layers. Elaborate warp movements in textiles produce a considerable number of complex geometric and representational designs. Certain forms of warp ends, warp end-finishes, selvage knots, and repair techniques occur for the first time.

A drop in the number of lithic artifacts, fish bones, and bird bones suggests a change in the subsistence base, and possibly in the environment. Bird believed that a limited coastal uplift was occurring at the time of the Huaca Prieta preceramic occupation, and he speculated that it may have changed the nature of the shore, its coastal shelf, and its fauna.

#### COMBINATION III—Layers J, I, and H

This combination of layers is the debris of the first three layers (of five) which built up after the construction of retaining wall 2. The K-J division is well defined by a salt crust, digging tool marks, and evidence in the stratigraphy that nearly all of one layer (represented by the small segment K.1) may have been removed, possibly to create mortar for the retaining wall. Layer J produces a corrected radiocarbon date (#318B) of 2010 ± 614 B.C., a date considerably younger than the 2654 ± 317 B.C. date of layer K imme-

diately below it. Although these two dates must be interpreted with considerable liberality, the possible time span between them hints at a lost layer. Combination III has no architectural evidence other than the retaining wall.

The decreased presence of fish and birds continues in this combination of layers. The botanical assemblage observed in previous combinations continues, but in less quantity.

As one moves upward in Test Pit 3, the average volume of material excavated from each layer generally increases due to the outward pitching of the northern and southern walls of the pit. Nevertheless, lithic implements are less abundant than in lower layers. The increased volume of debris per layer does not explain the great increase in textiles in combination III (810 specimens, compared with 292 in the previous combination).

Combination III has a number of unique artifacts. Two polished stone artifacts (a drilled, polished chip and a polished bowl fragment) were found in layers H and J, respectively. Both of these are probably importations. No decorated gourd fragments are found above layer H. Only two split-pair twined mats are found at Huaca Prieta, one in layer H, the other in layer G (of combination II). Most mats are plain-twined, with weft spaces at 11 cm intervals or less. However, in layer J and above, a number of mats have weft spaces above 11 cm.

Numerous changes are noted in the textiles. Not only does the number of specimens increase, but plain twining becomes the predominant twining technique. It is replacing a proportionately smaller number of split-pair and transposed-warp twined fabrics. Floated warps in twined fabrics, a technique found only in association with plain twining, first appear in layer J, although they are not found again until layer G. Occasional use of multiple warps in twining occurs for the first time in layer J. The occasional accidental use of warp crossing (Code XII, Group I) occurs for the first time in layer J and is present in all upper layers. Warp movement Group IV (woodland) continues in this combination of layers as about one-fifth of the twined transposed-warp fabrics, whereas warp movement V (condor) reduces to a third or less of these. It may be notable that woodland type warp

movement is usually combined with plain twining, whereas condor-type is most often associated with split-pair twining. Warp movement Groups III, VI, and VII do not appear above this combination.

The proportional increase in the use of bast fiber in warps of twined fabrics stabilizes in this combination. Bast continues to occur mainly plied with cotton in the traditional S-spun Z-spun Z-doubled yarn structure. S-spun Z-doubled repair yarns with a cotton-bast mix are found only in the layers of combination III (Code XVIII). All-cotton warps in split-pair twining do not appear above layer I. Z-spun S-doubled yarns continue their decrease in proportion to other yarn structures, and drop out completely in twined wefts. In general, the variety of yarn structures increases in combination III. The new types of yarn structure used in combination III are mostly what Bird referred to as "freak" yarns. For example, there are two fabrics in which a pure cotton warp is structured in the manner of two-ply yarns containing bast. Here we also find eight examples of warps with cotton spun S and bast spun Z, doubled in the S direction. S-spun Z-doubled cotton yarn continues as the basic or primary yarn type. Single-ply yarns begin an increase in combination III.

In layer J, fabrics bearing natural color (coloration through the use of different natural colors of cotton) begin to increase substantially as a percentage of all fabrics. Primary and terminal selvage knots increase in variety, and knots K (primary) and N (terminal) continue to be the most popular. Primary knot K (cut end) appears to be replacing the simpler Type B (loop around the side). In twined warp end finishes (Code XXVI; table 14), Type L appears for the first time in layer I and increases relative to the other types in upper layers. Type J, on the other hand, drops in number in combination III. Type H is dominant.

The warp ends in twined fabrics undergo several changes which relate to striping. The warp end types whose construction is best adapted to the creation of warp stripes are G, H, I, J, L, and Y. Types I and J first appear in combination III, while the far more common Types G and H increase in use as a percentage of warp end types. Type G is also

well adapted to condor-type warp movement; Type I to woodland-type movement. The simple Type C, which is not suitable for the creation of stripes, decreases in relative use.

It should not be surprising, then, that warp stripes as a percentage of all designs increase in layer J and continue at a high level in upper layers. This increase, in turn, corresponds to a major drop in the number of complex geometric (nonobjective) and representational designs in the same layers. In layer J, variations in material, color, or yarn grouping probably not intended to create a pattern increase in proportion to all designs. The growing use of warp stripes is associated with the heavy occurrence of plain twining in these same layers.

#### INTERPRETATION

The layers of combination III and the evidence for a possible lost layer at the K-J division, provide evidence for changes in the material culture, particularly in the textiles. This combination of layers began to build up shortly before 2000 B.C.

The number of fabric specimens increases, and perhaps a higher rate of production accounts for traits which might be interpreted as less care for detail and lack of precision. For example, the use of occasional (accidental) multiple warps becomes more frequent. In layer J there is an increase of variations in material, color, or yarn groups, which are probably not intended to create a pattern. Accidental warp crossings start in layer J and continue. In general, complex warp movements decline in use or drop out, and this relates to the decrease in nonobjective and representational designs which are replaced by the simpler stripes made in a variety of ways, usually in plain twining.

It is intriguing to consider that different loom systems may be related to the trends mentioned above. Bird wrote (Chapter 9) that the Huaca Prieta textiles were made on looms with sustained warps (tension looms). However, the twining specialist Nora Rogers has suggested that the textiles with complex designs are made more easily with a system in which cut warps hang from a single loom bar. Such looms make it easier to correct mis-

placed warps and create complex warp structures (designs). On the other hand, tension looms allow one to work faster, and produce more textiles. Thus the trends to less precision, greater volume, and fewer complex designs may hint at a greater use of tension looms beginning in combination III. The presence of cut warp ends on some Huaca Prieta twined fabrics is suggestive of a loom system with unsustained, hanging warps, but certain proof is lacking.

The trend to more mistakes, less detail, and less complex patterns may be seen in other artifacts from the same layers. Mats made with less sturdy construction due to widely spaced wefts appear above layer H. Decorated gourds cease to appear above layer H. Representational designs almost disappear above layer J. It may be noteworthy that the first of only two certain representations of the human form in a textile (41.2/1286—a piece of great technical sophistication) appears in layer H2I2 of combination III. However, some highly stylized faces, possibly human, are present on one specimen (41.2/1565) from layer L.

#### COMBINATION II—Layers G and F

This combination is the top two layers of debris built up while retaining wall 2 was exposed. Retaining wall 3 appears to have been constructed during the formation of layer F. No architectural remains other than wall 2 are associated with these layers. Burials 901 and 897 were placed in layer F at about the time retaining wall 3 was built. The same subsistence evidence found in combination III is present in combination II.

Only a limited number of new artifacts and artifact traits appear for the first time in this combination. Mussel shells with attached fibers and/or rushes exist only in this combination. Baskets with coil bottoms appear for the first time in layer G. Baskets with many woven weft rows do not appear above layer G.

In the textiles, the high number of specimens found in combination III continues. Warp floats in plain twining reappear in layer G. Transposed-warp movement Groups II and IV (woodland) have their last occurrence,

leaving Group V (condor) as the only remaining complex warp movement. The most important development in weaving (Code XIV) is that paired warps begin in layer G. Fabrics bearing natural color peak in use, at about 13 percent of all fabrics, and begin a decrease which will continue through layer C, where they disappear entirely. Applied colors, on the other hand, end a long decrease in popularity and stabilize. In general, the use of color drops markedly in layer F, and remains low through combination I. Twining warp end-finish Types L and M are the most common.

In designs in twining, stripes continue as the primary design technique, but compact weft stripes drop out in layer G, as does the use of combined techniques to create stripes through a color change (Code XXXII, K). No representational designs in twining are found above layer F.

#### INTERPRETATION

The layers of combination II represent trends well-established in the lower combination III. The trend in textiles is away from elaborate designs requiring fine detail and precision work. Even striping, which replaces complex designs, is achieved in fewer ways. The replacement of fish and bone remains with large mollusks, a change observed in combination III, may be related to the appearance of shell artifacts in some quantity for the first time in the layers of combination II and above.

#### COMBINATION I—Layers E, D, and C

These layers represent the final preceramic occupation at Huaca Prieta. They are composed of the debris built up after the construction of retaining wall 3. Bird noted that layer C was not only the top layer of the preceramic occupation of the mound, but that it may have built up “in large part after its abandonment.” The yield of cultural materials from layer C is uncharacteristic of the lower three combinations of layers. Textiles and other organic specimens are in low quantities, whereas lithic artifacts, mainly flakes, are in considerable number.

One radiocarbon date from layer D (#321)

has a corrected age of  $1249 \pm 341$  B.C., an uncharacteristically late time for the Peruvian north coast terminal preceramic. It is contradicted by a date (#322) from Test Pit 5 of  $1696 \pm 254$  B.C. That date is associated with Initial Pottery Period remains.

The layers of combination I are associated with the preceramic houses excavated on top of the mound. Numerous burials are in the houses, and burial 896 is in layer C.

The evidence for subsistence in combination I includes the presence of a new inferior kind of pepper. This is the first introduction of new botanica in the Huaca Prieta preceramic sequence. Fish and bird bones continue in low numbers.

Of 76 mats found at Huaca Prieta only seven are woven and only three have cotton wefts. Five of the seven woven specimens, two with cotton wefts, are found in combination I. In the lithic assemblage, there is a considerable rise (in layers C and D) in the number of flakes and flake tools, but not in cores or core tools. Wrapped stones do not appear above layer E.

In the textiles, split-pair twining continues as a small percentage of twined fabrics. On the other hand, very few transposed-warp fabrics are present, and most of those have accidental warp crossings. Weaving with paired warps and wefts appears for the first time in layer C. Probably because of the small sample of specimens in layer C, many textile traits appear for the last time in layer D. Among these are: warp movement Group V (condor), single yarns in twining end finishes, most warp end and warp end finish types, fabrics bearing natural color or dyes, accidental weft crossings in terminal construction, S-spun Z-spun Z-doubled repair yarns, the use of seams or joins in twining, and paired warps in weaving.

In combination I some traits increase (S-spun Z-doubled yarn in weaving wefts, single-ply warps in twining, and rolling and bunching as a percentage of edge repairs), whereas others such as weft counts stabilize after a previous increase. The percentage of fabrics with stripes declines.

The specimens of layer C, although not a large sample, exhibit some characteristics which reverse trends established in the upper

layers: (1) The yarns have less bast and less S-spun Z-spun Z-doubled structure (a 10 percent drop over previous layers); (2) Split-pair twining increases slightly (from 2 to 8 percent of twined fabrics); (3) No fabrics with natural color are found; (4) The proportion of fabrics with stripes as designs drops.

#### INTERPRETATION

The presence of a large number of flakes with few cores may indicate a change in the lithic technology, or that cores were simply not deposited in the debris. Designs in fabrics continue to simplify, with fewer striped pieces and no representational designs. The introduction of a new botanical species may hint at contact with other areas. In general, combination I has evidence for a continuation of trends developing earlier, many around the division between layers K and J.

The reduced number of fabrics found in layer C may be due to a decreased rate of deposition, and probably production, of fabrics, rather than factors of preservation. This observation is suggested by the fact that textiles from layer C exhibit some trends typical of those from below layer J, where the yield of fabrics was also low. These hints of a return to earlier characteristics may indicate that changes in twining structures, designs, yarn fiber, yarn construction, fabric coloring and even lithic technology are linked, and perhaps some of the factors which caused certain trends to develop around layer J were diminished during the formation of layer C. Whether these changes are in some way related to the abandonment of the mound by its preceramic inhabitants is unclear.

#### CHRONOLOGICAL SYNTHESIS

Bird noted (letter, 1976) that at the Huaca Prieta "evidence of culture change is very limited, and [the inhabitants] were most conservative in their customs." This conservatism is reflected throughout the collection of excavated materials. Lithic implements and botanical material vary little in makeup from the lower to the upper layers, although their amounts vary. Similarly, burial customs appear to have varied little throughout the occupation, and very few changes are noted in

the basketry and matting. The proportions of the textiles created with the major techniques are remarkably stable throughout the occupation, and the kinds of gourd artifacts vary little.

Although continuity is the most prominent feature of the Huaca Prieta, the excavations did reveal evidence for a number of apparently significant and interrelated changes in material culture at the mound. This summary will begin with comments on the discernible changes in the subsistence base and artifacts, as well as the possible relationship of these changes to causal factors. The summary will conclude with an attempt to demonstrate how a number of innovations in the textiles might be related to a few basic changes and a considerable number of responses to those changes.

Earlier, this chapter noted that the subsistence base of the population changed through time. Fish and bird bones drop in layers M and K, respectively. Lithic implements become less common in the upper layers, and most botanical materials are found in reduced quantity. On the other hand, in those same upper layers, large mollusks are more prevalent, and textiles are far more common than in lower layers.

The cause of all these changes is not clear, and their relationship to any causal factors must remain speculative. Environmental change is one possible influence: Bird presented evidence for a limited coastal uplift which might have altered the shore's marine resources as well as the productive potential of the nearby agricultural land. Another factor to be considered is the effect of a possibly increasing population. Bird did not think that there was good evidence for population increase at the Huaca Prieta, although if it occurred, it could have affected dependence on agricultural and maritime resources. The decline in lithic implements and botanical materials in the upper layers of Test Pit 3 does not suggest a growing population. The decrease in fish and bird bones may indicate that the population in the upper layers depended less on animals, although there is no corresponding increase in botanical subsistence material, as would be expected if dependence on agriculture had increased. Outside contact is another possible factor in the

changes at the Huaca Prieta. Evidence for such influences is minimal, however. Less than half a dozen artifacts out of more than 30,000 may have been brought in from the outside. Bird wrote (letter, 1976) "my impression is that the Huaca Prieta community, and others existing along the coast at the time, led rather isolated lives with minimal contacts." Finally, it is uncertain to what degree the changes in subsistence remains and other artifacts are the result of changing patterns of deposition by the community that lived on the mound. The radiocarbon dates suggest that the rate of deposition of the layers may have been quite regular, but it is impossible to know how representative the layers are of the debris deposited by the entire community.

A most striking development among the textiles, one which might be tied for several other trends, is the large increase in the number of fabrics found in the upper layers of HP 3. Since the sample came from a limited portion of the midden, this increase does not in itself constitute clear evidence for a larger population at the site. It is possible that it represents instead a greater use of textiles per capita, and may reflect the growing social importance of cloth.

A major change in the makeup of the HP 3 textiles which might be the result of increased textile production is the increase in plain twining relative to other twining techniques from layers L to G, and the corresponding drop in the appearance of split-pair and transposed-warp movements during the same span of layers. This apparent replacement process roughly parallels the period of greatest growth in textile deposition, and accelerates in layer J, where there is a large jump in the number of textiles. It is possible that the textile-makers turned from the complex structural techniques to the simpler plain twining in order to facilitate increased fabric production.

The shift from complex to simpler techniques in twining produced a number of other changes in the textiles of Huaca Prieta. Fabrics whose construction involves condor-type warp movement, a technique which generally appears in conjunction with split-pair twining, drop sharply as a proportion of twined fabrics in layer J. Woodland-type warp

movement, a technique more often associated with plain twining, first turns up in significant numbers in layer L, after plain twining has begun to increase; it disappears in layer F, as transposed warp movements complete their decline. The appearance, in layers J and L, respectively, of twining warp floats and ribbing, which are found only in plain twined fabrics, is also part of this complex of changes.

Designs, too, are affected by this change in types of twining. Geometrical (nonobjective) and representational designs decrease greatly in layer J, and continue decreasing until they drop out entirely in combination I. Warp stripes, on the other hand, increase consistently in relation to other designs in layers M through I, with an especially large jump in layer J. Complex designs in twining are created only through warp transpositions, whereas warp stripes appear only in plain-twined fabrics. The change in designs accounts, in turn, for the appearance and increasing popularity of warp end types G, H, I, J, and Y after layer M, since these yield the arrangement of warps which are most suitable for the creation of stripes.

Another major change in the makeup of the textiles, which can be traced provisionally to the increase in textile production, is the rise (in combinations IV and III) of the use of yarns made of bast-cotton mixes, particularly in twining warps. Accompanying this change is a drop in the proportion of pieces with all-cotton warps. Of the two materials, cotton has many advantages for the manufacture of most textiles, being more long-lasting yet softer, more easily spun, and having a texture more able to grip adjacent yarns. Given the probable absence of irrigation at this early date, it is likely that cultivation of cotton was possible only in the restricted area watered by fresh-water ground seepage, an area of limited agricultural potential. One explanation of the co-occurrence of an increased use of bast and increased textile production could be that as more textiles were

made, the demand for yarn material exceeded the cotton-production capacity of the arable land, and it became necessary to add bast to yarns.

The change in yarn fiber explains a change in the relative popularity of S-spun Z-doubled yarn construction (which decreases somewhat as a proportion of all yarn structures in combinations IV and III) versus S-spun Z-spun Z-doubled construction (which increases substantially in relation to other yarn structures in layers L through F). The simpler, first type is the main construction used in all-cotton yarns, while the second and more complex one is used in the construction of most cotton-bast mixes.

Beginning with combination III there is evidence for less precision and less care for detail in fabrics. In general less time was apparently spent on a given fabric. Evidence for this includes the following:

1. the appearance of accidental warp crossings and occasional multiple warps;
2. the increased occurrence of variations in material, color, or yarn grouping not apparently intended to create a pattern, in layer J;
3. the appearance of accidental weft crossings in terminal construction (Type K);
4. the replacement of complex warp movements by simple ones, and the replacement of complex designs by stripes.

All of these, which parallel the growth in the number of textiles, or occur around the time of their greatest growth, could be explained as resulting from increased textile production, and possibly the greater use of looms with sustained warps (tension looms).

In layer C, which contains the latest remains from the preceramic occupation at Huaca Prieta, there are hints of a return to some characteristics found in textiles of the lowest layers. The meaning of these developments in layer C is uncertain, but may suggest that circumstances just prior to it were beginning to diminish or change.

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# APPENDIX 1. THE TEXTILE CODE FOR PERUVIAN FABRICS

By Junius B. Bird, assisted by Milica Dimitrijevic Skinner

*Background comment by Milica Dimitrijevic Skinner, 1984:*

The idea of using a computer to analyze Huaca Prieta textiles stemmed from a visit of Mr. Owen Henderson, formally with McLaughlin Research Corp., New York City, who offered his expertise to transfer all catalogs of the Department of Anthropology of the AMNH to computer cards. He was referred to Junius Bird. The Museum was not ready for an endeavor of such magnitude, but Bird immediately thought that we could use Mr. Henderson's help for the textile analyses. Thus in 1960 the work creating the Textile Code began. The National Science Foundation made a grant of \$14,000 to the project, and by 1963 the code and computer processing had been completed.

With the recent advances in computer science, the design of the Textile Code for computer cards

is now obsolete. However, its many categories and their subdivisions remain a valid analytical tool. The usefulness of the Code now rests in the aid it may provide for future analyses of prehistoric Andean textiles. It was created to handle all such fabrics. It systematizes and describes a wide range of the elements which can be studied in any collection of ancient fabrics.

In retrospect, perhaps the greatest advantage of arranging the textile data for computer processing was the systematization it imposed. The Textile Code is a testament to Bird's broad interest in Andean textiles, and to his ingenuity, since this code resulted in one of the first applications of computers to South American archaeological materials. The following Introduction and Textile Code were completed in the late 1960s.

## INTRODUCTION

The following coding system was developed for data processing by computer. It was created to simplify the study of the relationship of a complex mass of information derived from Peruvian textiles in an archaeological context. While the system was developed some years ago, the complete set of codes has not been published. Publication is prompted now by a growing interest in Peruvian fabrics among archaeologists and others. The extent of the problems in recording and analyzing prompted the creation of a basic system that will allow investigators to exchange similar information. It is especially for these persons that the Textile Code is prepared. Those not concerned with chronological changes and development may find the coded classification of textile techniques useful. This is basically an application of Irene Emery's *The Primary Structures of Fabrics* (1966), to be referred to later, and could serve as a simple guide to the understanding of fabric techniques.

In 1968 the Metropolitan Museum of Art, supported by a grant from the IBM Corporation, sponsored a conference on computers and their potential applications in museums. The papers presented were published later

that year, among them "The Use of Computers in the Analysis of Textile Data: Specifically, Archaeological Fabrics from Peru," by Junius B. Bird.

The introductory comments and background record given at that time are still applicable, with minor modification, and can be included here to advantage. They give some idea of the scope of the project and the reasons why we became involved.

When studied carefully and fully, textiles are probably the most complex artifacts of daily life that archaeologists may have to deal with. Unfortunately, such perishable material survives in quantity for any length of time only under the most favorable conditions, such as prevail in certain desert areas. Elsewhere, under differing conditions, textiles survive only sporadically, preserved by unusual factors or conditions. As rarities, and in limited numbers, they pose no problems in analysis and recording. Only when they are encountered in quantity does the compilation and handling of the information they can provide become a real problem.

Textiles are complex because they combine a multitude of variable details and features with varied structural and decorative techniques to achieve a wide range of products.

In addition to technical data, we must consider such things as design, pattern-repeat systems, function, and even repair techniques. The extent and scope of the details will become apparent as the various codes are examined.

The need for a coding system arose when we were faced with the problem of recording all observable data on a series of 9800 sections and incomplete pieces of fabrics, and a quantity of related scraps, yarns, and cords. These had been produced during a period roughly from 2500 to 500 B.C., at and near the Huaca Prieta. We knew that an analysis of the material on a chronological basis would reveal trends, changes, and stable factors in the fabric production. As the specimens had been found in association with other cultural material, we hoped to develop a clearer picture of the human record in that area and time.

It was a task of distinct steps that need only be mentioned briefly here. First, there was the cleaning and preparation for study, a full-time job for one skilled assistant for one year. Then came the recording of data involving microscopic examination, yarn by yarn, piece by piece, feature by feature, followed by cataloging as the material was classified.

At this point all data, except for large technical drawings, were compiled in a numerical card file divided into chronological units. A decision then had to be made on how we could best score, interpret, summarize, and present the information. The problem seemed a logical one for computer processing, provided we could devise an adequate coding system for use with the standard IBM 80-column card of the time.

Before describing how this was accomplished, we present some background information that will help in understanding the scope of the problem. When the Spaniards first entered Peru in the sixteenth century, they found a politically united nation, extending far beyond the present limits of Peru, with a population of at least 6 million individuals. All utilized textiles in some form or other and all were clothed. To be otherwise was barbarous. In more ancient times, an indignity was inflicted on male prisoners of war by stripping them of their clothes.

The average wardrobe, at least in the six-

teenth century, consisted of from two to five articles, made either of cotton, available in varying shades of natural brown and gray as well as white, or wool from the domesticated alpaca and llama and, to a much lesser degree, from the wild vicuña. Bast and hard fibers, obtained from wild plant sources, were of minor importance seldom used in clothing, serving mainly for such items as bags, sandals, and cordage. In quality of workmanship, the fabrics in general exceeded the products of Spanish weavers. In variety of techniques employed, the Peruvians certainly surpassed contemporary Europeans.

Production was largely a family craft. All girls, and some boys, learned to spin in childhood, and probably all women did some weaving. A major part of their time, in fact, was devoted to the production of yarn and fabrics. Great quantities of cloth, largely in the form of garments, were presented as offerings at religious centers and were collected as tribute for the state. The Spaniards encountered vast quantities assembled in store-rooms, as much a measure of national wealth as the gold in our Fort Knox. Such hoards were drawn on to clothe the armies, more was distributed as gifts, and some was burned or sacrificed at religious rituals. Especially fine garments were created for the rulers and officials, and certain women were employed solely for this work.

The great importance and prestige attached to textiles at the period of the Spanish conquest was an outgrowth of an ancient tradition. We do not know when fabric production started, but it was well-established by 2500 B.C.; so well, in fact, that the inception must have been some centuries or millennia earlier. By the beginning of the Christian era, some important individuals were buried with an astonishing assemblage of remarkable fabrics. In one instance, a total of over 300 square yards of cotton and wool cloth, including many separate products, was used for the clothing and wrappings of a single individual. Another gentleman of the same period had been packed away with 75 garments and other fabrics, the largest a single-loom product with four finished selvages, 87 ft 3 in. in length, 11 ft 3 in. in width. It is calculated that to make this piece, 107 miles of two-ply yarn had been used.



whether to devise a code just for the material at hand, or one that would have broader application and would be useful in the future. We knew that there were radical differences between the early fabrics and those available from later periods, and that to prepare a code to encompass all would be a much more complex undertaking. Although we were confident that it could be done, time, effort, money, and advice would be needed.

For advice, we had the help of the staff of the Service Bureau Corporation. A supporting grant (No. 16007) was received from the National Science Foundation.

One of the first points we had determined was that a single computer card could not carry all data for all types of textile specimens. Only if a fabric is made of a single, continuous cord or yarn (fishnets will serve as an example) can this be done. For woven or twined fabrics having warps and wefts working in opposition to each other—that is, two sets of elements—there can be more entities than the space on one card permits. For them, within our plan, two cards had to be used. Card 1 carried warp data and major information; Card 2, weft data and information supplementing Card 1 entries. (Today, with advanced computers, the data would be handled in a much more efficient manner—MDS.)

The divisions or groupings of card columns are indicated by the data-sheet headings (fig. 189). The number of cards used to record the information from each textile is entered in the first column.

The recorded information falls into two categories: first, the simple routine entry of catalog numbers, measurements, site designations, and excavation data; and second, the entry of coded information from the analysis of the specimens. The data sheet designed to carry all these entries measures 23 by 17 in. (fig. 189). Heavier lines are used to delineate each code column or group of numbers, and every fourth horizontal line was made heavier for visual guidance. At the right of the 80th column, under the heading Comments, is space for such information as the available diagrams, drawings, or photographs of the specimen, or other comments. These comments are for convenience only and nothing entered there is intended for computer use.

In all, there are 37 data-sheet headings subdividing the 80 columns. Of these, seven are for card and catalog-specimen numbers; 15 columns are utilized for counts and measurements. The balance, 58 columns, are divided among 30 information codes, some of which, for lack of space, are alphabetical rather than numerical.

#### EXPLANATIONS OF THE COLUMN AND CODE HEADINGS

##### *Column*

- 1 *For Machine.* Used solely for sorting Card No. 1, with warp data, from Card No. 2, with weft data. Other numbers here could be assigned to additional cards for any one specimen if needed or for some other basic breakdown if desired (see col. 22).
- 2 *Catalogue.* A code (I) indicating the catalog in which specimens are recorded. As an example, at the American Museum of Natural History, South American archaeological material, including textiles, is entered in several volumes.
- 3-7 *Specimen Number.* The catalog number. While museum cataloging systems vary considerably, most could be adapted to the space allocated.
- 8-9 *Technique.* A code (II) for technique, important as a primary sorting key, covers the basic divisions of textile construction techniques used in Peru, and some of their combinations. The variations within the major divisions are dealt with in the separate codes Looping and Netting, Plaiting (including braiding), Twining, and Weaving. Theoretically, all these might have been combined into one large code under Technique. They are subdivided for simplicity in scoring and programming.
- 10-11 *Valley or Area.* A code (III) utilizing an existing numerical ordering

## Column

- of the Peruvian coastal region, prepared by Professor John Rowe.
- 12-14 *Site*. A code (IV), used for numbered sites within one valley or area. While certain geographical units may ultimately have more than 999 recorded sites, it will be many years before a four-digit record is needed.
- 15-18 *Chronology and Excavation Data*. A code (V) used for excavated subdivisions within sites noted with code IV. The material with which we were directly concerned was derived from 94 subdivisions. As these were not all successively chronological, but in some cases overlapped in time, a three-digit code was used. The fourth column in this area was reserved for future use, since some sites will have many more than 999 subdivisions.
- 19 *Cultural Period*. A code (VI). The terminology and ideas about Peruvian cultural periods is in a state of flux, as evidenced by alternative and conflicting proposals. Except for radiocarbon measurements, no exact dating of the prehistoric record by periods has been achieved; so for general purposes, a broad frame of reference will suffice. For this, Rowe's system, adapted from earlier work, is good. Eight code numbers cover the time spanning the preceramic to the historic periods, and the ninth is for items unidentified or uncertain as to period. If a specimen can be specifically placed at the time when one period ends and another begins, it is assigned to the later period and the fact noted by an entry in the Special Features code.
- 20-21 *Identification, Function*. A code (VII). If the original purpose of a fabric is obvious or can be deduced with certainty, that information is recorded here. Unfortunately,

## Column

- when dealing with fragments and incomplete material, it is often impossible to determine original function and there is no alternative but to score the function as uncertain.
- 22 *Number of Loom Products*. A count (VIII). Andean garments are frequently of more than one fabric or loom product. If a shirt is made of four separately woven products, each is treated as a separate specimen and, therefore, eight cards are needed to carry all data. In contrast, the count of several woven fragments that appear to have come from one loom product are entered under Number of Items, and have the usual two cards. From one set of figures we have the count of loom products providing the information; from the other, the number of pieces handled in the study.
- 23-24 *Number of Items*. A count. See above.
- 25-26 *Looping and Netting*. An illustrated code (IX), applied to single-element constructions. While there may be more variations within these techniques than can be handled with a two-digit code, in the Andean area this is not the case.
- 27 *Plaiting*. A code (X). This should include braiding. There are varied and complex forms of plaiting among Peruvian fabrics.
- 28-29 *Mesh-Size: Nets*. A measurement in millimeters. While two digits cover the net material dealt with in this study, larger mesh nets may be found; if so, reference to them could be made under the Special Features code.
- 30-31 *Twining*. A code (XI), used for an important category or division of fabric construction, particularly among the early or preceramic fabrics.

## Column

- 32-33 *Warp Movement.* An illustrated code (XII), which covers the warp transpositions encountered among the twined fabrics dealt with. The several basic movements are assigned the Roman numerals in figures 191 and 192. To permit inclusion of other possible variants, the numbers assigned are not in direct sequence but relate to the basic movements.
- 34 *Weft Course.* An illustrated alphabetical code (XIII), recording the manner in which weft yarns move from selvage to selvage in both woven and twined constructions. This does *not* record the movements about, over, or between the warps.
- 35-36 *Weaving.* A two-digit code (XIV), categorizing various woven fabrics, following the systematic structural breakdown presented by Irene Emery in *The Primary Structures of Fabrics*. In compiling this code, we made a survey of available collections of pre-Spanish woven fabrics and made provision for all variations encountered. Examples of each, so far as possible, were assembled at the American Museum of Natural History, labeled as to their classification within the Code, and kept together as a unit for reference by anyone concerned. Since then, we have seen very few deviants, but we have been pleased by the general adequacy and basic validity of the categories devised. Naturally, there are often pieces with more than one technique present within a single specimen, as when the two sets of warp in double cloth are combined in a twill construction. The handling of the record in such cases is explained in the instructions with the Code.
- 37 *Complete or Not.* A simple code

## Column

- (XV), necessitated by the fact that more often than not one has to deal with fragmentary material. It provides a simple means of drawing together specific data. For example, if one wants a compilation of loom width measurements for any one period, or by periods, one uses this code to select all specimens which are complete and those fragments retaining portions of both side selvages.
- 38-41 *Dimensions.* These lengths are in metric units, the warp dimensions on Card 1, the weft dimensions on Card 2. When dealing with fragmentary specimens we have omitted measurements as insignificant, except in those cases where the pieces are larger than average and provide minimal warp or weft figures.
- 42-43 *Fiber, Material.* A code (XVI), with 53 entries for the common fibers and their combinations as they occur in the yarns. As there are as yet no accurate data on the identification of the cameloid wools, which vary somewhat in each species depending on age, sex, and part of body, we have not listed them separately. If trustworthy, simple tests are ever devised for the identification of basts, hard fibers, hair, and wool, there is room in the Code for specific entries. The Code also covers the observed occurrences of combinations of fibers as they differ in 2-ply yarns and in pairs of yarns. The latter was necessary to record the varied distribution of fibers in the preceramic twined fabrics, where pairs of warp yarns, usually 2-ply, are used. A set of simple symbols (fig. 84) was used when the distribution of fibers in the fabrics was plotted. This was done methodically for each piece. In some, the distribution of the fiber combinations created warp

## Column

stripes as, for example, stripes of all-cotton pairs versus stripes where one-fourth of the fiber in each pair is a bast (number 25 in the code). A comparison of the fiber plots and the yarn counts involved sometimes enabled us to identify pieces which were originally in a single fabric. This section of the Code is, of course, applicable only to a certain class of fabrics and may be limited to a specific region.

- 44-49 *Yarn Structure.* A two-part code (XVII) repeating part of the fiber information as it relates to twist direction. It requires complementary entries in adjacent columns. The six columns allotted permit recording of three different yarn types for the warp on Card 1, three for the weft on Card 2. If more than three occur, reference to this is in the SPECIAL FEATURE code. Columns 44, 46, 48 are for the yarn fiber or material (the numerical part of the code); 45, 47, 49 are for yarn structure (alphabetical code). The twist-direction symbols, representing the slant of fibers and the slant or lay of the elements in yarns of two or more ply were proposed by the textile analyst Louise Belinger. It is a graphic system, far more effective than the expression of the description in words.

We have made no attempt to include any record of the degree of twist, even though this was deliberately varied for specific functions. To include it in a coding system would involve various measurements for each specimen, and the end results would not justify the effort. Instead, our policy has been to make sample checks within selected lots.

- 50-51 *Repair Yarns.* A two-part code (XVIII), which uses the same (as in Code XVII) numerical-alpha-

## Column

betical yarn structure code for those yarns used for repair and sewing and could also include embroidery yarns. Where two types occur, one is entered on Card 1; the second, on Card 2.

- 52-53 *Color, Type, Application.* A code (XIX), recording colors as natural, a dye, or a pigment. So little is known of the ancient dyes and dyeing procedures that it would be futile even to consider dye and mordant identification. The application or use of colors falls into varied categories. Two-tone yarns are made of contrasting strands. Fiber can be dyed before spinning and fibers of different colors combined. A fabric may be dyed after it is created or, more commonly in Peru, the yarns were dyed before construction. Resist-dyeing techniques restrict dye application to portions of the yarn or finished fabrics—to mention only some of the procedures. Their combinations add to the recording problem.

- 54-57 *Colors.* A code (XX). This is perhaps an oversimplification due to card space. It permits entry of only four major colors in the warp and four in the weft per specimen. If more are present, they are recorded in the SPECIAL FEATURES code. It was obvious that the recording of exact colors, through reference to color charts, would necessitate a large code requiring many card columns for different color combinations if the full range in Peruvian fabrics were to be covered. If anyone ever wishes to attempt this, supplementary cards could be used, or a new code devised. Our own conclusion is that the work is not warranted because one is faced with color variations resulting from aging and fading, as well as the unintentional differ-

## Column

- ences of tone when the dyers were attempting to duplicate a specific color. This is difficult even in controlled laboratory procedure; it was more difficult for the ancients working with unrefined mordants and a multitude of dye sources. For these reasons the COLORS code is limited to ten categories in each of four columns.
- 58-62 *Counts.* A numerical record of warp and weft counts recorded for a span of 2.5 cm. The reason for this is twofold. Earlier published records are in counts per inch. More importantly, the average counts of yarns, especially in the low-count fabrics, cannot be recorded accurately for 1 cm without using two decimal places. A count per 2.5 cm, using only one decimal place, provides all the accuracy needed. In practice, we normally count at least 5 cm of fabric—more in widely spaced weft rows in twined fabrics.
- 63 *Twining Twist.* A code (XXI) recording the direction of the twist of the weft elements in twined fabrics and the degree of twist. In twining, the common practice is that two weft yarns twist 180° when they pass between the warp, which means that each yarn appears alternately on opposite sides of the fabric. Where a 360° twist is used, each returns to the same side after the twist. In compact-weft twining, when the weft yarns have color, the differences in twist degree will control color distribution for the creation of effects or designs.
- 64 *Terminal Construction.* A code (XXII). As the majority of woven and twined pre-Spanish fabrics have uncut warp yarns, with warp-end selvages, there was some point where the final insertion of the weft required a change in procedure in

## Column

- weft insertion. Generally, the last weft was darned in with a needle or needles. When one has a specimen complete in warp length, it is usually possible to determine if this work occurred somewhere in the body of the fabric or close to or in the warp end loops.
- 65 *Selvage Knots.* An illustrated code (XXIII) recording the various types of knots used to join the ends of two or more weft yarns at a selvage. Commonly, this is a feature of twined fabrics but also occurs in woven ones where successive weft picks are united by knots.
- 66 *Weft Handling.* Partially a code (XXIV). The first four digits represent the counts of the weft yarns used. Other numbers were assigned for combinations. For woven fabrics see categories 0-7, cols. 35, 36. Tabulations were made only for end-finishes of woven fabrics. For twined fabrics, tabulations were made for both end finishes and bodies of specimens.
- 67 *Warp Ends.* An illustrated code (XXV) showing the observed differences in the handling or course of the warp yarn at the ends of the fabrics.
- 68 *End, Finish.* An illustrated code (XXVI) showing the varied systems of stabilizing or finishing off the warp ends.
- 69 *End, Number of Weft Rows.* A count (XXVII) recording the number of wefts where there is a clear-cut change from the weft distribution in the rest of the fabric. Many twined fabrics with spaced weft in the body of the fabric will have two or more compact weft rows to strengthen or decorate the warp ends. Preceramic woven fabrics have the same feature.
- 70 *Repair Technique.* A code

*Column*

(XXVIII) which may be expanded as more variations are encountered. It now covers the common methods used.

- 71 *Stitches.* An illustrated code (XXIX) for the stitches used in joining seams or binding edges in repairs or in embroidery. All possibilities have not been encountered in the material dealt with.
- 72 *Superstructural.* A code (XXX) identifying additions to, or modification of, finished fabrics by embroidery, appliqué, or the use of feathers or other ornamental materials.
- 73-74 *Special Features.* A two-digit code (XXXI) that is, in a sense, a place for annotations to point out features not fully covered by the other codes, or when there is not sufficient space on the cards for all information. For example, if a specimen has more types of yarns than can be entered in the columns where yarn data are recorded, reference to that fact can be indicated under this code. To get the specific information one may have to refer to the data-sheet comments or to the source information.
- 75-80 *Design.* A code (XXXII), actually a combination of six codes: three numerical, the others alphabetical. The first records whether the piece has simple stripes, representational, or nonobjective themes, and so on. The second records how these were achieved. The third is a breakdown of nonobjective design. The fourth identifies representational motifs. The fifth and sixth cover the layout and orientation of repeats, if these occur. This is a compromise with what could be done, for textile design and decoration. The complexity of pre-columbian textile design would certainly require more than an 80-

*Column*

column card to record all the possibilities.

## OPERATION AND ACCURACY

The preparation of the codes involved considerable experimentation and revision before they reached the forms presented here. There must be ways in which the whole could be improved, but there were no major problems in application. Some rechecking of specimens was necessary during the entry of data where the original recorded information on the catalog cards was not clear in detail. Otherwise the work of data-sheet entry proceeded quite rapidly. In the end, the information for 4181 specimens and groups of specimens, on 225 data sheets, was transferred to 7148 punched cards. At the Service Bureau Corporation the card-punch operators expressed satisfaction with the design of the data sheets and reported no problems. We did, however, encounter 33 card-cutting errors, with no clue as to what caused them.

For the analysis of the information we had prepared 106 questions to be applied to the material from 94 chronological subdivisions. As we were thoroughly familiar with the interrelationship of the codes, programming the questions was not difficult.

Sorting was done with an IBM 407 machine, since we were not asking for figures other than scores. As the reports came in, the results of each question were assembled on graph paper with the figures grouped in chronological order. Percentages were determined from which interpretation of the changes and stability of features could be drawn. In the end we have the most complete and detailed analysis of textile information for certain periods ever assembled. Granted that this is a regional record, it does provide a standard for comparative purposes that has already proven most useful in judging miscellaneous small lots from other parts of Peru.

An example of the computer's work is as follows. It was asked to produce the figures on the occurrence, and the distribution throughout the excavation units, of single-ply yarn used in warp pairs in twining. The results are found in several columns on table 8 on Yarn Structure in Chapter 9. The other

charts dealing with textiles were also compiled from computer-arranged data.

By and large we believe the results to be accurate. There were errors on our part and some in the work at the Service Bureau. Ours resulted from failure to make certain entries; most, more properly called changes, were the result of reinterpreting some features in different terms. Only in a few cases were the errors caused by transposition of entries. After adding the 33 Service Bureau cutting errors, the total of cards to be recut amounted to 318.

A check of the reasons for recutting the 318 cards is definitely pertinent to this review of the project. We had, of course, anticipated that there would be errors, and they came to light as the Service Bureau reports were studied and analyzed. The checking of these reports was simplified by the fact that they were subdivided on the basis of the various chronological and excavation divisions. Comparison of the numbers of specimens checked for specific features within each division against the record of the number of specimens in each division usually indicated where the discrepancies occurred. In addition, we were thoroughly familiar with the material and, as the records of feature distribution developed, we could easily check deviations. In all such cases the data-sheet entries and the sources of information on the catalog file cards were compared. Where card entries were unclear or questioned, we also reexamined textile specimens with the microscope for more precise or detailed analyses.

Such reconsideration resulted in a revision of data-sheet entries, a change of certain card entries, and, in the end, corrections of the Service Bureau reports.

Some codes needed modification in the form of additional subcategories and more precise instructions for their use. As an example, the code for Twining: Warp Movement, Columns 30, 31 on the data sheet, was ultimately so revised that almost all entries for the various ways warp yarns were manipulated had to be changed on the data sheets. Fortunately, the number of specimens with this feature is small, and the handling and analysis of the information posed no problem. In this case, 195 out of 265 entries were changed. These are changes resulting

from the modification and improvement of a code rather than from errors.

In addition to what has just been described, the revision of data-sheet entries in all other codes can be summarized as follows: Out of 4181 specimens and groups of specimens, 94 required changes in 159 column entries. The real errors occurred in 81 column entries for 49 specimens as follows: information omitted for 31 specimens; erroneous entries for 8 specimens; entries transposed in adjacent horizontal rows for 5 specimens; entries transposed in adjacent columns for 4 specimens; confusion of source data cards for 2 specimens. (One specimen had errors of two kinds, hence the numbers listed total 50 rather than 49). In addition, we had failed to code any information for one specimen.

The errors noted are admittedly only those that were detected; one can rightly wonder if others occurred. However, the search for mistakes was rigorous, and while one cannot claim perfection in such work, we have satisfied ourselves that there is certainly nothing more that would appreciably affect the results.

From the standpoint of future work it is important to understand how or why mistakes occurred. The fact that there were only nine instances of entries made in the wrong place on the data sheets where over 500,000 entry spaces were dealt with indicates that the data-sheet plan and work of entry was reasonable. Virtually all of the other mistakes can be attributed to the manner in which the basic information was compiled on the catalog cards, the source of the information to be coded.

It must be remembered that this was the first detailed study ever made of textiles of the types and age dealt with; at the beginning we had no way of anticipating what the study would reveal. Equally important, we did not then know that the statistical analysis would later involve coding and computer processing. Accordingly, the plan worked out for the printed catalog cards was adequate for certain basic data and records, but it was inadequate for the varied information on related features that frequently was recorded only by sketches. Had we worked with the type of card we now envisage as desirable, with the code plan as a guide, most errors and changes would

have been avoided. We would now enter the code data for each item on the catalog cards. The card punchers could work directly from them, but, unless such cards were duplicated, this would not be advisable. There is too much labor and expense involved in their preparation to run the risk of loss. Personally, we favor the compilation of the coded information on data sheets regardless of how the source-card information is prepared.

The most serious mistake at the Service Bureau was the permanent loss of the entire set of punched cards. Fortunately, this oc-

curred after the 106 questions had been processed. When other questions arose that could have been handled by computer processing, the answers were obtained by manually searching the data sheets. We found that this could be done quite quickly and effectively. The experience convinced us that for smaller lots of textiles, the data should be coded and entered on such sheets even if there is no intention to have cards cut and processed. It not only is a compilation of information in accessible form, but forces one into orderly thinking about a complex subject.

## THE TEXTILE CODE FOR PERUVIAN FABRICS

Code	CODE AND COLUMN HEADINGS	Columns
—	Not used	1
I	Catalogue	2
—	Specimen number	3-7
II	Technique	8-9
III	Valley or area	10-11
IV	Site	12-14
V	Chronology and excavation data	15-18
VI	Cultural period	19
VII	Identification, function	20-21
VIII	Number of loom products	22
—	Number of items	23-24
IX	Looping and netting	25-26
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XXX	Superstructural	72
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### CODE I. CATALOGUE, COLUMN 2

0	South American Archaeology	41.0
1	South American Archaeology	41.1
2	South American Archaeology	41.2

### SPECIMEN NUMBER, COLUMNS 3-7

Examples: 1234  
1235A  
1235B

### CODE II. TECHNIQUE, COLUMNS 8-9

1	Unlisted
2	Looping: yarn end led through loops
3	Looping: loops led through loops; knitting, etc.
4	Netting: knotted, open and compact; fish-nets, etc. (do not use for slings)
5	Netting: knotted, fillet, etc.
6	Spiral interlinking
7	Plaiting, braiding; ends free
8	Plaiting on loom or frame (spranging)
9	Plaiting: elements twined
10	Twining: weft elements active
11	Twining: warp elements active; "tablet" weaving, etc.
12	Weaving
13	Weaving: Soumak
14	Weaving and twining combined
15	Weaving combined with looping (2)
16	Interlocked darning

### CODE III. VALLEY OR AREA, COLUMNS 10-11

A list of 98 Peruvian coastal valleys and archaeological areas, listed by governmental de-

partment, from north to south. Only Code nos. 23 (Chicama) and 25 (Virú) were used in the computer study.

#### CODE IV. SITE, COLUMNS 12-14

- 1 Huaca Prieta (Chicama Valley sites numbered provisionally by Ford)
- 71 Guañape, Huaca Negra (Ford and Willey, 1949)
- 315 Guañape, Huaca 3 (Ford and Willey, 1949)

#### CODE V. CHRONOLOGY AND EXCAVATION DATA, COLUMNS 15-18

##### Test Pit: HP 1—Negative Period Ceramics

- 101 Position uncertain
- 102 Layer A
- 103 Layer B
- 104 Layer C 1
- 105 Layer C 2
- 106 Layer C 3
- 107 Layer D 1
- 108 Layer D 2
- 109 Layer D 3 (Sample, 1, Trench)
- 110 Layer E
- 111 Layer F

##### Test Pit: HP 2—All Early Preceramic

- 201 Layer A 1
- 202 Layer A 2
- 203 Layer B
- 204 Layer C
- 205 Layer D
- 206 Layer E
- 207 Layer F
- 208 Layer G 1
- 209 Layer G 2
- 210 Layer G 3
- 211 Layer H

##### Test Pit: HP 3—Negative Period Ceramics

- 301 Layer A 1 (1 Mochica sherd)
- 302 Layer A 2
- 303 Layer A 3
- 304 Wheelbarrow trench (above cobbles)

##### Test Pit: HP 3—Preceramic Period

- 305 Position uncertain
- 306 Layer C 2
- 307 Layer C 3
- 308 Burial (lower part layer C 3)
- 309 Layer D 1
- 310 Layer D 2
- 311 Layer D 3
- 312 Layer D 4
- 313 Layer E 1

- 314 Layer E 2
- 315 Layer F 1
- 316 Layer F 2
- 317 Burial (middle part layer F)
- 318 Layer G
- 319 Burial (lower half layer G)
- 320 Layer FG
- 321 Layer H
- 322 Layer GH
- 323 Layer I
- 324 Burial (lower half layer I)
- 325 Layer H 2, I 2
- 326 Layer J 1
- 327 Layer J 2
- 328 Layer J 3
- 329 Layer K
- 330 Layer L 1
- 330 Layer L 2
- 330 Layer L 3
- 330 Layer L 4
- 331 Layer M
- 332 Layer N
- 333 Layer O 1
- 333 Layer O 2
- 333 Burial (lower half layer O)
- 334 Layer P 1
- 334 Layer P 3
- 335 Layers R 1, R 2, R 3
- 336 Side trenches C D E
- 337 Side trenches G H I
- 338 Side trenches H I
- 339 Side trenches I J
- 340 Side trenches J
- 341 Side trenches H I J
- 342 Side trenches K
- 343 Side trenches I J K
- 344 Side trenches M ±
- 345 Side trenches O P Q
- 346 Wheelbarrow trench—Lot 1
- 347 Wheelbarrow trench—Lot 2
- 348 Wheelbarrow trench—Lot 3
- 349 Wheelbarrow trench—Lot 4
- 350 Wheelbarrow trench—Lot 5
- 351 Sample 2 (top)
- 352 Sample 2 (middle)
- 353 Sample 2 (bottom)

##### Test Pit: 3/1—Cupisnique Period

- 354 Burial in trench with skeleton

##### Test Pit: HP 4—Cupisnique Period

- 401 Layers B 2, C 4, D 4

##### Test Pit: HP 4—Early Ceramics—Guañape Types

- 402 House 1, skeletons 3, 4, 5, 6
- 402 House 2
- 402 Layer Y 2

## Test Pit: HP 5—Cupisnique Period

- 403 Layer A 1
  - 404 Layer A 2
  - 405 Layer A 3
  - 406 Layer A 6
  - 407 Layer A 7
  - 408 Layer A and B general
  - 409 Layer B 1
  - 410 Layer B 2
  - 411 Layer B 3
  - 412 Layer B 4
  - 413 Layer B 5
  - 414 Layer B 6
  - 415 Layer B 7
  - 416 Layer B 8
  - 417 Layer B 9
  - 418 Layer B 10
  - 419 House 2 (layer A 4 = entrance to House 2; therefore put together)
  - 420 Storage vault (north of entrance to House 1)
  - 421 House 4
  - 422 House 5
  - 423 House 5 (*huaquero* hole)
  - 424 House 6, House 7, skeleton-associated material found outside House 4, Layers D 1, E 2, F 2; refuse by disturbed grave 10 m in trench
- Test Pit: HP 6—Probably close to Cupisnique Period
- 425 Layers 1 and 2

## Virú Valley—Guañape Site 71—Preceramic Period

- 501 Position uncertain
- 502 Layer A 2
- 503 Layer B
- 504 Layer C
- 505 Layer D
- 506 Layer F
- 507 Layer F 2
- 508 Layer G
- 509 Layer H
- 510 Layer I

## Virú Valley—Guañape Site 71—Preceramic—Early Ceramic Period

- 511 Wheelbarrow trench, 50–60 cm below surface

## Virú Valley—Guañape Site 71—Late Phase Pre-ceramic Period

- 512 House fill (W. D. Strong, Test Pit 1)

## Virú Valley—Guañape Site 71—Early Ceramic Period

- 513 Niche house

## Virú Valley—Guañape Site 71—Juncture of Ceramic and Preceramic Debris (?)

- 514 West end of wheelbarrow trench leading to Bird's pit

## Virú Valley—Guañape Site 71—Cupisnique Period

- 515 Temple structure
- 516 W. D. Strong Cut 1, 50–75 cm below surface

## Virú Valley—Guañape Site 315—Preceramic Period

- 517 Huaca 3

CODE VI. CULTURAL PERIODS,  
COLUMN 19

- 1 Unknown
- 2 Preceramic Period
- 3 First Ceramic Period
- 4 Early Horizon (Chavin-Cupisnique)
- 5 Early Intermediate Period
- 6 Middle Horizon (Tiahuanaco)
- 7 Late Intermediate Period
- 8 Late Horizon (Inca)
- 9 Post-Conquest

If a specimen has been found at a level marking the close of one period and beginning of the following, then enter the number of the later of the two and enter a 3 in Special Features; also enter as if there is specific data indicating a fix within any period.

CODE VII. IDENTIFICATION, FUNCTION,  
COLUMNS 20–21

Use only when identity is positive. No entry for unclassifiable fabric fragments.

- 1 Unlisted
- 2 Yarn
- 3 Reel or ball of yarn
- 4 Yarn hank
- 5 Necklace, bracelet
- 6 Rope or cord, both twisted and braided
- 7 Quipu and knotted cords
- 8 Fishnet float binding
- 9 Sling cord
- 10 Sling complete or sling center
- 11 Fishnet, large mesh (score nets or fragments which can be identified as fishnets, i.e., are water worn, regardless of form and type)
- 12 Fishnet, small mesh (same instruction as for No. 11)

- 13 Net, large mesh, function uncertain (score all which cannot be positively identified as fishnets)
- 14 Net, small mesh, function uncertain (same instruction as for No. 13)
- 15 Carrying cloth or net (made in any technique)
- 16 Bag, rectangular, seamed sides and bottom (made in any technique)
- 17 Bag, rectangular, seamed one side and bottom (made in any technique)
- 18 Bag, rectangular, seamed bottom only (made in any technique)
- 19 Bag, cylindrical, with rounded bottom (made in any technique)
- 20 Unknown function, rectangular fabric (do not use for netted products; score incomplete pieces retaining sections of end and side selvages)
- 21 Narrow fabric belting under 10 cm provided length is twice the width
- 22 Cap or hat
- 23 Turban, strap
- 24 Turban, rectangular
- 25 Turban, other
- 26 Headband
- 27 Kerchief or carrying cloth
- 28 Poncho
- 29 Poncho shirt, sleeveless
- 30 Poncho shirt with sleeves
- 31 Shirt, other
- 32 Loincloth
- 33 Short wrap-around skirt
- 34 Long wrap-around skirt
- 35 Skirt, other
- 36 Cloak or shawl
- 37 Jacket or coat
- 38 Trousers
- 39 Ankle band
- 40 Arm band
- 41 Footwear
- 42 Bedding
- 43 Wall hanging
- 44 Altar or ceremonial cloth
- 45 Mummy wrapping

CODE VIII. NUMBER OF LOOM PRODUCTS,  
COLUMN 22

- 0 Spiraling construction
- 1 1 loom product
- 2 2 loom products
- 3 3 loom products
- 4 4 loom products
- 5 5 loom products
- 6 6 loom products
- 7 7 loom products

- 8 8 loom products
- 9 9 or more loom products

Many woven specimens are sewn at the selvages where they are joined to other pieces. In other cases, a single fabric may be folded and sections of the selvages sewn together. With fragmentary seamed pieces, it is impossible to be positive if one or more products are present except in rare instances. For our scoring purposes, two fragments, seamed together along a selvage, will be counted as two unless identity is without question.

NUMBER OF ITEMS, COLUMNS 23-24

Count total of pieces per catalog number

- Examples: 1235, 1 piece: score 1  
 1236a-g, 7 fragments: score 7  
 1237a-g, 7 pieces *junco* cord: score 7

CODE IX. LOOPING AND NETTING,  
COLUMNS 25-26

Netting

- 0 Unlisted net
- 1 Open mesh net, cowhitch knots
- 2 Open mesh net, cowhitch knots, interlocked sections
- 3 Open mesh net, overhand knots
- 4 Open mesh net, overhand knots, interlocked sections
- 5 Open mesh net, cowhitch and overhand knots
- 6 Open mesh net, sheet bend knots
- 7 Open mesh net, sheet bend knots, interlocked section
- 8 Open mesh net, square knots
- 9 Open mesh net, unlisted knots
- 10 Compact knotted fabric, overhand knots
- 11 Compact knotted fabric, overhand knots, patterned
- 12 Compact knotted fabric, square knots
- 13 Compact knotted fabric, square knots, patterned
- 14 Compact knotted fabric, unlisted knots
- 15 Compact knotted fabric, unlisted knots, patterned
- 16 Reserved
- 17 Compact knotted fabric, fibers caught in knots, Type 1 (D'Harcourt, 1962, fig. 81B)
- 18 Compact knotted fabric, fibers caught in knots, Type 2 (D'Harcourt, 1962, fig. 84)
- 19 Compact knotted fabric, fibers caught in knots, unlisted type
- 20 Open mesh, multiple element "nets"
- 21-29 Reserved

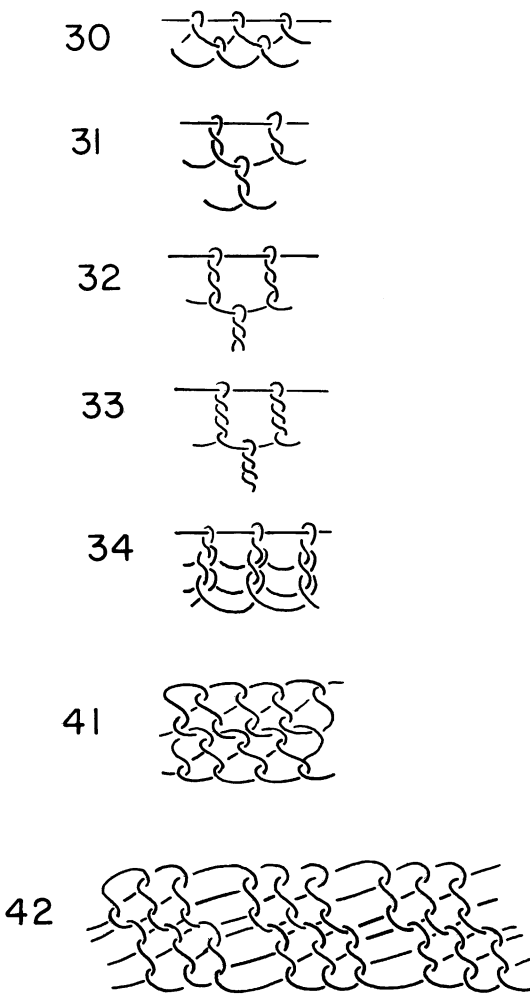


FIG. 190. Illustrations for Code IX Looping, cols. 25-26.

#### Looping (fig. 190)

Successive interlocked loops formed by leading a yarn end through varied turns. Slant of crossing portions of movements recorded, Column 63.

- 30 Simple hitch looping, locked on spans
- 31 Simple hitch looping, like 30, one full twist
- 32 Simple hitch looping, like 30, two full twists
- 33 Simple hitch looping, like 30, more than 2 twists
- 34 Simple hitch looping, locked on turns
- 35-39 Reserved

#### Looping: Simple Basic Figure 8 Stitch

- 40 Unlisted variants
- 41 Type 1, plain

- 42 Type 1, patterned A, by extending portions of stitch
- 43 Type 1, patterned B, by building up separated areas
- 44 Type 1, patterned C, by use of successive yarns

#### Modified Interlacing of Basic Figure 8 Stitch

- 45 Type II, plain
- 46 Type II, patterned
- 47 Type II, unlisted
- 48 Type III A
- 49 Type III B
- 50 Type III, unlisted

#### Simple Basic Figure 8 Stitch Combined with Other Stitch

- 51 Type IV A
- 52 Type IV B, unlisted

#### Modified Basic Figure 8 Stitch

- 53 Type V, twists at row juncture
- 54 Type VI A, added twists at one point of stitch juncture
- 55 Type VI B, unlisted
- 56 Type VD A, extended so stitch has three sections
- 57 Type VD B, extended stitch with more than four sections or points of interlacing
- 58 A construction which would correspond to a single row of VD B stitches with X number of sections
- 59 Combination: 41 and 56
- 60 Combination: 44, 42, 52
- 61-69 Reserved for Figure 8 variants and combinations
- 70 Add other specific looped construction

*Note:* When Figure-8 loop pouches start with running hitches or other variations of looping, note only in comments. Also note edging.

#### CODE X. PLAITING, COLUMN 27

- 0 Unlisted
- 1 3-strand braid
- 2-9 Reserved

#### MESH SIZE: NETS, COLUMNS 28-29

Measurements recorded in millimeters up to 99 mm

#### CODE XI. TWINING, COLUMNS 30-31

#### Regularly Spaced Wefts

- 0 Unlisted
- 1 Plain twining: single warps

- 2 Plain twining: paired warps
- 3 Plain twining: multiple warps
- 4 Plain twining: paired and occasional (accidental?) multiple warps
- 5 Plain twining: paired and multiple warps, ribbing intentional
- 6 Plain twining and warp floats
- 7 Split-pair twining
- 8 Split-pair twining and plain twining
- 9 Split-pair twining and warp floats
- 10 Transposed-warp twining
- 11 Transposed-warp twining and plain twining
- 12 Transposed-warp twining and split-pair twining
- 13 Transposed-warp twining and plain and split-pair twining
- 14 Plain twining, single and paired warps (1 and 2 combined)
- 15-19 Reserved

#### Regularly Spaced Wefts and Compact Bands of Two Weft Rows

- 20 Plain twining: single warps
- 21 Plain twining: paired warps
- 22 Plain twining: multiple warps
- 23 Plain twining: paired and occasional (accidental?) multiple warps
- 24 Plain twining: paired and multiple warps, ribbing intentional
- 25 Plain twining and warp floats
- 26 Split-pair twining
- 27 Split-pair twining and plain twining
- 28 Split-pair twining and warp floats
- 29 Transposed-warp twining
- 30 Transposed-warp twining and plain twining
- 31 Transposed-warp twining and split-pair twining
- 32-38 Reserved
- 39 Regularly spaced pairs of weft rows; plain and transposed warps

#### Regularly Spaced Wefts and Compact Bands of More Than Two Weft Rows

- 40 Plain twining: single warps
- 41 Plain twining: paired warps
- 42 Plain twining: multiple warps
- 43 Plain twining: paired and occasional (accidental?) multiple warps
- 44 Plain twining: paired and multiple warps, ribbing intentional
- 45 Plain twining and warp floats
- 46 Split-pair twining
- 47 Split-pair twining and plain twining
- 48 Split-pair twining and warp floats
- 49 Transposed-warp twining
- 50 Transposed-warp twining and plain twining

- 51 Transposed-warp twining and split-pair twining
- 52-59 Reserved

#### Wefts Completely Compacted

- 60 Plain twining

#### CODE XII. TWINING—WARP MOVEMENT, COLUMNS 32-33

When two movements occur in one specimen, use Card 2 for the second. When three or more are present, also enter 36 in Special Features Column. Roman numerals indicate broad categories based on some common feature; the Arabic numbers are used in coding. See diagrams of each type (figs. 191, 192).

#### Group I. Miscellaneous and Accidental Type

- 10 Fabrics either too poorly preserved or too small for specific group classification; all have evidence of some transposed-warp movement either accidental or deliberate.
- 11 Accidental crossing of warps, not to be confused with intentional shifts.
- 12 Crossing or transposition of warps for the purpose of regrouping or redistributing warp colors or other yarn differences. Results in simple stripe modification or permits subsequent work in other movements. Some specimens, especially eye motif pieces in condor-type construction, show other rearrangement of the warp order. Such manipulations have significance only as they relate to the warping procedures. Evidently, some individuals preferred to prepare the warp in one manner, then to modify the color order by transposing. As such movements are merely a step in production and have no overall effect on appearance, they have not been included in the code. Movement No. 12 is listed because it occurs by itself—unassociated with any other movement.

**Group II. Pair Transposition Type:** Transposition of adjacent warp pairs shifted one space left of right, with adjacent pairs passing either under, over, or around each other.

- 20 Very small or poorly preserved pieces in which the warp movements seem to be limited to this type.
- 21 Two adjacent warp pairs exchange positions, crossing but not encircling each other, then return to their original alignment. Two weft spaces are necessary for the completion of the movement. They may be successive spaces or the altered position of the warps

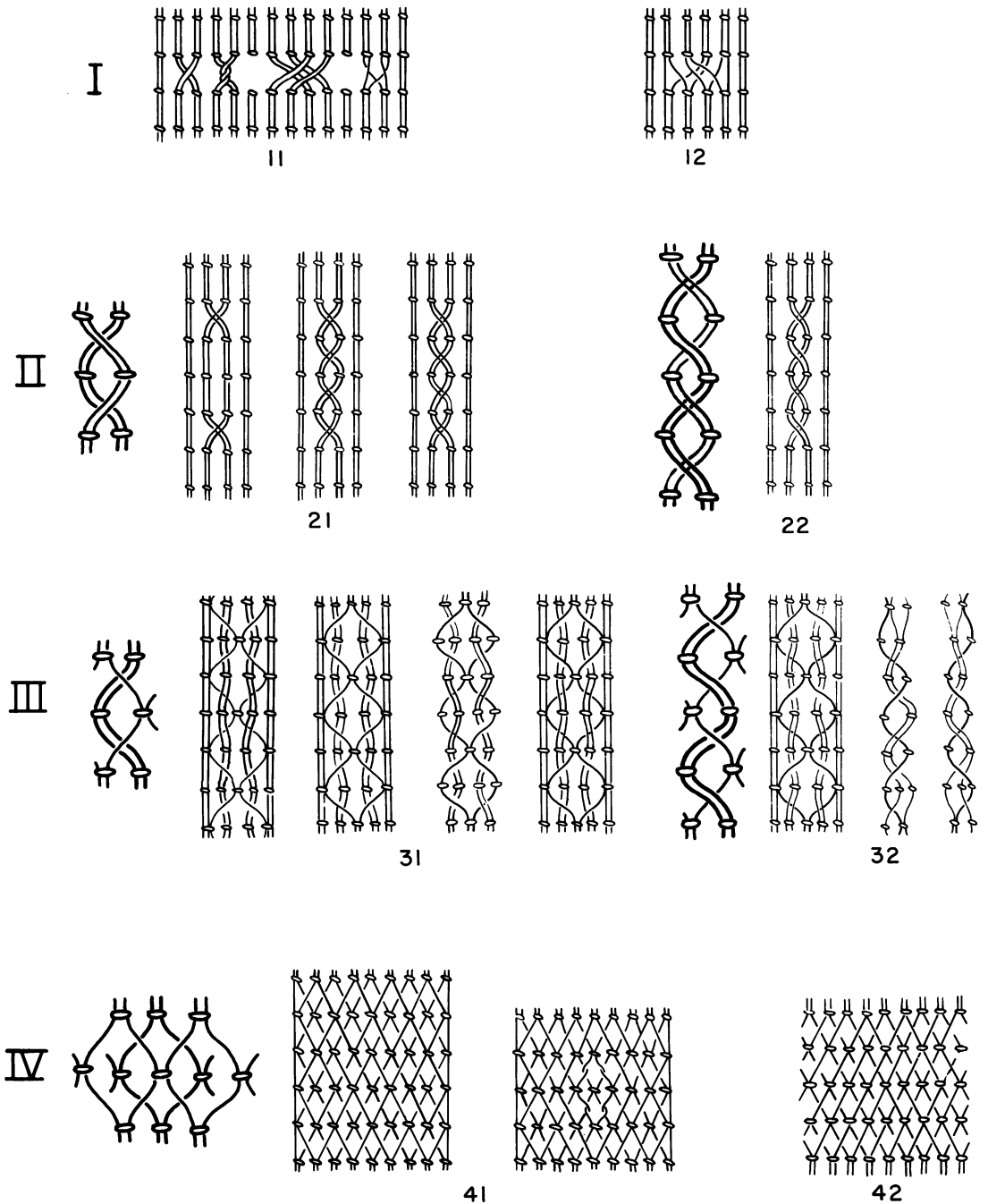


FIG. 191. Illustrations for Code XII Twining Warp Movement, cols. 32-33 (Groups I-IV).

may be held for any number of weft rows before the movement is completed. Simple effects and patterns can be created by repeating the movement along the same and

successive warp pairs and by varying the relative positions and direction of the crossings. (In all but one of the items covered by this code, the warp pairs never shift more

than one space left or right from the original order. The exception, 41.1/9919, has the simple crossing at irregularly scattered points, so aligned that certain warps move further from their original positions in subsequent crossings. In this regard the piece is related to those in the VII and VIII groups where the shift is deliberate, not accidental, as seems to be the case with 41.1/9919.)

- 22 Two warp pairs exchange position as in 21, with the difference that repetition of the movement results in spiraling of adjacent pairs. When warps are sustained and secured at each end, the encircling twists will be reversed somewhere along the warp length.

**Group III. Single-warp Transposition Type:** Transposition of a warp pair and a single warp, with shifts one space left and right, the warps passing either under, over, or around each other. In most cases the single warp comes from a pair divided and rejoined in successive weft rows.

- 30 Fragments.  
 31 The movements of the single and paired warps are identical with 21, but as three pairs are usually involved the range of combinations and effects is greater.  
 32 As with 22, the yarns spiral about each other as the movement is repeated and must reverse somewhere if the warp order is secured at each end before construction. In split-pair twining, two yarns will be held together as a pair to work against a third warp. The appearance of the final product will differ markedly from one with a plain twined field, but this does not mean that the basic movement differs.

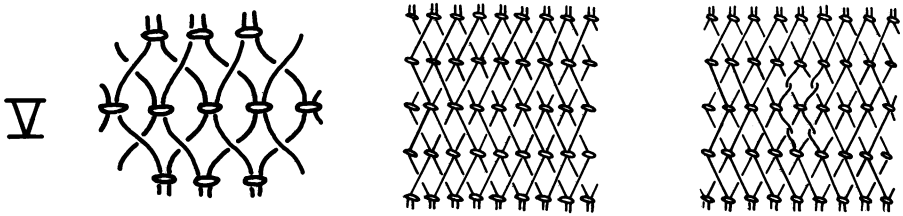
**Group IV. Woodland Type:** Within two weft spaces and held by the twines of three weft rows, each warp pair is separated: one yarn shifting one space to the left, the other one space to the right. The two reunite in the third weft row to form a simple diamond. When yarns of the alternate pairs remain on opposite sides of a fabric, two opposing grids of diamonds are formed, the centers of one set coinciding with the junctures of the diamond margins on the reverse. When the even-numbered warp pairs form a color contrast with the odd pairs, the movement can produce a fabric with the colors held on opposite faces. However, as one set of yarns does not completely hide the other, one color is simply dominant on a ground of the other. By changing the relative position of contrasting yarns as the opposing warps are transposed, the colors can be shifted from one face to the other and patterns and designs created.

- 40 Small fragments or badly worn pieces too incomplete to show more than that the woodland type movement was used.  
 41 The basic woodland type movement with diamonds opposing diamonds. Half-twists can be used between weft rows to create a dot or minimal distribution of color. The creation of diagonal lines in this technique results in a right and a wrong side for viewing the finished product.  
 42 Woodland variant. Warping order is the same as with 41. It differs in that some warps or portions of warps are handled as in the condor type. In these areas, where visible sections of warp all slant in one direction between two weft rows, colors will alternate from yarn to yarn. Only nonobjective geometric designs or effects were created.

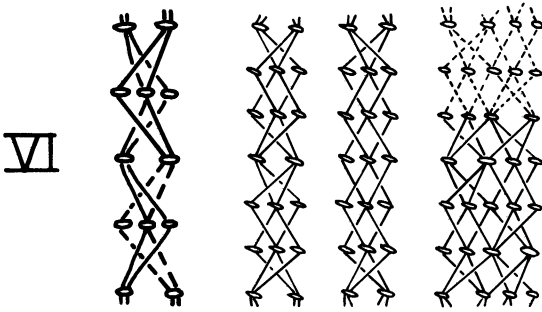
**Group V. Condor Type:** A movement essentially identical with the woodland type, yet the appearance of the finished fabrics is markedly different. It, too, is complete in two weft spaces and has the warp pairs divided and transposed one place left and one right. Color contrasts occur in each pair rather than in alternate pairs so the control of color distribution necessitates a different sequence of warp movements. The formation of a diamond in the condor type brings both colors to the same surface while in the woodland type it will hold them to opposite sides. In the final product, colors are much more concentrated than in the woodland type, for one set of warps completely hides the other. The figure or pattern created has a negative-positive relationship on opposite sides of the fabric.

- 50 Small fragments or badly worn pieces, too incomplete to show more than the use of the condor type movement. Some could be from portions of 42 where there are no successive opposing diamonds.  
 51 The condor type movement: As with 41, half-twists between weft rows produce the minimal distribution of color; used for pupils of eyes, etc.

**Group VI. Huaca Prieta Geometric Type:** A movement which starts with both yarns of each warp pair shifting to the right or left. As they shift, they separate and are held by two twining twists in the next weft row. Together they work in opposition to the adjacent warp pair moving in the opposite direction on the reverse side of the fabric. The movement may be completed in two weft spaces, or the divided pairs may be carried as slanted or zigzagged parallel yarns for one or several weft spaces before reuniting. Colors are distributed in alternate warp pairs as with the wood-

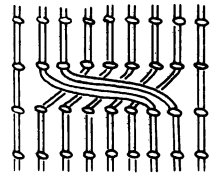


51



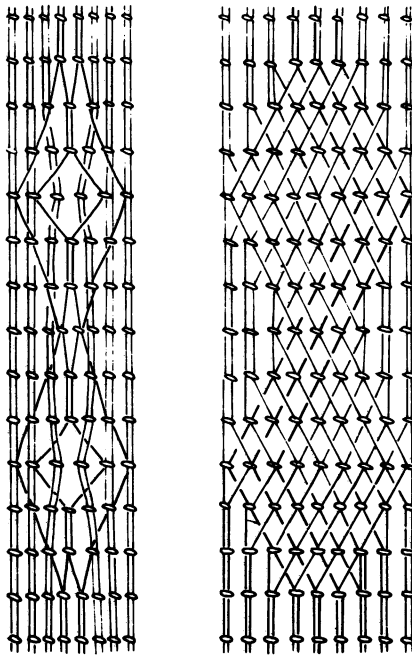
61

VIII



81

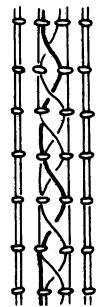
VII



71

72

IX



91

FIG. 192. Illustrations for Code XII Twining Warp Movement, cols. 32-33 (Groups V-IX).

land type. The technique produces only nonobjective geometric designs and effects, structurally identical on both faces of the fabric. Again, half-twists of opposing warps are used between weft rows for minute detail. The figure does not show the transposition of paired yarns to give the desired spacing to the basic movement unit or to maintain warp order.

- 60 Small fragments or poorly preserved pieces showing some evidence of the presence of this movement.
- 61 The geometric type movement, obviously generally used with alternate warp pairs of contrasting color.

**Group VII. Shift and Return Type:** Movements which shift warps progressively further away from their original alignment through successive weft rows. The return to the original alignment is accomplished by the reverse of earlier movements.

- 70 Fragments too small or too poorly preserved to show full sequence of movement.
- 71 Certain warp pairs are subdivided and carried over or under adjacent warp pairs and are caught in the same weft turns as hold the pairs. For maximum visual effect, the transposed yarns should differ in color from the adjacent yarns.
- 72 Certain groups or series of warp pairs subdivide to form two sets of yarns which work in opposition to each other, diverging through successive weft rows until the outermost reach the margins of the patterned area. At this point the direction of all reverses and the process is repeated, ultimately ending at some point where the yarns return to their original order.

**Group VIII. Multiple Shift in One Space Type:** Movements restricted to one weft space at a time with a shift of warps or warp pairs more than two places left or right. The shifting yarns appear as floats.

- 80 Fragments too small or poorly preserved.
- 81 Two warp pairs shift together, followed several weft rows later by a similar shift of the two warp pairs that previously lay beside the first. To return the warps to their original order, all movements in one direction must be repeated in the reverse.

**Group IX. Spiral Type:** Movements by which more than two yarns or pairs spiral about each other with the successive transposition of the individual yarns within the group.

- 90 Not used.
- 91 Three yarns turn about each other, all shifting, one at a time one space either left or right, then back to original alignment. Each in turn is then carried along for two weft spaces before repeating the movement.

#### CODE XIII. WEFT COURSE, COLUMN 34

Use Card 1 for fragments which have parts of both side selvages; Card 2 for fragments with one selvege only. Weft passages B, D, E, and G are limited to twining; others applicable to both twining and weaving.

- A Weft course not covered by following descriptions
- B Starts at one edge, ends with knot at other (fig. 193). Two or several complete passages, then ends with knots (C, D, E, F)
- C See fig. 193
- D See fig. 193
- E See fig. 193
- F See fig. 193
- G One continuous weft from point of entry to last row or pick; twisted within span of advance at selvege
- H One continuous weft from point of entry to last row of weft insertion
- I Two or more continuous wefts alternating as shown, advances made at same selvege
- J Two continuous wefts like I, advancing shifts on opposite selvages
- K Two or more continuous wefts used in creation of weft stripes and advanced along the selvages; similar to I and J
- L Two continuous wefts entering the same shed from opposite edges
- M Two continuous wefts entering the same shed from opposite edges and shifting to the next shed whenever they meet
- N Three continuous wefts alternating in successive sheds and entering in opposite directions
- O Two or more continuous wefts laid in successive sheds and traveling in the same direction
- P One or more wefts used regionally with wefts turning within body of fabric. Use for both continuous and discontinuous wefts
- Q Two continuous wefts interlocked at selvege (this occurs in some double cloth)
- R Eccentric, i.e., weft running at other than right angles to the warp for outlining in tapestry
- S Eccentric, i.e., weft at other than right angles to warp for curvilinear construction

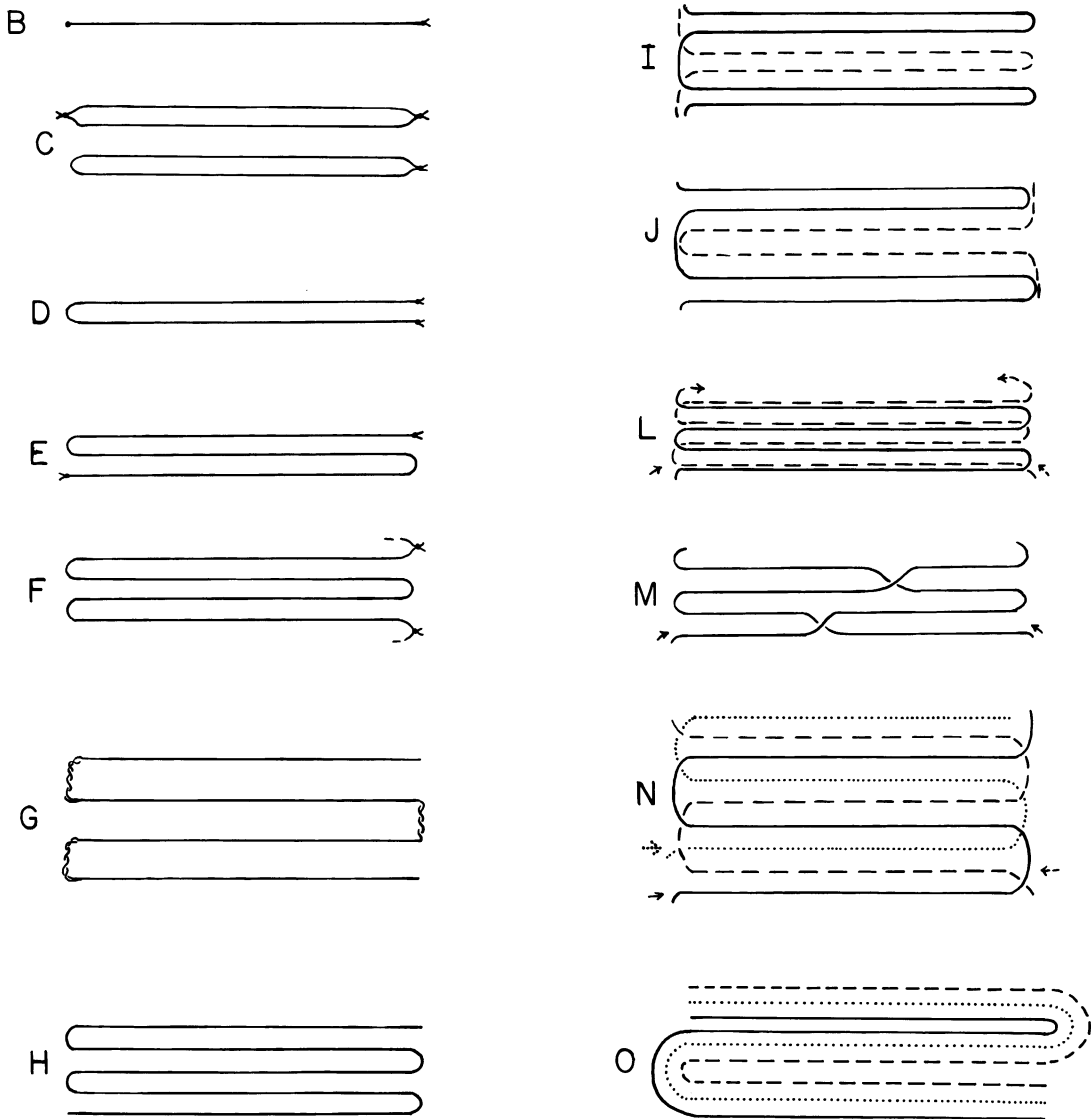


FIG. 193. Illustrations for Code XIII Weft Course, col. 34.

T Discontinuous, regionally inserted wefts plus others running selvage to selvage

CODE XIV. WEAVING, COLUMNS 35-36

When two techniques occur in one specimen, use Card 2 for the second. When three or more are present, also enter 4 in Special Features. Roman numerals indicate broad categories based on some common feature; the Arabic numbers are the ones used in coding.

Group I. Plain Weave

- 0 Unclassified
- 1 Plain weave: combination of 6 and 7
- 2 Plain weave: 1 warp × 1 weft
- 3 Plain weave: 1 warp × 2 weft
- 4 Plain weave: 2 warp × 1 weft
- 5 Plain weave: 2 warp × 2 weft
- 6 Plain weave: warps vary, e.g., paired and single, etc.
- 7 Plain weave: wefts vary, e.g., paired and single, etc.

## Group II. Floated Constructions—Warps Active

- 8 Unclassified
- 9 Simple.<sup>1</sup> Warps taken from ground weave movement to float as desired only on obverse of fabric for effect or pattern. The motif may be created on both faces by repeating warp movement in successive areas, but each area is a single-faced structure. Example: 41.1/9476.
- 10 Simple. All floated warps separated by plain weave nonfloated yarns. Floats appear only on obverse. Example: 41.1/9477.
- 11 Simple. Pattern created on obverse only, but some floats carried on reverse without creating negative-positive images. Similar to No. 9. Example: 41.1/9964.
- 12 Simple, balanced floats on both faces. Adjacent yarns work in opposition to each other, the floats of one face matched by comparable floats on a balanced construction on the other. Pattern image on opposite face is negative-positive. In simplest form, only two warps required. Example: B/789.
- 13 Simple. Floated yarns, separated by non-floated yarns appear on the reverse. Design created by presence and absence of color in apparent plain weave ground. Float system is based on the use of two or four adjacent warps or warp pairs. Example: 41.1/3465 has two white warps followed by two brown ones; all brown regularly over 1 under 1. The two white warps enter the weave without breaking the shedding order of the brown. No. 41.1/3464 same as preceding, but groups of four floated warps separated by groups of four nonfloated.
- 14 Complementary<sup>2</sup> warps: two sets working in opposition to each other are alternately used against a third warp to create a pattern. All float on both faces as needed. Obverse pattern clear, reverse less so. Example: B/8641.
- 15 Complementary warps: two sets working in opposition to each other are employed with several alternative sets which are used successively. The total number of warps on the obverse at any one pick should equal the total count of one warp set. Others are all on the reverse. This is analogous to No. 14 with three warp sets available for alternative use instead of just a single third set. Example: 41.2/933 (this specimen has five sets).

- 16 Complementary sets of warps, floats limited to reverse face. Obverse has appearance of plain weave but with color changes where complementary warps are substituted for basic or ground warps. Example: Paracas border panels which, depending on design and color plan, have an equal number of alternate warps on the reverse, all slack so that certain colors can be shifted to different locations if necessary.
- 17 Complementary warps handled in pairs which divide, transpose left and right as diagonal floats, then return to original alignment. Movement shifts face to face creating negative-positive images. Both ground and figures are floated yarns. Examples: 41.1/3447, B/8665.
- 18 Supplementary<sup>3</sup> warps which transpose left and right floating over a plain weave ground. Movement shifts face to face creating negative-positive images. Example: B/8607.
- 19 Supplementary warps shunt face to face, float without entering the basic shed. Example: 41.0/9084.

## Group III. Floated Constructions—Wefts Active

- 20 Unclassified
- 21 Simple. One continuous<sup>4</sup> weft, taken from basic weave to float as desired only on obverse of fabric for effect of pattern.
- 22 Simple. One continuous weft, pattern achieved on obverse only but some floats carried on reverse without creating negative-positive images.
- 23 Supplementary wefts, two continuous wefts, basic and pattern weft. The latter is laid with basic weft, then floats as desired on obverse only and travels selvage to selvage (brocade). Examples: B/8598, 41.0/5512.
- 24 Like No. 23, but pattern weft is discontinuous,<sup>5</sup> restricted to local area (brocade). Example: 65/5279.
- 25 Like No. 23, but floats all on reverse. Effect is that of an inlay.
- 26 Discontinuous weft inlay. A nonfloated construction included here because of close identity to No. 23. Example: B/1288.
- 27 Supplementary discontinuous wefts laid reg-

<sup>3</sup> *Supplementary yarns*—ones which theoretically could be removed without modifying the basic or ground structure.

<sup>4</sup> *Continuous yarns*—those which travel from side selvage to side selvage, or from end selvage to end selvage.

<sup>5</sup> *Discontinuous yarns*—those which do not travel from side selvage to side selvage or from end selvage to end selvage, but are limited to a restricted area.

<sup>1</sup> *Simple*—fabrics in which the warps and wefts are withheld from the plain weave ground to float as desired.

<sup>2</sup> *Complementary yarns*—two or more sets of inter-working yarns which are both necessary for the fabric structure.

- ularly over and under two or four warps between the basic weft which travels in plain weave order. This construction yields a tapestry-like finished product. The number of supplementary weft rows varies. Example: 41.2/788.
- 28 Supplementary discontinuous wefts laid regularly over and under two or four warps in a gauze fabric between the basic wefts which travel over 1 under 1. This construction yields a tapestry-like finished product. The number of supplementary weft rows varies. Example: 41.2/578. In this specimen, the gauze is type No. 70.
  - 29 Supplementary continuous weft shunts face to face without entering basic shed. Exception: long floats may be sustained by being caught or bound by a warp. Examples: B/8628 (border), B/4207.
  - 30 Supplementary discontinuous weft shunts face to face without entering basic shed. Exception: long floats may be sustained by being caught or bound by a warp. Examples: B/4339, B/8628 (main motifs); B/8593 (main motifs); B/8746, B/4139. When the supplementary weft floats equally on each face, a clear negative-positive image results. This relationship diminishes as variance in float lengths increases, to disappear where the supplementary yarn is held almost entirely to one face.
  - 31 Supplementary discontinuous interlocked weft shunts face to face without entering the basic shed. Interlocking system like two-way interlock in tapestry.
  - 32 Two or more continuous supplementary wefts shunt face to face in succession. While one is used, one or more others are dropped and create "long" floats on reverse. Example: 41.2/824.
  - 33 Two or more supplementary wefts shunt face to face in succession, one or more continuous, the other or others discontinuous. While one is used, one or more others are dropped and create "long" floats on reverse. Example: 41.0/5576 (one-half of bag only; in this, only one continuous yarn and one discontinuous).
  - 34 Two complementary continuous wefts work in balanced opposition to each other, floating on both faces. Result is negative-positive images of pattern. Example: B/4206.
  - 35 Two complementary continuous wefts paired in basic shed, then floated in succession on obverse; on obverse, one floats while other travels in shed. Reverse has appearance of plain weave; obverse may appear to be entirely of floats. Example: TM 99.176.
  - 36 Two complementary continuous wefts substituting for each other, one floating while other remains in basic shed. Floats all on reverse. Example: 41.2/819.
  - 37 Three continuous wefts of which two are complementary and alternate with each other in relation to a third weft. Floats, both faces. Pattern clear on obverse, obscured on reverse by the floating complementary wefts. Example: B/8593 (border).
  - 38 Three continuous wefts, of which two are complementary and alternate with each other in relation to a third weft. Floats, both faces. Pattern clear on obverse, obscured on reverse by the floating complementary wefts. Additional colors introduced by using discontinuous yarns in certain areas. Example: B/8556.
  - 39 One continuous nonfloating weft with a succession of additional floating discontinuous wefts which are interlocked where color difference is required. The pattern is created by the interplay of the continuous weft and the discontinuous wefts used one at a time. Two discontinuous yarns can overlap in portions of the design, in which case the one not used floats on the reverse. Example: B/8583.
  - 40 One continuous weft with two sets of additional discontinuous wefts which interlock in back where color difference is required. Each design band or unit has three colors, those of the continuous weft and the two discontinuous wefts which cross the area. Example: B/8670.
- Group IV. Floated Construction: both warps and wefts active
- 41 Unclassified
  - 42 Simple, single face, both warps and wefts floating. Example: 41.2/3426.
- Group V. Floated Weave: neither satin nor twill
- 43 Warp active. These have yarns handled as in plain weave between the warps involved in the staggered float systems.
- Group VI. Twill (terms: even—2 over 2 under; 3 over 3 under, etc. uneven—2 over 1 under; 2 over 3 under, etc.)
- 44 Twill: unclassified
  - 45 Twill: even, continuous diagonal
  - 46 Twill: even, horizontal herringbone
  - 47 Twill: even, vertical herringbone
  - 48 Twill: even, diamond
  - 49 Twill: uneven, continuous diagonal

- 50 Twill: uneven, horizontal herringbone
- 51 Twill: uneven, vertical herringbone
- 52 Twill: uneven, diamond
- 53 Twill: uneven, turned (weave turned or counter-changed for damask-like patterning).

#### Group VII. Satins

- 54 Satin: unclassified

#### Group VIII. Tapestry

- 55 Tapestry: unclassified
- 56 Tapestry: slit
- 57 Tapestry: wefts dovetailed about common warp (noninterlocked)
- 58 Tapestry: wefts interlocked between warps
- 59 Tapestry: two way or Swedish interlock
- 60 Tapestry of other technique than plain weave, e.g., twill and other floated constructions.

#### Group IX. Tubular Weave

- 61 Tubular weave: unclassified
- 62 Tubular weave: patterned. Interchange of warps from face to face forms double cloth in central area.
- 63 Tubular weave: patterned on both faces. Pattern warps carried inside tube when not used.

#### Group X. Double, Triple, etc. Cloth

- 64 Double, triple, etc. cloth: unclassified
- 65 Plain weave double cloth (2 sets warp, 2 sets weft, both faces finished).
- 66 Incomplete or single-faced double cloth (2 sets warp, 2 sets weft, 1 face finished; unfinished face has some warps floated, not woven with matching weft).
- 67 Triple cloth (3 sets warp, 3 sets weft, 3 complete layers of fabric).

#### Group XI. Gauze

- 68 Gauze: unclassified
- 69 Gauze: half-twist or movement
- 70 Gauze: one unit warp shift (involves 2 warps)
- 71 Gauze: two unit warp shift
- 72 Gauze: two unit warp shift, extra 1/1 interlacing weft between main crossings
- 73 Gauze: alternate pairs and split pairs, 4 warps (2 weft passages complete gauze movement).
- 74 Gauze: alternate pairs and split pairs, S warps (involves 1 warp pair from each adjacent 2-pair warp groups; 4 weft passages, complete gauze movement).

#### Group XII. Pile Fabrics

- 75 Pile: unclassified
- 76 Pile formed by uncut loops of basic weft.
- 77 Pile formed by uncut loops of extra or supplementary weft placed in same shed as basic weft.
- 78 Pile formed by cut loops of extra or supplementary weft placed in same shed as basic weft.
- 79 Pile formed by knotting yarn or fibers to warp or weft.

#### Group XIII. Miscellaneous Techniques

- 80 Unclassified
- 81 Interlocked warp construction: weft continuous selvage to selvage
- 82 Interlocked warp construction: discontinuous wefts matching the color changes in the warps
- 83 Dovetailed warp construction, i.e., patchwork: warps turn about scaffold yarn
- 84 Transposed-warp techniques where warps do not float
- 85 Open work: unclassified
- 86 Open work: by irregular handling of weft
- 87 Open work: by spacing warps and wefts
- 88 Open work: slits in plain weave (monochrome slit tapestry)
- 89 Warp wrapped patterned construction

#### CODE XV. COMPLETE OR NOT, COLUMN 37

- 1 Complete in loom length only
- 2 Complete in loom width only
- 3 Complete in both loom length and width
- 4 Incomplete length
- 5 Incomplete width
- 6 Incomplete length and width
- 7 Length as sewn
- 8 Width as sewn
- 9 Length and width as sewn

4, 5, and 6 are included as we have recorded incomplete measurements where these are unusually large and are useful in providing maximum measurements. Some incomplete fabrics may be larger than any of the complete ones.

#### DIMENSIONS, COLUMNS 38-41

Dimensions are given in millimeters. If a specimen measures more than 9999 mm, enter 6 in Special Features.

Card 1: Length (warp-wise for weaving and twinning)

Card 2: Width (weft-wise)

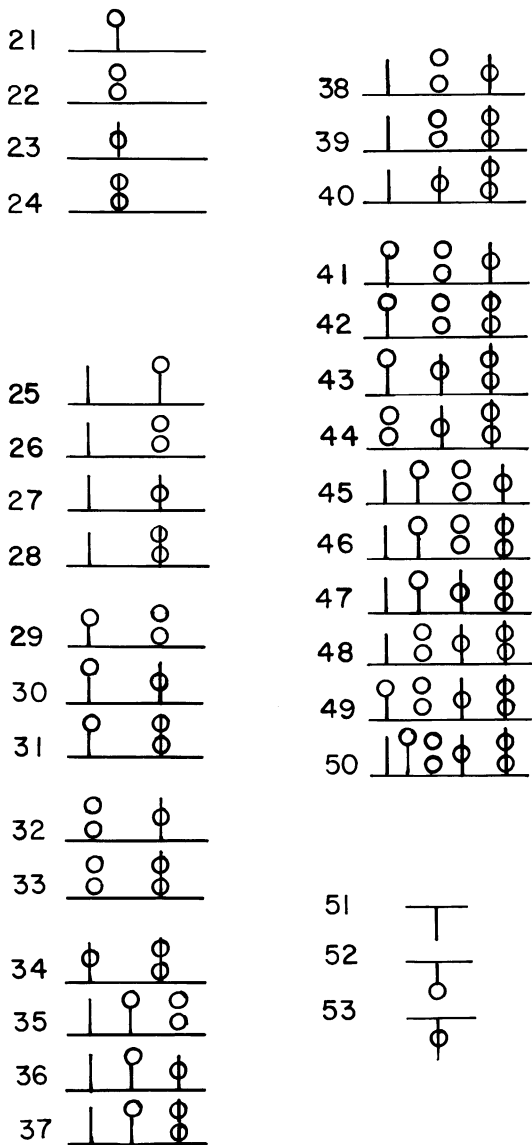


FIG. 194. Illustrations for Code XVI Fiber Material, cols. 42 and 43.

CODE XVI. FIBER, MATERIAL, COLUMNS 42-43

Use Card 1 for warp or single-element construction; Card 2 for weft.

Plant Fibers

- 0 Unlisted plant fiber
- 1 Cotton
- 2 Cotton × bast (plied together)

- 3 Cotton plus bast (blended)
- 4 Combinations: yarns of cotton and cotton × bast
- 5 Combinations: yarns of cotton and cotton plus bast blended
- 6 Combinations: yarns of cotton × bast and cotton plus bast blended
- 7 Combinations: yarns of cotton, cotton × bast, cotton plus bast blended
- 8 Bast
- 9 *Junco* (sedge)
- 10 Hard (Fourcroya, etc.)
- 11 Unlisted combinations: yarns of differing plant and/or animal fibers

Animal Fibers and Combinations

- 12 Human hair
- 13 Cameloid wool, unspecified species
- 14 Combinations: yarns of wool, yarns of cotton
- 15 Combinations: yarns of animal hair, and yarns of cotton
- 16 Unlisted animal hairs

Blended Plant and Animal Fibers

- 17 Cotton plus wool
- 18 Unlisted blend

Plant and Animal Fibers Combined by Plying

- 19 Cotton × wool

Fiber percentage by pairs (fig. 194). Materials as combined in warp pairs

- 20 Unlisted
- 21 ¼ bast
- 22 ½ bast
- 23 ¼ bast blend
- 24 ½ bast blend

Materials as combined in warp pairs in different sections of fabric forming either warp stripes or varied warps

- 25 Cotton vs. ¼ bast
- 26 Cotton vs. ½ bast
- 27 Cotton vs. ¼ bast blend
- 28 Cotton vs. ½ bast blend
- 29 ¼ bast vs. ½ bast
- 30 ¼ bast vs. ¼ bast blend
- 31 ¼ bast vs. ½ bast blend
- 32 ½ bast vs. ¼ bast blend
- 33 ½ bast vs. ½ bast blend
- 34 ¼ bast blend vs. ½ bast blend
- 35 Cotton vs. ¼ and ½ bast
- 36 Cotton vs. ¼ bast and ¼ bast blend
- 37 Cotton vs. ¼ bast and ½ bast blend

- |  |  |
|--|--|
| 38 Cotton vs. 1/2 bast and 1/4 bast blend                      | 48 Cotton vs. 1/2 bast, 1/4 bast blend, and 1/2 bast blend           |
| 39 Cotton vs. 1/2 bast and 1/2 bast blend                      | 49 1/4 bast vs. 1/2 bast, 1/4 bast blend, and 1/2 bast blend         |
| 40 Cotton vs. 1/4 bast blend and 1/2 bast blend                | 50 Cotton vs. 1/4 bast, 1/2 bast, 1/4 bast blend, and 1/2 bast blend |
| 41 1/4 bast vs. 1/2 bast and 1/4 bast blend                    | 51 Paired 2- and 1-ply cotton  |
| 42 1/4 bast vs. 1/2 bast and 1/2 bast blend                    | 52 Paired 1 cotton single and a 2-ply, 1/2 of which is bast          |
| 43 1/4 bast vs. 1/4 bast blend and 1/2 bast blend              | 53 Paired 1 cotton single and a 2-ply, 1/2 of which is blended bast  |
| 44 1/2 bast vs. 1/4 bast blend and 1/2 bast blend              |  |
| 45 Cotton vs. 1/4 bast, 1/2 bast, and 1/4 bast blend           |  |
| 46 Cotton vs. 1/4 bast, 1/2 bast, and 1/2 bast blend           |  |
| 47 Cotton vs. 1/4 bast, vs. 1/4 bast blend, and 1/2 bast blend |  |

Code XVII

YARN STRUCTURE

Columns 44-45; 46-47; 48-49

Use Card 1 for warp or for single element construction; Card 2 for weft

This code is a numerical-alphabetical code in which Nos. 0-8 refer to the yarn material, and Letters A-Z to the yarn structure. Up to three types of warp and weft may be recorded in the following pairs of columns: 44-45; 46-47; 48-49.

Yarn material is entered in the even columns, the first of each pair; yarn structure in the odd columns, the second.

When more than three types of warp or weft occur in a specimen, also enter 8 in Special Features code.

Fiber, Material -- Columns 44, 46, 48Yarn Structure -- Columns 45, 47, 49

0 Unlisted	A Unlisted	M More than 3-ply	∇
1 Cotton	1st or spinning twist direction	N More than 3-ply	∧*
2 Cotton x bast (plied together)	B Single \	O Other	
3 Cotton x cotton and bast blended (one strand all cotton, the other blended cotton and bast, the two plied together)	C Single /	3rd twist direction	
4 Cotton and bast blended (both strands are cotton and bast blended, the two plied together)	D 2-ply √	P 2-ply redoubled	∨
5 Bast	E 2-ply ∧	Q 2-ply redoubled	∨
6 Junco	F 2-ply √+ / *	R 3-ply redoubled	∨
7 Wool	G 2-ply /+ \ /	S 3-ply redoubled	∨
8 Human hair	H 2-ply √+ \ \	T More than 3-ply redoubled	∨
	I 2-ply /+ \ \	U More than 3-ply redoubled	∨*
	J 3-ply √	V 3 2-ply	∨
	K 3-ply ∨	W 3 2-ply	∨
	L Other	X More than 3 2-ply	∨*
		Y More than 3 2-ply	∨*
		Z Unspun fiber or filament	

\*1 Example: F=Cotton spun \ plied with bast spun / , the two doubled /

Asterisks within twist symbols indicate any combination over 3

FIG. 195. Code XVII, cols. 44-45; 46-47; 48-49.

### CODE XVIII. REPAIR (SEWING OR SUPERSTRUCTURAL), YARN STRUCTURE, COLUMNS 50-51

When two types of yarn occur in one specimen, use Card 2 for the second. When three or more are present, enter 11 in Special Features.

Use Code XVII for Numerical Alphabetical Entries

For a collection in which no embroidered superstructural yarns occur, only repair and sewing yarns were entered.

### CODE XIX. COLOR: TYPES AND APPLICATION, COLUMNS 52-53

Use Card 1 for warp or single-element construction; Card 2 for weft.

#### Yarns

- 0 Uncertain: either pigmented, dyed, or natural (for both yarns and finished products)
- 1 Natural (natural color and tone present in cotton and wools; this does not include white)
- 2 Two-tone yarns of natural colors
- 3 Pigmented
- 4 Dyed
- 5 Two-tone dyed yarns
- 6 Resist dyed yarns—ikat
- 7 Wrapping of fibers about restricted areas of yarns (achieves color contrasts where desired, or textural differences in others)
- 8 Combination: natural and dyed
- 9 Combination: pigmented and dyed
- 10 Combination: natural and pigmented
- 00 Other combination of two or more of preceding

#### Finished Products

- 11 Pigmented: overall application
- 12 Pigmented: limited areas; painted, stamped
- 13 Pigmented: smears only or traces
- 14 Dyed: overall application
- 15 Dyed: limited areas; painted, stamped
- 16 Tie dyed
- 17 Traces, smears of dyes

### CODE XX. COLORS, COLUMNS 54-57

Use Card 1 for warp or single-element construction; Card 2 for weft. The four columns are designated for the combination of colors. If more than four colors occur in a specimen, use Special Features Code, Item 9.

- |          |          |
|----------|----------|
| 0 White  | 5 Yellow |
| 1 Tan    | 6 Green  |
| 2 Brown  | 7 Blue   |
| 3 Red    | 8 Purple |
| 4 Orange | 9 Black  |

When a color or colors are restricted to some portion of a fabric, as in striped goods, and the field or other stripes were assumedly white, 0, indicating white, is used in addition to the color present. Otherwise one could interpret the piece as all brown and red, or whatever is listed.

In one recorded collection, colors were rare and modified by time and dirt. Some blackish, possibly

dark blue, traces of color were listed as black, a salmon-red as orange.

### COUNTS, COLUMNS 58-62

Card 1: warp count or number of rows (in looping).  
Card 2: weft count.

Where marked variation in counts occurs within a single specimen, use Special Features Code, no. 16. If warp cannot be distinguished from weft, as in some fragments, use Special Features Code, no. 15.

### CODE XXI. TWINING TWIST DIRECTION, COLUMN 63

Use Card 1 for twist direction in body of fabric; Card 2 for twist direction in end-finish.

- 1 Z twist
- 2 S twist
- 3 S and Z twist used irregularly
- 4 S and Z twist used rhythmically at standard intervals
- 5 S and Z twist used in adjacent wefts placed in contact with each other
- 6 S and Z twist used in compact weft bands of more than two weft rows

### CODE XXII. TERMINAL CONSTRUCTION AND INTERWARP WEFT KNOTS, COLUMN 64

#### Twining

- 1 Accidental twisting of warps
- 2 Accidental crossing of wefts in adjacent weft rows

#### Weaving

- 3 Shows as an area with less compact weft within the body of the fabric
- 4 Shows as an area in which pattern is modified or abandoned
- 5 Terminal construction adjacent to the warp ends

#### Both Weaving and Twining

- 6 Nondetectable (use only when full loom length survives)

#### Interwarp Weft Knots

- 7 Occurrence of weft knots between warps in twining (fig. 196)

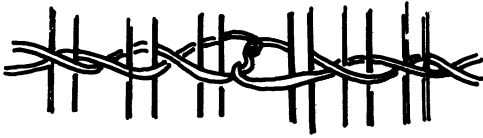


FIG. 196. Illustration for Code XXII Terminal Construction and Interwarp Knots, col. 64.

### CODE XXIII. SELVAGE KNOTS, COLUMN 65

When both selvages present, use Cards 1 and 2

#### Primary Selvage (fig. 197)

- A Unlisted
- B Single turn about first warps
- C Like B, with overhand crossing of the wefts inside selvage warps
- D Like B, with overhand bend (thumb or openhand knot) at center of yarn used for weft
- E Identical with D, except that two yarn ends are united by the overhand bend
- F Cowhitch about selvage warps
- G Magnus hitch, similar to cowhitch with two full turns in one half of knot.
- H Like G, but started by joining two yarn ends with overhand bend
- I Secured with two turns about selvage warps before ends pass through bight
- J Middle of weft yarn tied to selvage warps with half hitch
- K Ends of two yarns tied to selvage warps with half hitch
- L Ends of two yarns tied to selvage warps with clove hitch
- S<sup>6</sup> Primary: cowhitch of paired yarns with only one end carried into the weft row
- T<sup>6</sup> Primary: cowhitch of paired yarns with pair separating to form two weft rows

#### Terminal Selvage (fig. 197)

- M Unlisted terminal selvage knot
- N Overhand bend united weft ends outside last warp
- O One weft element tied about last warp with overhand knot, then weft ends united as in N
- P Two weft rows; both ends united in one overhand bend
- Q Two weft rows; all ends united in an overhand bend after being tied individually with the same knot as in N
- R Simple overhand crossing precedes the

<sup>6</sup> S and T are used at this point because we overlooked these two knots while developing the code.

overhand bend. One primary selvage, coded as A, has this knot.

#### Combinations of Various Selvage Knots

- U Combination of C, G, H
- V Combination of C and D
- W Combination of various primary selvage knots
- X Combination of various terminal selvage knots

### CODE XXIV. WEFT HANDLING, COLUMN 66

Use Card 1 for weft handling in body of fabric; Card 2 for end-finish.

- 1 Singly
- 2 In pairs
- 3 In triples
- 4 In multiples
- 5 Combination of 1 and 2 in different areas
- 6 Combination of others in different areas
- 7 Combination of 1, 2, 3, or 4 in regular alternating order
- 8 Combination of preceding to form rep, either an overall effect or weft stripes

*Note:* All twined weft have two yarns or groups of yarns twisting about the warps. The terms listed, when used for twined fabrics, apply to the yarn on only one side of warps, i.e., "in pairs" means that in any one weft row four yarns are used in one weft passage.

### CODE XXV. WARP ENDS, COLUMN 67

When both ends present, use Cards 1 and 2

- A Missing or frayed through wear or decomposition
- B Unclassified
- C Loops; warping done with one yarn twined as indicated (fig. 198)
- D Loops; like C with floating advance, warped with two or more yarns used one at a time
- E Loops; warping done with one yarn, twined as indicated
- F Loops; like E with floating advance, warped with two or more yarns used one at a time
- G Loops; warping done with a pair of yarns handled as a pair
- H Loops; like G with floating advance, warped with two or more pairs of yarns handled one pair at a time
- I Loops; warping done with two pairs of yarns used together
- J Loops; like I with floating advance, warped with 4 or more pairs of yarns handled 2 pairs at a time

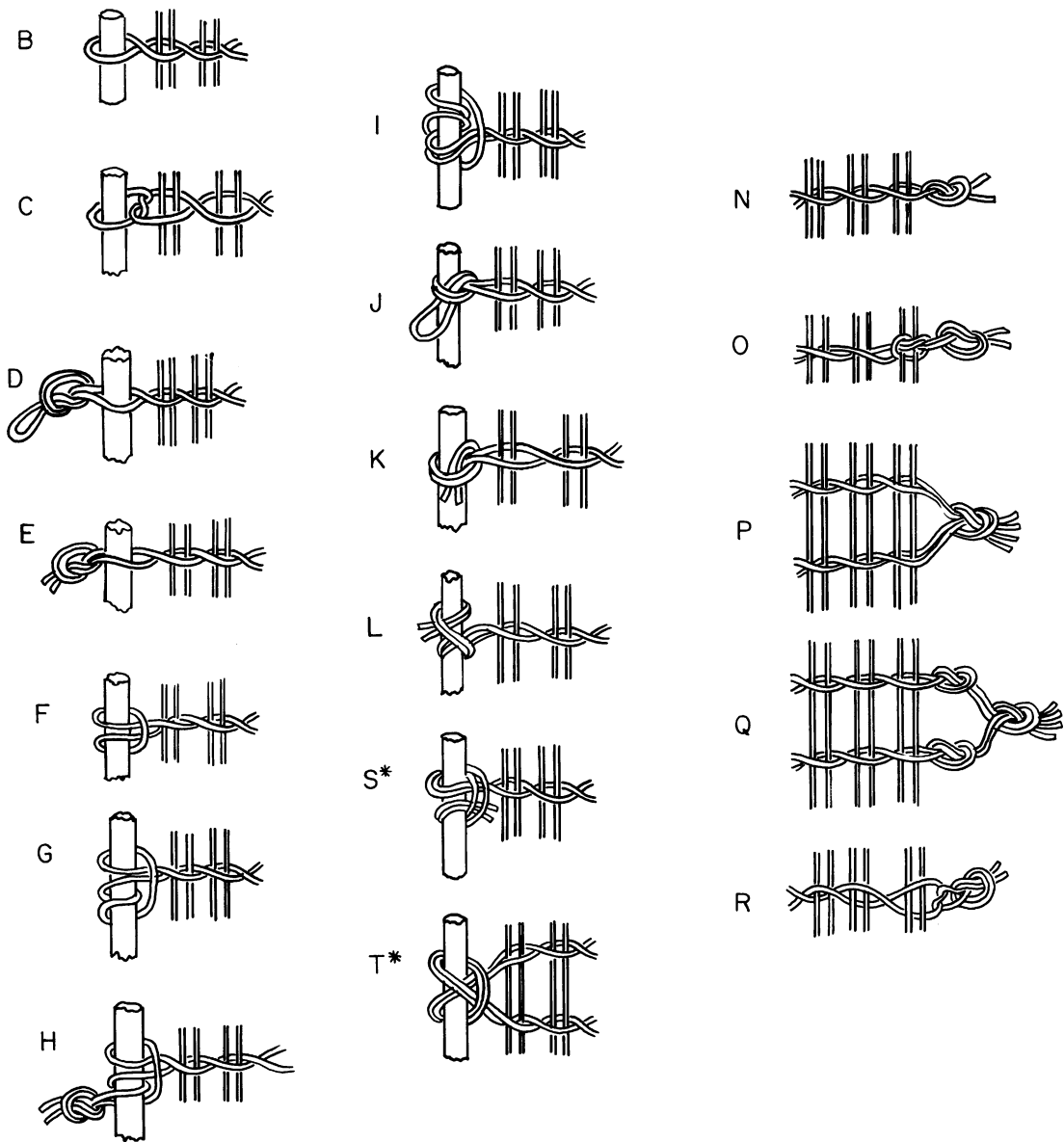


FIG. 197. Illustrations for Code XXIII Selvage Knots, col. 65.

- K Loops; twined as indicated
- L Loops; twined weft gone
- M Loops; with heading or weft woven in
- N Loops; uncut, form fringe beyond twined row as in C
- O Loops; uncut, form fringe beyond any other twined construction than C
- P Loops; uncut, form fringe, no twining
- Q Loops uncut, chained

Warp Ends Cut

- R Cut
- S Cut ends turned and interwoven diagonally
- T Cut and form fringe
- U Cut and form fringe, knotted to prevent fraying
- V Cut and form fringe, knotted as in Mexican type rebozas
- W Cut and plaited

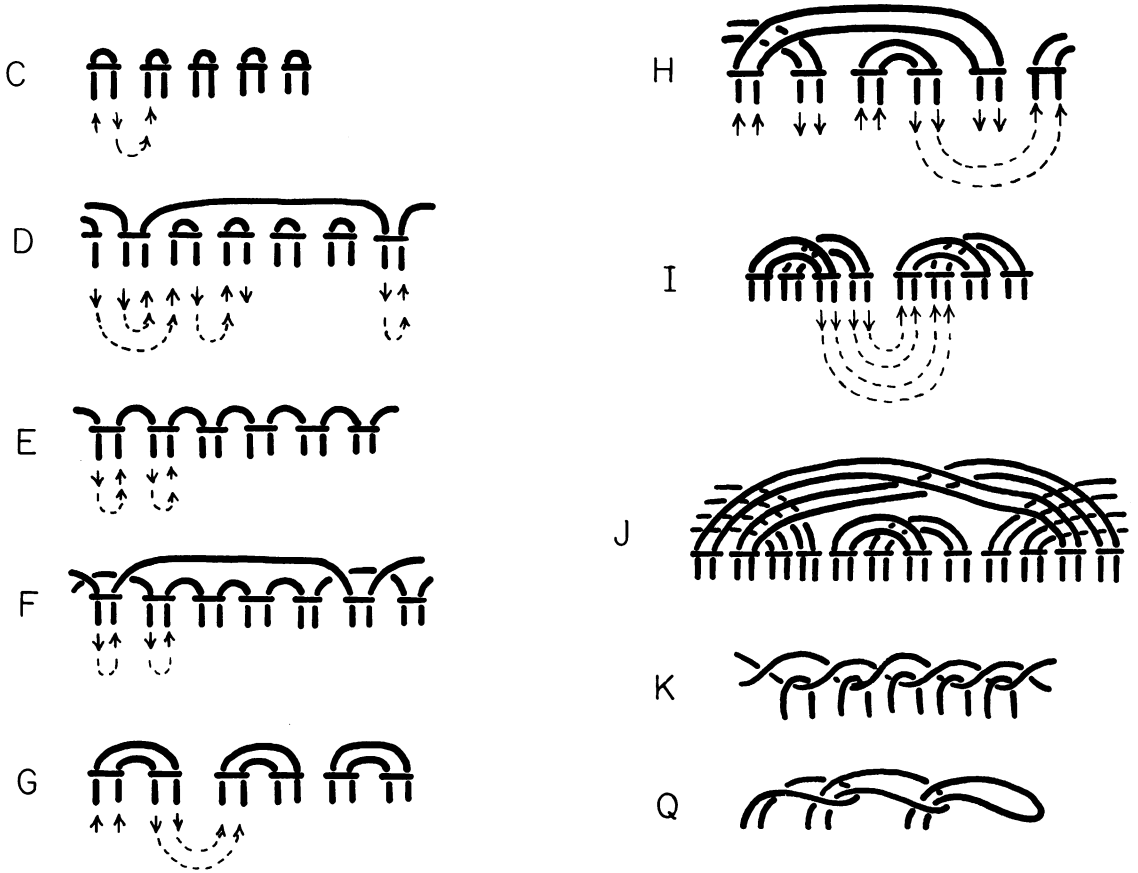


FIG. 198. Illustrations for Code XXV Warp Ends, col. 67.

Combinations

- X Combined D, H
- Y Combined C, G
- Z I combined with others (I, G; I, H, etc.)

CODE XXVI. WARP END: FINISH,  
COLUMN 68

When both ends present, use Cards 1 and 2

- A Unlisted
- B Heading cords or yarns used
- C No heading cord, the weft follows same order of insertion as in rest of fabric
- D Tubular ends
- E Warp ends grouped and bound or tied with a continuous yarn with a succession of knots

Compact Band or Single Row of Twining

- F Unlisted compact band
- G Incomplete, not enough to classify

- H About regular pairs or same number of warps as handled regularly in body of fabric
- I About pairs in split-pair order
- J About more than one pair or groups of three warps regularly handled
- K About more than one pair splitting the groups in alternating rows
- L First and last rows about the same warps as in rest of fabric, intervening wefts or weft about two or more pairs handled regularly
- M First and last weft rows about the same warps as in rest of fabric, intervening wefts about two or more pairs splitting the groups in alternate rows
- N First and last rows about same warp pairs as in body of fabric. Other rows in split order about groups of three warps (not 3-warp pairs)
- O First row over regular pairs; second and following rows about two or more pairs in regular order

- P** First row over regular pairs; second and following rows about two or more pairs in split order
- Q** (Like N); first and last rows about same warp pairs as in body of fabric; other rows in regular order about groups of three warps (not 3-warp pairs)
- R** Outer row or rows in regular order about groups of three warps; inner row about same warp pairs as in body of fabric
- S** Outer rows in split order about groups of three warps; inner row about same warp pairs as in body of fabric
- T** Outer row or rows in regular order about more than one pair of warps; inner row about same warp pairs as in rest of fabric
- U** Outer rows in split order about more than one pair of warps; inner row about same warp pairs as in rest of fabric

#### Other End-Finish

- V** Spaced rows of twining about regular pairs but closer or different than the regular weft

#### CODE XXVII. WARP END: NUMBER OF WEFT ROWS, COLUMN 69

When both ends present, use Cards 1 and 2

- 0 Incomplete
- 1 1 row
- 2 2 rows
- 3 3 rows
- 4 4 rows
- 5 5 rows
- 6 6 rows
- 7 7 rows
- 8 8 rows
- 9 More than 8 rows

#### Code XXVIII. REPAIR TECHNIQUES, COLUMN 70

If two repair techniques occur within a specimen, use Cards 1 and 2. If there are more than two, use Special Features Code; enter no. 10.

- 0 Unlisted

#### Weak Areas

- 1 Insertion of interwoven or darned reinforcing ("repair") wefts
- 2 Insertion of twined reinforcing ("repair") wefts

#### Edges

- 3 Tying off of broken warp or weft ends
- 4 Rolling or bunching of cut, torn, or woven edge, secured by sewing

#### Holes and Tears

- 5 Whipping of edges of holes
- 6 Patching
- 7 Darning
- 8 Drawstring closing

#### Joining

- 9 Joining of pieces

#### Code XXIX. STITCHES, COLUMN 71

When two types of stitches occur within a specimen, use Cards 1 and 2.

- 0 Unlisted
- 1 Running stitch (fig. 199)
- 2 Back stitch
- 3 Stem stitch
- 4 Knit stem stitch, face and reverse
- 5 Whipping stitch
- 6 Blanket or buttonhole stitch
- 7 Spiral joining (overcast) stitch
- 8 Laced joining (fishbone) stitch
- 9 Successive half-knots or hitches

#### CODE XXX. SUPERSTRUCTURAL, COLUMN 72

Features added to finished fabrics

- 0 Unlisted superstructural feature

#### Embroidery

- 1 Single face: isolated outline figures or details against ground fabric
- 2 Single face: filled figures or areas
- 3 Double face: filled figures or areas, finished both sides, color distribution identical
- 4 Double face: only in case each face is embroidered
- 5 Needle-created edging or borders

#### Appliqué

- 6 Fabric on fabric
- 7 Feathers attached
- 8 Metal attached
- 9 Fringes other than those created with warp and weft ends

#### CODE XXXI. SPECIAL FEATURES, COLUMNS 73-74

When there is more data than can be entered in the space assigned to each code, or if there is some distinct or noteworthy feature, that fact is noted here. If needed, use Cards 1 and 2.

- 1 Fragments, too incomplete for full analysis

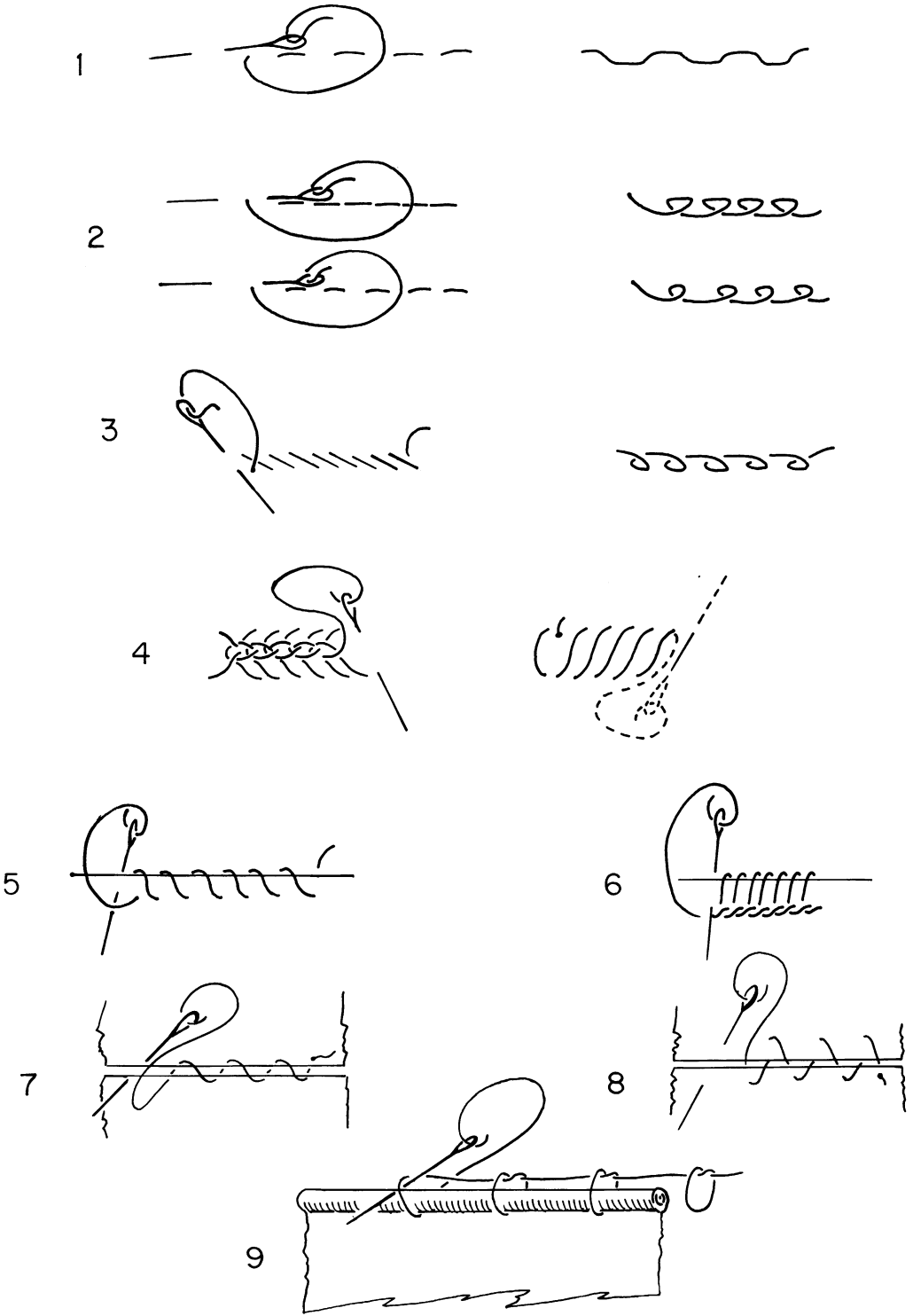


FIG. 199. Illustrations for Code XXIX Stitches, col. 71.

- 2 Chronology and excavation data, e.g., parts of same specimen in two layers, etc.
- 3 Cultural period, e.g., item fixed at juncture of two periods
- 4 Technique
- 5 Identification and function, e.g., dual function
- 6 Dimensions if measurement is more than 9999 mm.
- 7 Fiber, material
- 8 Yarn structure
- 9 Colors
- 10 Repair technique
- 11 Repair or sewing yarns
- 12 Superstructural feature
- 13 Design
- 14 Woven product other than rectangular
- 15 Counts: where warp and weft cannot be identified
- 16 Counts: range or variations
- 17 Weft course
- 18 Terminal construction
- 19 Warp ends
- 20 Warp end-finish
- 21 Interlocked warps
- 22 Added warps
- 23 Twining twist, e.g., when 360-degree twist is used in any section of fabric
- 24 Selvage knots
- 25 Mesh size, e.g., larger than 99 mm not square or with variations
- 26 Netting knots
- 27 Knots
- 28 Some warps turned and used as wefts or vice versa
- 29 Some warps or wefts tied or knotted with other material or yarn
- 30 Weft course turns within fabric; used to square up or straighten the weft alignment
- 31 Some warp pairs or multiples twisted deliberately for effect
- 32 Looping, with any kind of end-finish or edging
- 33 Sporadic, accidental twisting of warps in limited sections of their length
- 34 Interlocked wefts
- 35 Warp movement; has in addition to movement indicated, a half-twist (eye) detail not covered by code
- 36 Warp movement
- 37 Remains of sewing; not enough left to classify in other codes
- 38 An edge turned as with a hem and sewn
- 39 Fabric folded and sewn along edges
- 40 Twining used in unusual supplementary details

CODE XXXII. DESIGN—GENERAL,  
COLUMN 75

Card 1: Double face: motif visible on both faces of fabric, with or without same color distribution.  
Card 2: Single face: motif not clear on reverse face of fabric.

- 0 Variations in material, color, or yarn grouping, probably not deliberate attempt at patterning
- 1 Effect
- 2 Stripes
- 3 Nonobjective
- 4 Representational
- 5 Combined nonobjective and representational
- 6 Some type of pattern or effect achieved; too fragmentary to classify

CODE XXXII. DESIGN—STRIPES,  
PATTERN, AND EFFECT:  
HOW ACHIEVED, COLUMN 76

Use Card 1 for warp or single element construction; Card 2 for weft

- A Unlisted
- B Detected by decomposition
- C Use of color in or on yarns before warping, or applied on finished fabric
- D Use of color to create barred effect
- E Use of different materials
- F Use of yarns of different ply paired or grouped together: as, 2 plus 1 ply or 2-1-ply when 2-2-ply is the common type in rest of fabric
- G Use of yarns of different size or groups of yarn to produce ribbing or rep effect
- H Use of yarns of different twist direction
- I Use of varying compactness, i.e., count variation
- J Use of paired vs. singles or other combinations such as single vs. 2-ply
- K Combination of techniques in which color contrasts occur
- L Combination of EF
- M Combination of FG
- N Combination of BF
- O Combination of EG
- P Combination of EH
- Q Combination of CE
- R Combination of BE
- S Combination of CEF
- T Combination of BEF
- U Combination of EFG
- V Combination of FH
- W Combination of CF
- X Combination of EFH

- Y Combination of IE
- Z Combination of techniques (monochrome)

Categories L to Z were used for various combinations as they were encountered while transferring data from source cards. Those not covered by L to Z were entered as A.

**CODE XXXII. DESIGN—NONOBJECTIVE,  
COLUMN 77  
(Stripes handled in Column 76)**

When two motifs present, use Cards 1 and 2; when three or more present, use in Special Features Code, no. 13

- A Unlisted
- B Plaid
- C Zigzag band
- D Stepped band
- Z Wavy band
- F Squares and rectangles
- G Diamonds
- H Stepped diamonds
- I Triangles
- J Stepped triangles, stepped blocks
- K Stepped frets
- L Crosses
- M Stars, any kind
- N Circles, ovals, dots
- O Chevrons
- P S figures
- Q Wave symbols
- R Scroll
- S Figures possibly based on some representational form or detail too modified to classify in that category

**CODE XXXII.  
DESIGN—REPRESENTATIONAL MOTIFS,  
COLUMN 78**

When two motifs present, use Cards 1 and 2. When three or more present, use Special Features Code, no. 13.

- A Unlisted
- B Human figures
- C Human heads
- D Parts of human body (eyes, hands, etc.)
- E Figure (human?) with appendages of features suggesting mythological connotation, e.g., some Paracas and Nazca figures
- F Anthropomorphic figure (animal with hu-

man attributes, or human with animal attributes)

- G Monkeys
- H Cats
- I Other land mammals (foxes, mice, etc.)
- J Marine mammals
- K Fish
- L Crustaceans, mollusks
- M Birds
- N Birds, two-headed
- O Reptiles
- P Double-headed (snake?) motif
- Q Insects and spiders
- R Faces or heads, abstract
- S Plants
- T Flowers
- U Fruit and seeds
- V Creatures, unidentified
- W Reserved
- X Reserved
- Y Objects (weapons, clubs, etc.)
- Z Multitude of representational motifs of equal importance or several forms complementing the main motif

**CODE XXXII. DESIGN—LAYOUT,  
COLUMN 79**

- 0 Unclassified
- 1 Entire area
- 2 Entire area, diagonal plan
- 3 Entire area, horizontal plan
- 4 Entire area, vertical plan
- 5 Limited to corners
- 6 Limited to borders
- 7 Borders plus field
- 8 Panels or band

**CODE XXXII. DESIGN—ORIENTATION  
OF REPEATS, COLUMN 80**

- 1 All in same relative position
- 2 Facing left and right alternately without being inverted
- 3 Facing left and right and alternately inverted
- 4 Facing one way but alternately inverted as in 90° mirror images
- 5 Balanced interlocking. Motifs so planned and proportioned that if pivoted about a specific point, the first nests or interlocks with the second. If such a motif fills exactly half of a given area, the repeat will fill the other half.

## APPENDIX 2. THE CLEANING AND CONSERVATION OF THE HUACA PRIETA TEXTILES

From Bird, 1951b; and tape, 1968–1969

The excavated textiles were transported to New York in their original condition, hardened with salt and dirty with earth and ash. There was no precedent for the cleaning and conservation of such specimens. Bird therefore devised the following two-step process which first removed the salt, and then the dirt, without damaging the delicate fibers of the fabrics.

The process of cleaning the thousands of specimens took place under Bird's direction. A full-time assistant, Mrs. Tora Ogren, worked one year on the task.

It was first necessary to remove the salt, which had encased the dirt within the fragments, and made it impossible to open them without breaking the fibers. Several salt-encrusted wads of fabrics, as they were found in the field, were placed in cheesecloth, labeled, and dipped in a solution made of one part commercial ambroid (cellulose acetate) to nine parts acetone. They remained in the solution a short time, long enough for bubbling to stop. Then, thoroughly saturated, the specimens were placed unfolded on wire screen to dry. The fabrics were then very stiff and immobilized, but ready for the extraction of the salt.

The dry lumps of hardened fabric were placed in tanks with clean, running water. The salt passed out through the specimens as water circulated through them. They were left in the water many hours, or even days. The water was tested with silver chloride, a salt indicator, to determine when salt was no longer present.

The second part of the cleaning process removed the cellulose acetate and earth, and softened the fabrics. Excess water was drained off the same cheesecloth bags of hardened specimens, and they were placed in jars of acetone which dehydrated the fabrics, softened the cellulose acetate, and removed the earth. The removal of dirt was hastened by agitating the bags up and down, and moving the bags through a series of other, cleaner, jars of acetone. As the fabrics were moved up and down, the dirt emerged in clouds. The specimens were then removed from the bags, and opened.

Still damp, individual specimens were then pinned, unfolded, on composition board covered with aluminum foil. The pins penetrated the board, and the foil's smooth, nonabsorbent surface prevented friction on the delicate parts of fabrics which might otherwise pull and tear. The pinning properly aligned the warps and wefts. The textile was then left to dry. Later, it was mounted between clear plastic, ready for analysis and storage.

In some cases dirt remained on the fabric after the acetone bath. When additional cleaning was warranted, the flattened fabric was placed between screens and carefully washed in water with detergent (Orvis). Sponges were used to press the water through the screens and the fabric. This water bath sometimes caused the fibers to collapse and mat. That condition was avoided to some extent by a final dehydration in acetone, or a saturation with benzine.

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