17

THE DECLINE OF THE HARAPPANS

GEORGE F. DALES
May 1966

Four thousand years ago the world's first three civilizations were flourishing. The Sumerians of Mesopotamia and the Egyptians of the Nile valley are reasonably well known to us. The third civilization embraced an area more extensive than either Egypt or Mesopotamia, yet it is far less known. Its most impressive remains—the dead cities of Mohenjo-daro and Harappa in the Indus valley of what is now West Pakistan—were first excavated four decades ago [see "A Forgotten Empire of Antiquity," by Stuart Piggott; SCIENTIFIC AMERICAN, November, 1953]. Our knowledge of this remarkable culture of South Asia, which is called the Harappan civilization, has been limited until recently to what could be gleaned from archaeological findings at these two sites, mainly because the written records of the culture are scanty and not yet deciphered. New discoveries in both Pakistan and India, however, are now adding much to our understanding of certain events in Harappan times.

In the past few years many Harappan towns and villages have been discovered well outside the civilization's nucleus in the Indus basin, indicating that the Harappan state extended much farther than earlier investigators had realized. It is now known that Harappan authority reached westward at least to the modern border between Iran and Pakistan, that it touched the foothills of the Himalayas to the north, even extending to the headwaters of the Ganges, and that it stretched southward along the west coast of India as far as the Gulf of Cambay to the north of modern Bombay. The Harappan civilization thus controlled or dominated a triangle roughly 1,000 miles on a side [*see illustration on next page*]. A series of carbon-14 dates from Harappan sites along the coast of India also shows that many of these southerly towns and trading posts had continued to be occupied much later than the sites in the Indus valley. This and other bits of unexplained evidence have raised doubts concerning a fundamental hypothesis about the Harappan civilization: that Harappa and Mohenjo-daro had been sacked, and the Harappan civilization liquidated or absorbed, by the Aryan invaders who presumably brought the Indo-European language and culture to prehistoric India sometime during the second millennium B.C.

With the intention of learning more about the life and death of Harappan civilization the University of Pennsylvania and the Pakistan Government Department of Archaeology agreed on a joint reopening of the Mohenjo-daro site during the winter of 1964–1965. The expedition undertook, as part of a three-year program, to determine the total depth of the site's deposits of human occupation, something earlier workers had been unable to establish because groundwater lies only 15 feet below the surface of the plain at Mohenjo-daro. Efforts were made to devise some means of excavating these flooded occupation levels and to analyze evidence at the site, in the form of abundant accumulations of water-deposited silt, that the city had more than once been exposed to major floods.

During its mature period, from a few centuries before to a few centuries after 2000 B.C., the city of Mohenjo-daro housed an estimated 40,000 inhabitants in an area about a mile square. Today its ruins consist of two parts; a western mound that contains the so-called citadel is separated by a broad gully from a much larger eastern mound that contains the lower town [*see illustration on page 159*]. At the southwest corner of the lower-town mound an undisturbed area rises some 35 feet above the surrounding plain. In 1964 this area was selected for excavation in the hope of obtaining a sequence of stratified materials that could be correlated with the artifacts unearthed by earlier expeditions.

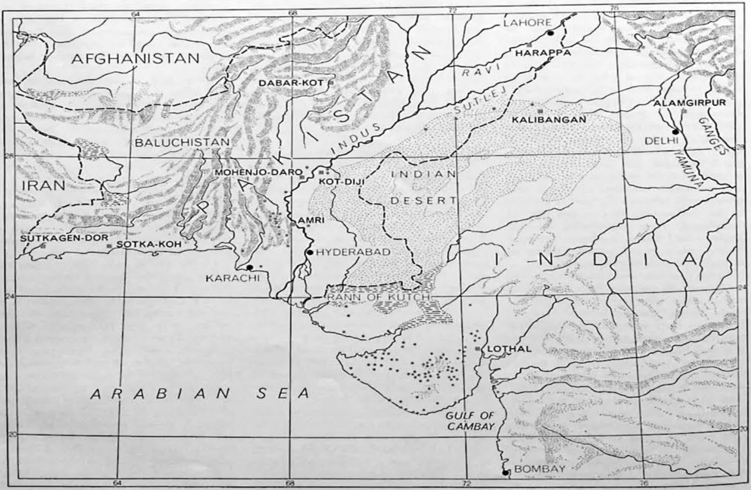
As a start it was decided to sink drill holes straddling the selected area to discover the depth of the earliest occupation levels. Core samples were collected at two-foot intervals; before the drills struck sterile soil 39 feet of core containing evidence of occupation had been raised to the surface. Thus the total depth of occupation in this part of Mohenjo-daro is 74 feet, about the equivalent of a seven-story building. Of the entire deposit, the deepest and therefore the earliest 24 feet (or almost a third) is still not available for study because of groundwater.

In the 1920's and 1930's, when the first digging was done at Mohenjo-daro, carbon-14 dating techniques were unknown and the only firm evidence of the city's antiquity came from the discovery of a few Harappan artifacts, principally stone seals, in ancient Mesopotamian sites. The Harappan seals found in reliably dated Mesopotamian strata belonged to a period extending from about 2350 B.C. to about 1800 B.C. The early investigators concluded that Mohenjo-daro and Harappan civilization in general had flourished during this same period. The carbon-14 dates now available for a number of Harappan and pre-Harappan sites tend to confirm this dating but also suggest that from 50 to 100 years might be added at each end of the period. When several new carbon samples collected from late

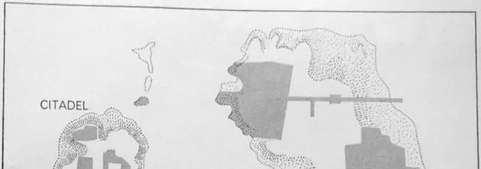
levels at Mohenjo-daro in 1964–1965 are analyzed, they should establish the date when that city—and civilization in the southern Indus valley—met its end.

Before discussing why and how Harappan civilization declined, something should be said about its origins. No formative phase, or early stage, of Harappan culture has yet been positively identified in the archaeological record of South Asia, although current excavations in Pakistan and India are beginning to yield some clues. Numerous pre-Harappan cultures have been found in the hills and valleys of Baluchistan, to the west of the Indus valley. Pre-Harappan groups also lived in the Indus valley itself just before Harappan culture appeared there in mature form. The Baluchistan sites have strong ties with Afghanistan and the Near East, but their relation to the origin and development of Harappan civilization is little understood. The same is true of the civilization's precursors in the Indus basin. At sites such as Amri, Kot-diji and Kalibangan materials belonging to the mature Harappan phase are found mixed with materials from late phases of the indigenous cultures. Such findings suggest that Harappan civilization arrived full-blown from some other area. At the same time earlier levels of these and other pre-Harappan Indus sites contain objects that are characteristic of Harappan civilization in its maturity. These findings argue either for an on-the-spot evolution from one culture to the other or, at the very least, for heavy borrowing from the local inhabitants by the Harappans when they first settled in the Indus valley. Perhaps the 24 feet of waterlogged occupation layers at Mohenjo-daro, containing as they should a record of the city's earliest development, will help to illuminate this question of Harappan origins.

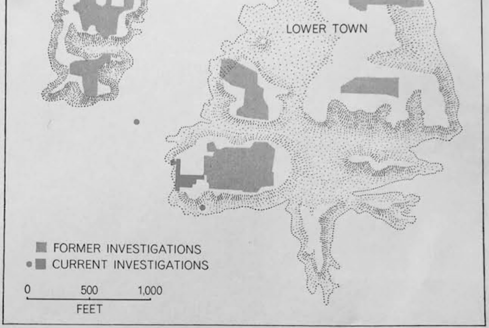
The problem of the decline and disappearance of Harappan civilization has been a matter of primary concern during the expedition's first two years of work. One of the discoveries made at Mohenjo-daro in the 1920's that is cited in support of the hypothesis that Aryan invaders destroyed the Harappan civilization was the presence of some 30 human skeletons in what appeared to be the upper levels of the site. The bodies had evidently been left where they fell rather than receiving burial; this seemed a dramatic archaeological confirmation of the postulated invasion and massacre. In 1964 the poorly preserved remains of five more bodies were unearthed in the upper levels of the excavation, only two to three feet below the surface of the mound. They lay in a narrow alley amid an accumulation of collapsed brick, broken pottery and ash. The period to which these dead belong is evidently late, but it has not yet been precisely determined. The fact that they had not had any normal kind of burial suggests that all five were the victims of some common disaster. None-



HARAPPAN CIVILIZATION at its maturity some 4,000 years ago controlled a triangular territory with sides roughly 1,000 miles long. The Indus valley was its central focus; Harappa, near modern Lahore, and Mohenjo-daro to the south were its great cities.



theless, we are reluctant to believe that either the earlier discoveries or our own support the hypothesis of an Aryan invasion. For one thing, no one has any exact knowledge of the date when the Aryans first entered the Indus valley area; they have not yet been identified archaeologically. For another, the sole purpose served by the invasion hypothesis is to explain the demise of Harappan civilization. If evidence can be found that Mohenjo-daro declined for other reasons, the invasion hypothesis goes by the board. Such evidence, in the form of traces of catastrophic floods, is now being subjected to close scrutiny.



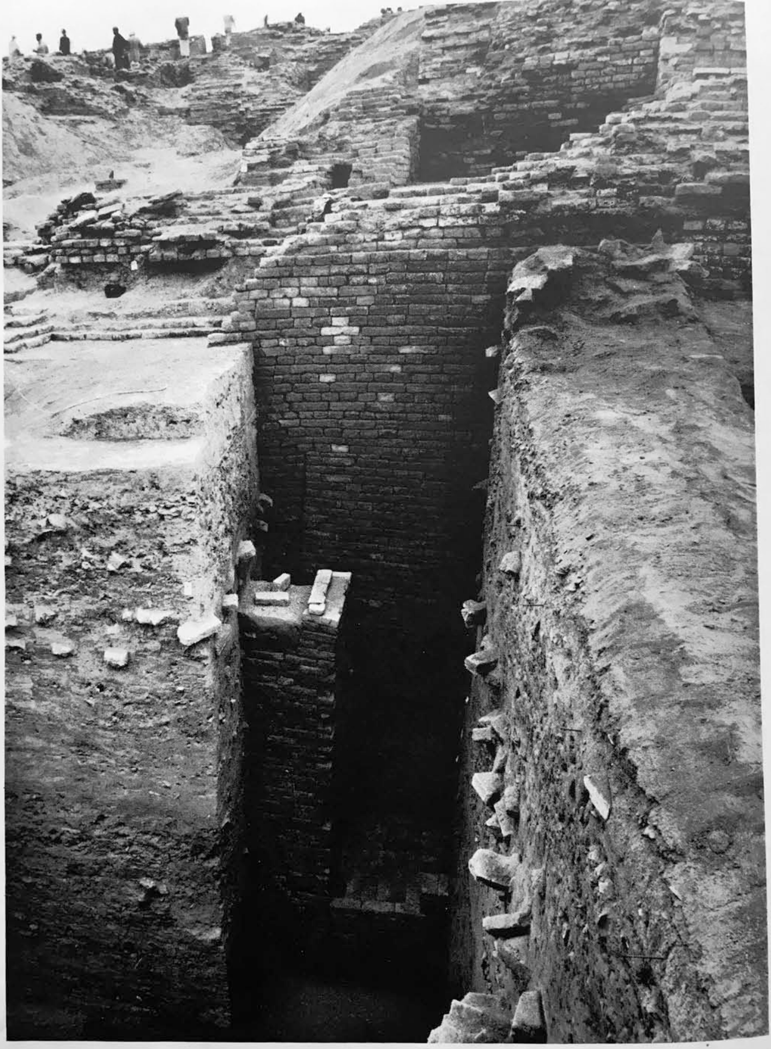
URBAN AREA of Mohenjo-daro is divided into the citadel district to the west and a larger district, called the lower town, to the east. The part of the lower town that was excavated in 1964 and the location of three test borings are shown in color. In this part of the site the culture-bearing strata are 72 feet thick; 24 feet of the accumulation is under water.

The presence of water-deposited silts at Mohenjo-daro had been recognized by early workers at the site as an indication that floods had played a role in the city's history, but no one suggested that the silts represented anything more significant than periodic brief overflows of the Indus River. Excavators who later worked at such sites to the south of Mohenjo-daro as Amri and Chanhu-daro found abundant evidence of flooding in these areas also. It was not until 1940, however, that anyone suggested a relation between the archaeological evidence of ancient floods and a number of topographic and geological anomalies of the Indus valley. In that year the Indian paleontologist M. R. Sahni noticed silt deposits perched many feet above the level of the Indus plain near the city of Hyderabad in what is now West Pakistan. This and other evidence suggested to him that the area's ancient floods had not been mere river overflows but events on a far larger scale. Major tectonic upheavals, Sahni proposed, might have blocked the Indus River from time to time; each such stoppage would have caused the gradual formation of a huge upstream lake that might then have persisted for decades.

Sahni's suggestion went virtually unnoticed until 1960. By that time two totally independent lines of research had led to the identical conclusion: natural disasters must have played a major role in the decline of Harappan civilization. In that year the University Museum undertook an archaeological survey of the Arabian Sea coast of West Pakistan. The field party discovered settlements of the Harappan era that had clearly been seaports but were now located as far as 30 miles inland. These displaced ports made it evident that the coastline in this part of Pakistan had risen considerably during the past 4,000 years, with the initial rise apparently having occurred during the Harappan period. In the same year Robert L. Raikes, a hydrologist, was conducting extensive surveys in southern Baluchistan and the lower Indus valley. Raikes's keen antiquarian interests led him to investigate the possibility that ancient topographic changes in the area might well be related to the decline of Harappan civilization. The mutual desire to combine archaeological evidence with the findings of another discipline led to a joining of forces. Raikes is now working with the Mohenjo-daro expedition as engineering consultant and is in charge of geological and hydrological investigations.

Just as Sahni had been puzzled by the silts near Hyderabad, so Raikes in 1964 sought an explanation for the thick silt deposits that are preserved in the ruins of Mohenjo-daro at points as high as 30 feet above ground level. The 1964 test borings that revealed the thickness of the underlying archaeological strata at the site showed that silt deposits also existed below the surface of the plain. When the layers above ground are added to those below, the silts sandwiched between the city's successive occupation levels span a vertical distance of 70 feet. A better explanation than occasional floods is obviously needed to account for such a multilevel accumulation.

Raikes's preliminary research not only suggests that the dam-and-lake hypothesis proposed 25 years ago by Sahni is tenable but also singles out an area near Sehwan, some 90 miles downstream from Mohenjo-daro, as the most probable area of tectonic disturbance

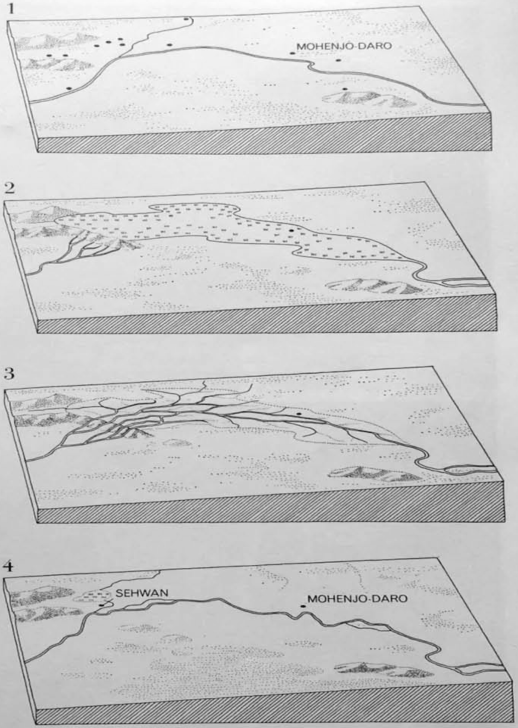


EXCAVATORS' HANDICAP at Mohenjo-daro is the presence of groundwater near the surface of the plain. This cut was made to uncover the bottom of the city wall (brickwork at rear). The work was halted by flooding at a depth of only 15 feet below the plain level.

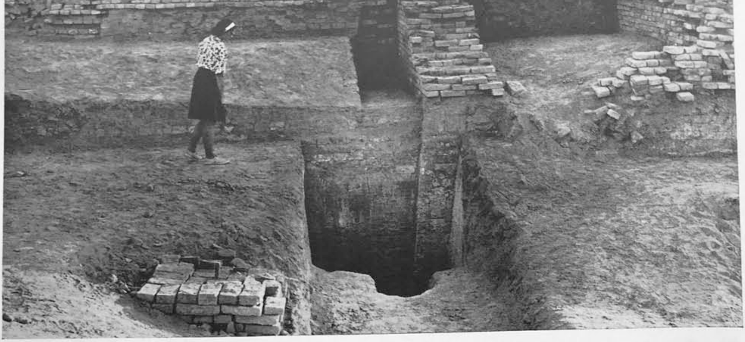
affecting the city. Both at Mohenjo-daro and at smaller sites between the city and Sehwan the silt deposits are of the kind characteristic of still-water conditions in a lake rather than the kind deposited by the fast-moving waters of a flooded river. Moreover, there is abundant geological evidence of rock faulting on a large scale near Sehwan. The faulting by itself could have raised a natural dam and turned the upstream portion of the Indus into a slow-filling lake. More probably, however, the same disturbances that caused the faulting were accompanied by massive extrusions of mud, aided by the pressure of accumulated underground gases. Such mud extrusions are not uncommon in Pakistan even today; for example, a number of mud islands abruptly appeared off the Arabian Sea coast in 1945.

Let us assume that some such barrier was thrown up near Sehwan. Thereafter the normal discharge of the Indus would not have reached the sea but instead would have accumulated in a steadily growing reservoir [*see illustration at right*]. As the rising waters encroached on the valley's villages and towns, many small settlements undoubtedly disappeared below the surface and were completely obliterated by silt. When the waters approached such a major population center as Mohenjo-daro, however, it seems logical to suppose that efforts were made to protect the city. The archaeological evidence strongly suggests that large-scale community projects were indeed undertaken at Mohenjo-daro for this purpose. As an example, massive mud-brick platforms were erected and faced with fired brick, apparently with the objective of raising the level of the city safely above the lake waters. One such embankment, partially excavated by the expedition in 1964, is some 70 feet wide and well over 25 feet high [*see top illustration on following page*].

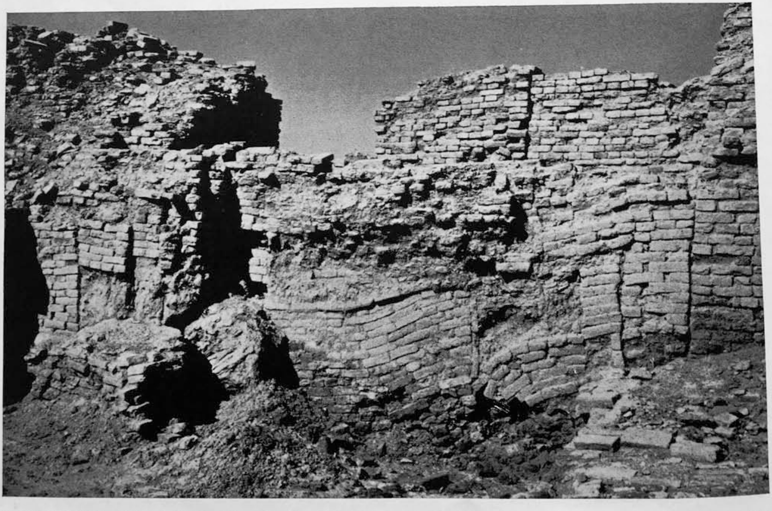
Eventually the waters accumulating behind the natural dam would have risen until they had spilled over it and begun to cut it away. Thereafter the Indus would have resumed its normal flow to the sea and re-erosion of the silt-covered floodplain would have begun. After each immersion the inhabitants of Mohenjo-daro found it necessary to rebuild or reinforce most of the city's buildings. Although they usually rebuilt directly on top of the older foundations and walls, they eventually encountered serious problems of decay and sinking. The ruins today dramatical-



PERIODIC FLOODING of Mohenjo-daro and other Harappan settlements in the Indus River valley was apparently caused by geologic disturbances in the vicinity of modern Sehwan. In *1* the Indus follows an unhindered course to the sea (*south is at left, north at right*). In *2* a massive mud extrusion or a rock fault dams the river and produces a shallow, marshy lake upstream, flooding Mohenjo-daro. In *3* the lake waters have topped the barrier; as it erodes, the lake empties. In *4* the cycle is complete and the valley is habitable again.



FLOOD COUNTERMEASURES taken at Mohenjo-daro included the construction of massive brick embankments to keep the level of the city above water. A pit (*center*) was dug down through 25 feet of unfired brick in one such embankment without reaching bottom.



FLOOD DAMAGE at Mohenjo-daro is evidenced by slumping brick masonry (*center*), which presumably reflects erosion of the city's unfired brick foundations during their prolonged immersion in lake water. The Harappans simply leveled masonry and built on top of it.

ly illustrate the problems they faced [*see bottom illustration on opposite page*].

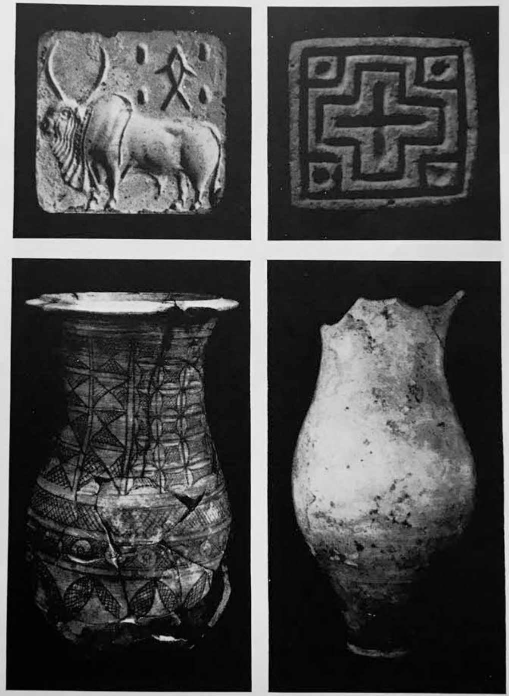
Both the multiple layers of silt at Mohenjo-daro and the evidence of multilevel reconstruction suggest that the city was flooded in this prolonged and damaging fashion no less than five times and perhaps more. At present it is impossible to estimate just how long each cycle of lake intrusion and withdrawal may have lasted, but it seems doubtful that the duration of any one cycle would have exceeded 100 years.

Could such a series of natural catastrophes, rather than the Aryan invasion, have brought about the collapse of Harappan civilization? The city of Harappa itself and lesser sites in the Indus valley to the north of Mohenjo-daro do not seem to have ever suffered significant flooding. Instead they give the appearance of having been abruptly abandoned, after which they stood empty for centuries. Such a pattern is certainly compatible with the invasion hypothesis. It is also compatible with a situation in which the Harappan state's weakened heartland to the south was unable to send help to the inhabitants of the northern frontier when they were threatened. The people who presented the threat could quite well have been hill raiders rather than Aryan invaders. An archaeological fact must also be taken into account in any effort to reconstruct the Harappan demise: The northern Indus sites show no evidence of a decline in material prosperity before their abandonment but quite the opposite is true of Mohenjo-daro and other southern sites. What does this contrast signify?

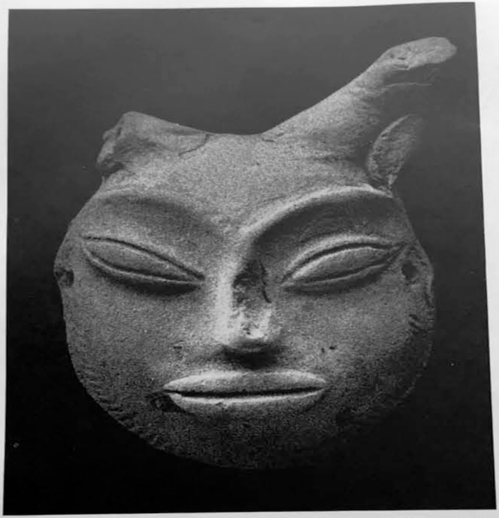
The mature phase of Harappan civilization at Mohenjo-daro appears to have degenerated into a well-defined late phase that in turn fades into a squatter phase. Both the materials and style of later artifacts and the quality of later architecture demonstrate a gradual process of degeneration. The traditional Harappan painted pottery of the mature phase, with its intricate black-on-red designs, is replaced in the late phase by plain unpainted ware. In contrast to the typical seals of the mature phase, carved out of soapstone and superbly engraved with animal figures in negative relief, the late-phase seals are not made of soapstone and bear only a few simple geometric designs. The deftly executed and spirited animal figurines of the mature phase are replaced by much cruder effigies. Even the buildings erected during the squatter phase reflect the same degeneration: they are jerry-built and often made of broken or secondhand bricks. These examples of diminishing prosperity in the south, or at least of a debasement in the Harappan civilization's standard of values, suggest an associated breakdown in the efficiency of state administration. Perhaps not only Harappan prosperity but also the Harappan spirit was being mired in an unrelenting sequence of invading water and engulfing silt.

What was the final fate of the Harappans? Findings at more than 80 Harappan sites recently identified in the Gujarat area of India provide a partial answer. A majority of the Indian sites belong to the late phase of Harappan civilization, but the culture had also been present in force in this area during its mature phase. The seaport at Lothal, for example, contains the largest structure of fired brick erected anywhere in the Harappan realm; it is identified by its excavator as a docking basin, ingeniously designed so that the ships within it remained afloat even at low tide.

With the onset of the late phase of Harappan civilization the Gujarat sites present a sad picture of gradual



HARAPPAN DECLINE is reflected in the lowered standards of workmanship characteristic of the late Harappan phase. A skillfully carved stone stamp seal of the mature Harappan phase (*top left*) is contrasted with a simple geometric one (*top right*), typical of the late phase at Mohenjo-daro. A similar contrast is seen between a polychrome painted pot of the mature phase (*bottom left*) and an unpainted pot from late-phase levels (*bottom right*).



HARAPPAN ARTISTRY is exemplified by this miniature terra-cotta mask, one and a half inches wide, found at Mohenjo-daro in 1964. Typical of mature Harappan workmanship, the mask has a boldly outlined human face topped by the ears and horns of some animal.

degeneration. Sophisticated Harappan traits are watered down by a mingling with impoverished local cultures until what was once distinctively Harappan is diluted to the point of nonexistence. No urban centers rise along the Gulf of Cambay, no more soapstone seals are carved, no more clay figurines are modeled. Trade with the civilized centers of the Near East, once the *raison d'être* for these Indian coastal ports, comes to a stop. The Harappan script, with its 400 or so still undeciphered symbols, disappears.

These findings are compatible with a hypothesis that envisions the disastrous sequence of floods at Mohenjo-daro and elsewhere in the southern Indus valley as the stimulus that drove the Harappans from the heartland of the far-flung state to take refuge in the Gujarat area. Suddenly crowded with refugees and deprived of support from the once prosperous realm that had fostered them, the Harappan trading towns on the southern frontier could have done little else than gradually merge with the countryside they had formerly dominated. On the basis of present evidence it seems probable that the Harappans, to borrow a figure of speech from T. S. Eliot, met their end not with an Aryan bang but with an Indus expatriate's whimper.