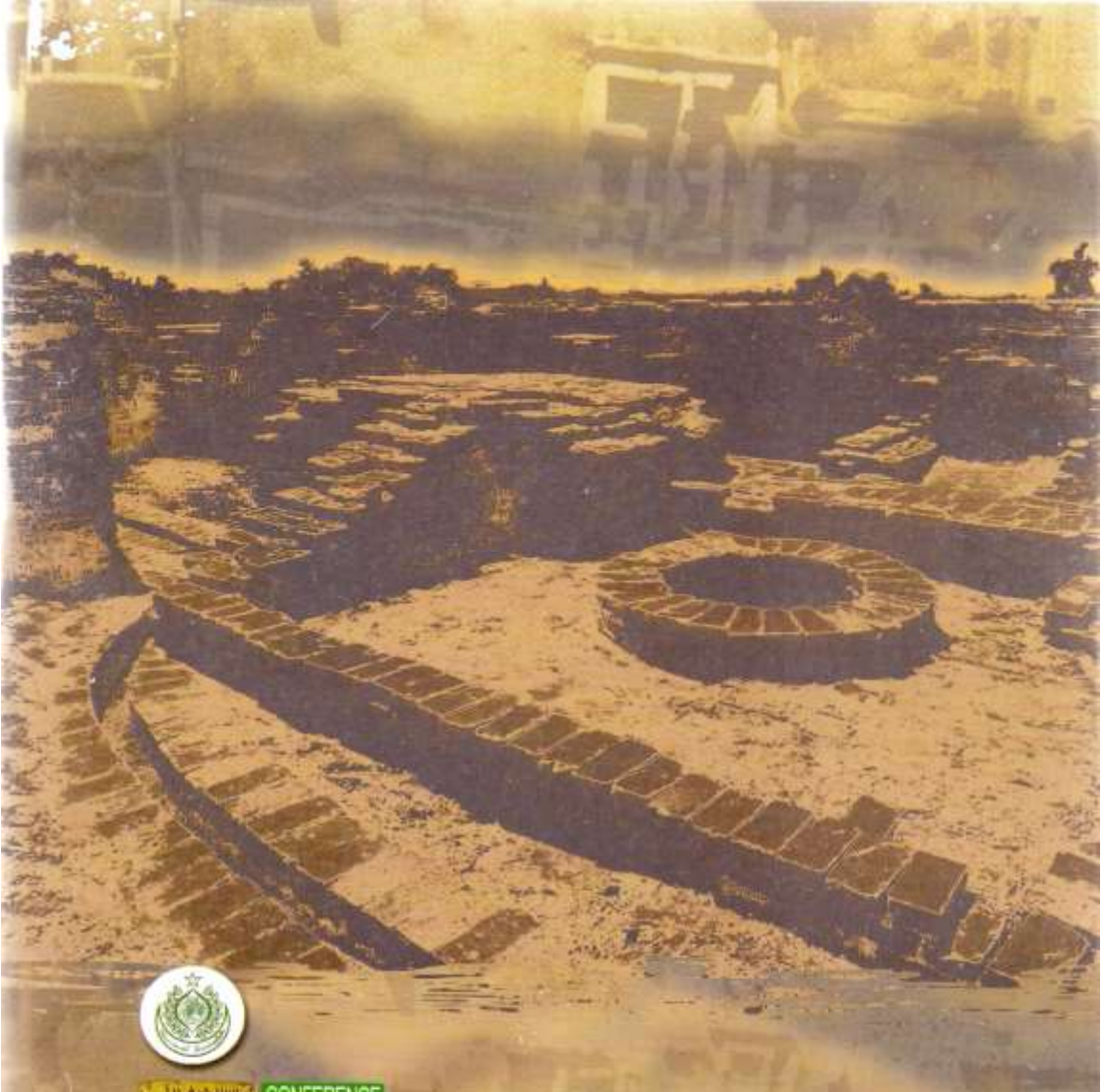
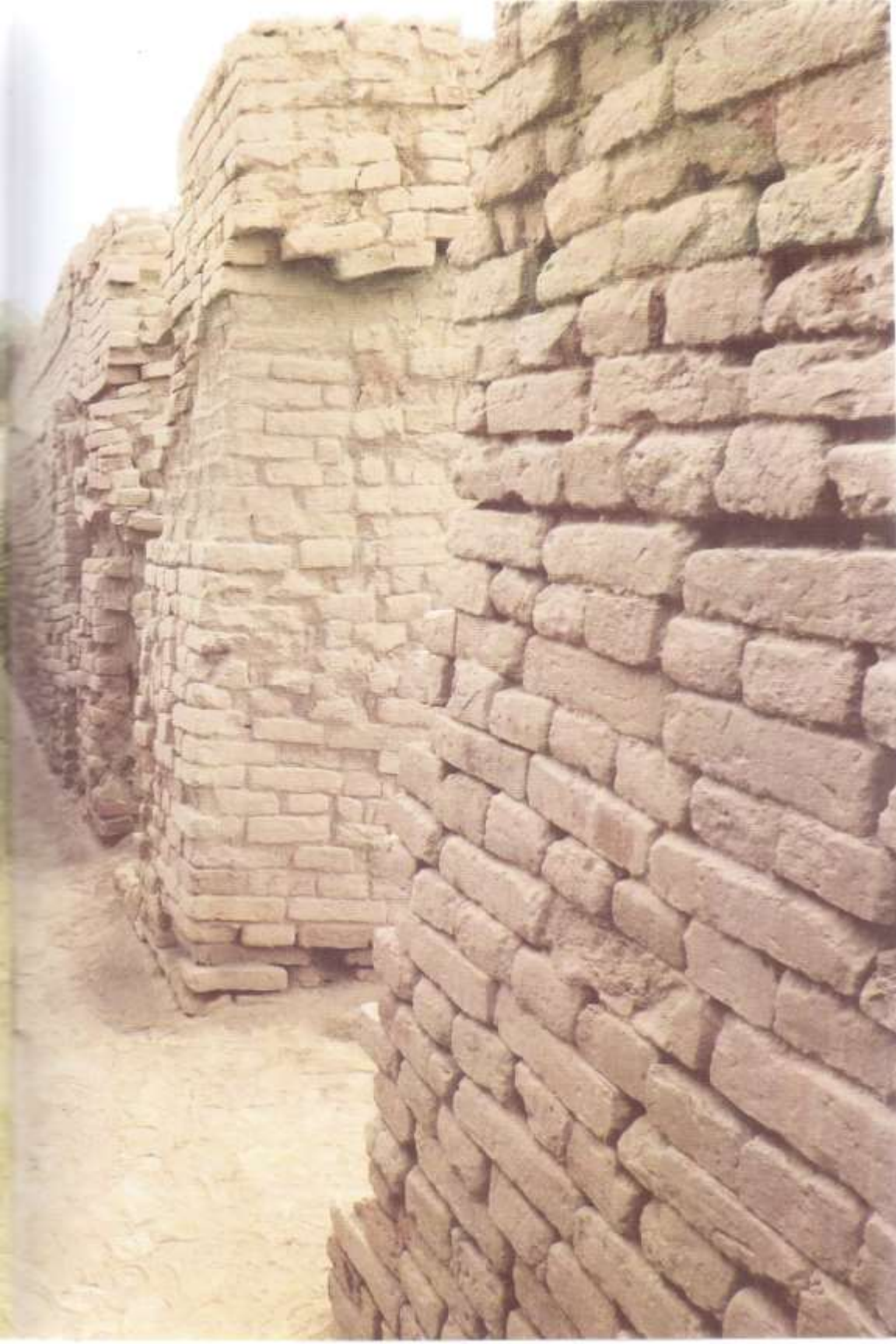


CONFERENCE ON MOHENJODARO & INDUS VALLEY CIVILIZATION 9-11 FEBRUARY 2017

9-11 February, 2017

Future in the Past

Introduction to MOHENJODARO & INDUS CIVILIZATION & its SCRIPT



Contents

The Indus Civilization

Jonathan Mark Kenoyer

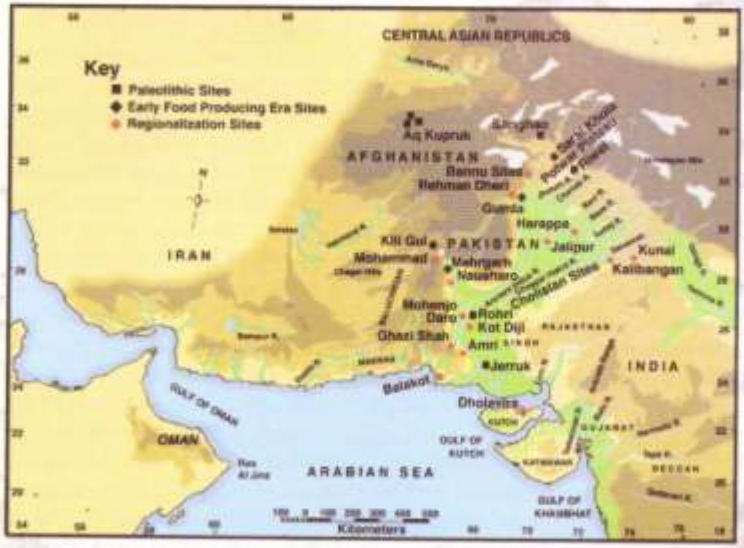
The Indus Civilization, also referred to as the Harappa Culture, is the earliest urban, state level society in South Asia (2600-1900 BCE) and was contemporaneous with state level societies in Egypt, and Mesopotamia. The core area for settlements of the Indus Civilization have been found in the alluvial plains of the Indus river and its tributaries as well as along the now dry bed of the Saraswati-Ghaggar-Hakra-Nara river system that flowed east of the Indus. Settlements of the Indus Civilization were also established in the rich agricultural regions between the Ganga and the Yamuna Rivers and throughout modern Gujarat, India. Because of its vast extent the term Greater Indus Valley has come to be accepted by most scholars as representing the territories surrounding the Indus River that include sites of this civilization.

The total geographic area encompassed by sites associated with the Indus civilization is over 680,000 square kilometers and includes most of modern Pakistan and parts of western India and northern Afghanistan. Indus artifacts have been found at sites in Oman and the Persian Gulf region, as well as in Iran, Iraq and various Central Asian countries, such as Turkmenistan. Indus style carnelian beads have also been found at the site of Troy, Turkey, the site of Aegina-Kolona, Greece, and Abydos, Egypt. These distant discoveries provide evidence for the great distances that were indirectly linked through trade of exotic objects.

Origins and Chronology

The origins of the Indus civilization can be traced to the early Neolithic settlements such as Mehrgarh, located along the borders of the major alluvial plain of the Indus River and subsequent Chalcolithic cultures that emerged at sites like Harappa, along the Indus and Ghaggar-Hakra River systems. All of these communities appear to be descended from even earlier Palaeolithic peoples living in the subcontinent and are not the result of migration from outside regions.

The chronology of the Indus civilization is now based primarily on radiocarbon dates using charcoal or burned bone from hearths and undisturbed stratigraphic levels. While the origin and decline of specific Indus sites varies slightly from one region to the next, excavations at the site of Harappa between 1986 and 2001 have provided more than 120 radiocarbon dates that can be used to define the chronology of this major urban center and surrounding regions of the northern Indus valley. The early Ravi Phase more



than 3700-2800 BCE corresponds to the Chalcolithic period when agricultural settlements were established in the alluvial plains and regional cultures were emerging in different regions of the northern and western subcontinent. The subsequent Kot Diji Phase, 2800-2600 BCE, represents the culmination of regional cultures and the establishment of the first small urban centers. The Harappa Phase (2600-1900 BCE) is the major period of urban expansion and corresponds to the Bronze Age in Mesopotamia and Egypt. Some scholars refer to the Harappa Phase, which lasts for over 700 years, as the Mature Harappan or Mature Indus period. This long time period can now be divided into three sub-phases on the basis of major rebuilding episodes and site expansion, as well as changes in artifact and writing styles. The Late Harappa Phase represents the final Indus occupation of the city. From 1900 to 1800 BCE a transitional phase can be identified during which pottery traditions, burial practices and other cultural patterns begin to change. What followed was a longer period of transformation and eventual decline that continued until around 1300 BCE in the region around Harappa, but may have lasted as late as 1000 BCE in other regions to the east.

General Indus Chronology based on radiocarbon dates from Harappa.

Period 1	Ravi aspect of the Hakra Phase	> 3700 BC - c. 2800 BCE
Period 2	Kot Diji (Early Harappa) Phase	c. 2800 BC - c. 2600 BCE
Period 3A	Harappa Phase A	c. 2600 BC - c. 2450 BCE
Period 3B	Harappa Phase B	c. 2450 BC - c. 2200 BCE
Period 3C	Harappa Phase C	c. 2200 BC - c. 1900 BCE
Period 4	Harappa/Late Harappa Transitional	c. 1900 BC - c. 1800 BCE
Period 5	Late Harappa Phase	c. 1800 BC - < 1300 BCE

Geography and Climate

The geographical setting of the Indus civilization includes the western plateau of Baluchistan and the piedmont zone along the western edge of the Indus. Resources of wood and minerals were obtained from the northern mountains of Afghanistan, Pakistan and India. Two major river systems, the Indus on the west and the Ghaggar-Hakra on the east combined to create a vast area for grazing and a fertile alluvial plain for agriculture. This plain can be divided into two regions, the Punjab in the north has higher rainfall from both the summer monsoon and the winter rains. The region of Sindh in the south is flatter and semi arid, with unpredictable rainfall. The eastern border of the civilization extends from the Yamuna and Ganga Rivers in the north, to the Aravalli ranges and the Thar Desert of Rajasthan, eventually ending at the mouth of the Narmada River in south Gujarat. The coastal zone bordering the Arabian Sea extended from the rugged Makran hills in the west, through the Indus delta and the Greater and Lesser Rann of Kutch, to the Gulf of Khambhat in the southeast. The large island of Kutch, the peninsula of Saurasthra and the coastal plains of north and south Gujarat represent several distinct geographical regions, but are generally included as part of the Greater Indus Valley region.

Two major climate systems dominate the greater Indus valley. The southwest summer monsoon brings rain and floods from June to August, and the winter cyclonic system contributes snow in the higher elevations and light rains throughout the Punjab and sometimes into Sindh. Snow melt in the spring results in major flooding, followed by summer monsoon and more flooding.

Settlements

Between 1500 to as many as 1700 sites have now been discovered and they include major cities (100-300 hectares) such as Mohenjo-daro, Harappa, Dholavira, Rakhigarhi and Lakhanjodaro, as well as smaller urban centers (50-100 hectares) like Ganweriwala that are located along the major river systems. Regional Towns (10-50 hectares) such as Kalibangan, and small towns (5-10 hectares) like Lothal, Chanhudaro and Banawali were situated along important tributaries or along major trade routes between the major cities. The hinterland was dotted with villages (1-5 hectares) such as Kot Diji, Nausharo, Balakot and Nageshwar, as well as small hamlets (<1 –1 hectare) that may have been country estates like Allahdino or coastal outposts, such as Surkotada.

Major Features of Indus Sites

Perimeter walls are found around most settlements with gateways that allowed for the control of access into and out of the settlement. These walls were probably built for protection from raiding and wild animals as well as for control of trade and protection from floods. Standardized fired and sun dried bricks with a thickness to width to length ratio of 1:2:4 are a diagnostic feature

of the Indus civilization. All domestic and public architecture throughout the Indus valley and adjacent regions used bricks with this same strict proportion. The standardization of brick size begins in the Kot Diji Period and was probably the result of shared cultural traditions of craft specialization, combined with the migration of kin related masons and brick makers to sites throughout the region, rather than highly centralized state control as proposed by early scholars.

Main streets were not paved and generally range is width from 4 or 5 meters that would allow two-way cart traffic. Large drains for waste water, sometimes covered with limestone slabs, were placed along the side of major streets and eventually emptied through the main gateways or walls out onto the plain. Many of the large drains were covered with a corbelled arch to allow the drain to pass under streets, walls or other buildings. Narrow side streets, 2 to 3 meters wide for one-way cart traffic led into the major neighborhoods, and smaller lanes for pedestrian traffic created an irregular network linking one house to another. Small drains leading from bathing areas and latrines fed into sump pits and larger drains on the main streets. Rectangular dustbins for dumping solid waste were often located along major streets and would have been cleaned out regularly by city maintenance workers.

Baked brick architecture using standardized bricks is seen at major cities and towns, while smaller settlements only used baked brick for drains, wells and bathing platforms. Mud brick was used for platforms and smaller dividing walls. Stone architecture is seen in regional sites such as Surkotada and Dholavira in Kutch, where there is locally available stone. There is evidence for wood and reed architecture at all sites. Gateways and important administrative or ritual structures had columned entry ways with large wooden columns set on stone ring bases.

House plans were quite varied with many different styles, but most had a central courtyard and surrounding rooms with a private entrance off the main street. Some houses did open out directly on to the street and these may have been shops with domestic quarters in the back or on the second storey. Most houses had separate bathing and toilet rooms located adjacent to the street. Bathing platforms were made with closely fitted bricks and had drains leading to street drain. Latrines were located next to the bathing area and consisted of reused large storage vessels buried up to the rim with a few bricks set along one edge of the rim to allow a person to squat more comfortably. A large water vessel with water and a small dipper were often placed next to the commode for washing up after using the latrine.

Wells for providing clean drinking water are common at most Indus sites. Some sites had only one well, but larger cities needed more water and at Mohenjo-daro archaeologists have estimated as many as 700 wells would have been scattered throughout the city. Wells were almost always made using specially designed wedge shaped bricks (or stone at Dholavira) to create a strong cylindrical structure. Some settlements like Harappa had only a few wells and appear to have obtained water from the nearby river or large

reservoirs constructed at the edges of the city. Reservoirs found at Lothal and Dholavira were lined with brick or stone with gypsum plaster to make them waterproof. Catchment drains for collecting water to fill reservoirs are found at the site of Dholavira and were separate from the sewerage drains. Drainage channels were constructed at sites like Dholavira and Lothal for directing river flow into the reservoirs.

Public areas for markets are found in front or inside of the major gateways and in various neighborhoods at large sites. Large buildings were discovered at Mohenjo-daro and Harappa that may have been used for public rituals, or by centralized administrators, but there is still much controversy of their precise function due to the lack of proper excavation and recording during the early excavations. The so-called "Great Bath" at Mohenjo-daro may have been used for ritual public bathing and the large building next to it may have been the foundation of a large hall or possibly even a palace. This building has been commonly referred to as the "Granary", but there is no evidence for it being used to store grain or any other produce.

Specialized architecture has been found at Mohenjo-daro that may represent a meeting hall, a dyer's shop or laundry, and a large building complex with a double staircase entry way may be a palace or temple. At Harappa circular brick platforms were discovered that excavators thought were used for processing grain, but recent excavations do not support this interpretation.

Indus Writing

The Indus script appears to have been developed indigenously and was not borrowed from the West Asia. It has its foundation in early written symbols dating to the Ravi Phase (3500 - 3300 BCE) at the site of Harappa and at approximately the same time from other sites in the greater Indus Valley region. This script became more standardized during the Kot Diji Phase, around 2800 to 2600 BC into what can be called the Early Indus Script. By 2600 BCE a fully developed Indus Script was being used throughout the Indus valley in an area that was twice the size of ancient Mesopotamia or Egypt.

The Indus script was usually written from right to left. This is confirmed through the analysis of sign sequences carved on the seals and on the basis of writing on pottery sherds that show the sequence of strokes. More than 4200 objects containing Indus script have been discovered, and most of these come from the sites of Mohenjo-daro and Harappa (over 3700). Recent excavations at Harappa have shown that the Indus seal writing and seal styles change over time and that there are new signs appearing in the later seals. Some signs found only on early seals also disappear in later times, indicating the change of script over time. Previously scholars had defined between 400 and 450 distinct Indus script signs or graphemes, but this must be revised due to the new information on the changes in the writing system. Most scholars agree that the writing is based on a logo-syllabic system where each sign means a word, a syllable, or a sound. However, some signs appear to represent pictographs of a human or a

fish, etc, and when used alone they might represent an idea or an entire story. The use of ideographs with a logo-syllabic writing system suggests that there were many different ways of using the writing.

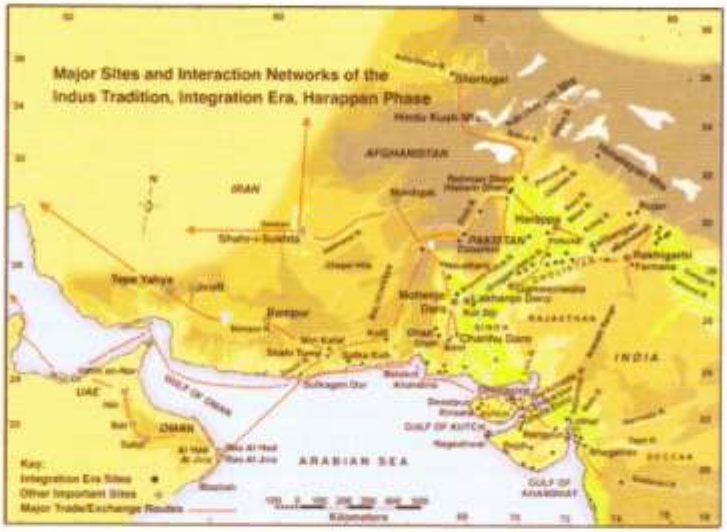
The Indus writing has not yet been deciphered and there is no hope of a breakthrough until a bilingual text or longer inscriptions with Indus script have been discovered. Due to the fact that the script was no longer used after 1900 BC it is not possible to connect it to later writing systems and known historical languages. Dravidian languages are now spoken primarily in south India, but some of the place names and river names such as the Nara and Porali rivers in Sindh and Baluchistan may represent Dravidian or Mundari (Austro-Asiatic) languages. Indo-Aryan languages may have been present in the northern Indus region and Baluchistan, while Sino-Tibetan languages may have been spoken in the far north at sites such as Shortughai. Remnants of earlier Neolithic languages that have no relation to any of the four major modern language families also may have been present in the region. Since urban centers are by their very nature places where people from different cultures come together, it would not be surprising to have many different language speakers present in the cities. As was common in Mesopotamia and Egypt, traders and elites from each group could have used the same writing system for inscribing their names or words for commodities. Words and names from any one of these four or five language families may have been written in the Indus script during the 700 years when the script was being used.

The production of seals and tablets was a highly specialized craft that was strictly controlled by the elite traders and rulers of the cities. New research at Harappa has been able to provide a new chronology for the writing and better define the wide range of contexts in which the writing was used by literate elites. The script is found on square seals made of stone and engraved with symbols and animal motifs. The most common animal on the seals is a mythical unicorn, while other seals are carved with a bull, an elephant or even a rhinoceros. Seals were used to stamp into clay sealings on goods to document and control trade, and also possibly for ritual purposes. Steatite and terra cotta tokens include script and what appear to be numbers. Some of these tokens may have been used for accounting and others appear to have been used for ritual purposes. Script is found inscribed on clay lumps that were used as sealings to lock storehouses. Merchants incised messages directly on large jars filled with trade goods to indicate the contents or the destination. Script was also painted or molded on pottery to define ownership or for ritual purposes. Examples of script have been found on tools and personal items that may indicate personal identification or ritual protection. Writing was also used in combination with narrative depictions of myths and religious ceremonies, possibly identifying the main characters or deities, or the name of the ritual. At the two largest cities of Harappa and Mohenjo-daro, distinctive copper tablets with script and animal motifs may be the earliest evidence for city coinage in South Asia, 1000 years before the introduction of stamp marked silver coins of the Achaemenid Empire.

Most inscriptions are only 5 to 7 signs long and are very small, ranging in size from 1 to 2 cm in height. However, one example of what appears to be a public signboard was been discovered in a side room of the major northern gateway on the citadel mound at Dholavira. Made with white gypsum inlay, the signboard had 10 script signs that are around 37 cm high and 25 to 27 cm wide. The board may have been mounted above the gateway for all to see, but this does not mean that everyone in the city was literate. The distribution of seals and writing in distinct areas of Harappa suggests that only certain segments of the population had seals and that although writing was found on artifacts throughout the city, the production of seals and the use of writing were restricted to the elites.

Socio-Political Organization

Scholars are currently divided on how to best describe the political organization of the Indus cities. Although most agree on the presence of a highly stratified social organization and the presence of multiple urban centers, some feel that these cities were not organized as state level societies, but were basically large chiefdoms. The main argument for chiefdom society is the fact that no large central buildings that could represent temples, palaces or administrative structures have been identified. Another argument is that there are no royal burials that are a common feature in the early states of Mesopotamia, Egypt and China. The opposite position, which is supported by most scholars, is that the Indus was organized as a state level society, but that it had a decentralized political and ideological organization.



In this model several competing classes of elites dominated the four or five major cities. In the course of 700 years different individuals and communities would have been dominant, but no single community was able to rule long

enough to establish a high degree of centralization. Merchants, ritual specialists and individuals who owned resources such as land, livestock and raw materials would have maintained different levels of control in different regions. These communities shared a common ideology, used a common script as well as a standardized economic system. In contrast to the large cities, the smaller settlements that included more agriculturalists and herders may have been less rigidly stratified and segregated than the larger cities. The largest cities, such as Harappa, Mohenjo-daro, Dholavira, Lakhanjodaro and Rakhigarhi may have been relatively independent city-states with direct political control over their immediate hinterland. Trade and exchange of important socio-ritual status items demonstrates that the cities and villages were politically and economically integrated, and therefore appear to be integrated on a general ideological level as well.

There is no evidence for the presence of a military or the use of warfare in the integration of the hinterland around the major cities. In contrast to the patterns seen in Mesopotamia and Egypt, there are no depictions of people being captured, attacked or subjugated. Even though large city walls with impressive gateways surrounded all of the major settlements, there is no evidence that these walled cities were ever attacked or burned. The city walls and gateways were probably guarded by armed watchmen, and the discovery of bronze arrow heads, spears and daggers indicate that they had the technological capability to protect themselves against bandits and raiders, as well as to wage warfare. The absence of conclusive data for warfare does not support a model for a peaceful civilization, and it is not unlikely that there were occasional battles and violent conflicts.

Indus Religion and Belief Systems

Without the aid of written texts it is difficult to reconstruct the Indus religion. They made clay figurines of animals, men and women that probably were used in special rituals. Some of the female figurines are thought to represent mother goddess images, while others are possibly toys for children. Soft limestone was used to carve small sculptures of deities or important people such as the famous "Priest-King" found at Mohenjo-daro. Harder stone was carved into nude male sculptures that have been found at the site of Harappa. These images were probably used in special domestic rituals to represent deities.

Many of the seals have narrative scenes that appear to represent ceremonies and mythological scenes. One famous seal from Mohenjo-Daro shows a deity with horned headdress and bangles on both arms, standing in a pipal (sacred fig) tree. Seven figures in procession and a kneeling worshiper sit before the deity with a human head resting on a small stool. Since no temples have been identified it is possible that worship took place under trees as depicted on this seal. Some terracotta tablets have narrative scenes stamped on both sides. At Harappa, one such tablet shows a figure, possibly a female deity, grasping two tigers by the throat, and standing above an elephant. On the reverse is a narrative scene depicting the killing of a water buffalo in the presence

of a priest or deity seated in yogic position. Such narrative scenes indicate the presence of a highly developed mythology and iconography and similar motifs are widespread at sites throughout the larger Indus region. Some of the iconography seen on Indus seals and the use of specific symbols such as the swastika and mandalas were incorporated into later Vedic, Brahmanical, Jain, and Buddhist religious traditions. Even though there is no direct historical connection, some Indus symbols and narratives do appear to have been incorporated into religious traditions that are collectively referred to as Hinduism today. For example, the famous seal from Mohenjo-daro with a horned deity seated in yogic position surrounded by wild animals has often been compared to later Hindu representations of Siva as "Lord of the Beasts".

Very few cemeteries of the Indus period have been discovered, and this suggests that most people who died were not buried in the ground, but their bodies were disposed of in other ways, such as cremation, water burial, or exposure in the jungle. The small number of Indus people who were buried appear to be a special type of Indus community that is distinguished by the use of Indus pottery and some ornaments in the burials, but no items of high value. These Indus people buried their dead in wooden coffins along with many pottery vessels that were probably filled with food for the afterlife. Most individuals, both male and female were buried with some simple ornaments, such as shell bangles or copper rings and agate beads. Elaborate ornaments of gold, silver and precious stones were never included in the burials and must have been inherited by the living relatives. Inscribed seals were not buried with the dead. No royal burials have been found.

Trade and Technology

The Indus cities were connected with rural agricultural communities and distant resource and mining areas through strong trade networks. They used pack animals, riverboats and bullock carts for transport. This trade is reflected in the widespread distribution of exquisite beads and ornaments, metal tools and pottery that were produced by specialized artisans in the major towns and cities. Cotton, lumber, grain, livestock and other foodstuffs were probably the major commodities of this internal trade. There was also external trade with Central Asia and Iran by overland routes. Trade with the Arabian Gulf region to Oman, the UAE and Bahrain as well at to the distant Mesopotamian cities, such as Susa and Ur was conducted by sea and may have been dominated by middlemen living along the Indus coast or Oman.

Indus artisans produced a wide range of utilitarian and decorative objects using specialized techniques of stone working, ceramics and metallurgy. They did not erect stone sculptures to glorify the power of the elites and most of the art and symbolic objects were relatively small and in many cases even made in miniature. Objects made with exotic materials and complex technologies were probably produced for the wealthy merchants and the ruling classes, while more simple objects made with local materials and simple technology were presumably for ordinary people. Ranking or stratification within the society

as a whole appears to have been reinforced by the use of various raw materials and manufacturing processes that resulted in finished objects with different relative values.

Pottery with a red slip and black painted designs were made in all the major

settlements for use in rituals and possible marriage ceremonies. Motifs on the pottery are usually arranged in panels and include the intersecting circle, fish scale, and pipal leaf design, combined with floral and geometric patterns, as well as animal and birds. Plain pottery was produced for everyday use, including disposable goblets with pointed bases that were common in the major cities. Copper and bronze were used to make ornaments, tools, mirrors, pots and pans. Bone, shell and ivory were used to make tools, ornaments, gaming pieces and especially inlay for furniture. Silver and gold utensils and ornaments and fine ceramic objects, such as stoneware bangles and glazed faience ornaments also were produced. The glazed faience of the Indus is much stronger and more durable than terracotta and was used to make beads, bangles, buttons, inlay and small vessels for holding pigments or perfume. Natural stones were prepared in specific ways to enhance their color and accentuate the natural patterns of the stone. Artificially colored stone, faience and painted terracotta ornaments were created as imitations of the natural stones.

Evidence for wool and cotton textiles is found preserved on copper tools and reveals the presence of a well-developed spinning and weaving tradition. Recent analysis of threads preserved inside of copper beads suggest that wild tussar silk was also being used. The textile industry would have been an important source of wealth to large cities that could maintain extensive cotton fields and large numbers of craftsmen and women.

Weights

The Indus rulers and merchants developed and maintained a highly standardized weight system for taxation and control of trade in specific commodities. Cubical stone weights were usually made from a special type of banded chert or agate and range in weight from 0.871 grams to 10,865.0 grams. The smaller weights were probably used in the weighing of precious stones, metals and perfumes/incense, while the larger weights may have been used for assessing the taxes for larger quantities of grain, foodstuffs and other commodities. Each graduated weight is double the weight of the previous weight category. These distinctive weights have been found at all settlements of the Indus region as well as in settlements on the periphery where Indus merchants may have obtained raw materials or traded finished products.

Agriculture and Animal Husbandry

The Indus subsistence system was highly diverse due to the many different environments that people lived in. Wheat and barley cultivation supplemented by animal husbandry was the foundation of the urban centers in the core alluvial regions, but millets and possibly rice were cultivated in Gujarat. Animal husbandry was dominated by humped zebu (Bos indicus) cattle, but also included non-humped cattle (Bos taurus), water buffalo (Bubalus bubalis), sheep, and goat. Fishing, hunting of wild fauna and the collection of wild fruits supplemented the major crops and animal foods. Wheat and

barley agriculture was practiced primarily during the winter growing season, and crops such as cotton and millet were probably cultivated after the summer monsoon. The presence of two growing seasons made it possible to create enough surpluses to support large cities and trade networks.

Due to the nature of the topography and the intensity of floods along the Indus and its tributaries, it was not possible to maintain major canals for irrigation. Most cultivation in the alluvium was based on adequate rainfall and opportunistic agriculture where crops could be planted along the banks of oxbow lakes and slower streams. Along the piedmont zone of Baluchistan, some Indus settlements constructed diversion canals for directing floodwaters to fields, and there is some evidence for the construction of small irrigation canals near the site of Shortughai in northern Afghanistan.

Decline and Legacy

Around 1900 BC there is evidence for a transitional phase during which many characteristic features of the Indus civilization begin to fall out of use. This transition represents a reorganization of power among the ruling elites of the Indus cities, but does not reflect the intrusion of new people or the invasions of Indo-Aryans as has been proposed in the past. The Indus script and square seals with unicorn and other animal motifs gradually disappear. Cubical weights for taxation and trade were no longer used, possibly because the major trade networks began to break down. Different factors leading to the decline and reorganization of the Indus civilization have been identified. The overextension of political and trade networks led to eventual fragmentation. The lack of a military to reinforce integration is another factor that would have had a direct impact on political and economic organization. The Saraswati-Ghaggar-Hakra river system in the east began to dry up and the changing river systems disrupted the agricultural and economic system. Eastern communities began to gradually migrate to the larger urban centers along the Indus or into new agricultural areas of the Gangetic plain and Gujarat. The processes involved in this transformation were more rapid in some areas, but by around 1300 to 1000 BC we see the emergence of a new social order dominated by Vedic communities who used horses for ritual sacrifice and warfare, spoke Indo-Aryan languages and worshiped new deities.

Although certain distinguishing aspects of the Indus civilization disappeared many other aspects of Indus craft technology, art, agriculture and possibly social organization, continued among the Late and post-Harappan cultures. These cultural traditions eventually became incorporated in the new urban civilization that arose in the upper Indus region around 1200 BC and later in the Gangetic region during the Early Historical period.

Archaeological Ruins at Mohenjodaro[1] World Heritage Site since 1980

Michael Jansen

Text produced for the UNESCO panel exhibition July 2010 at UNESCO Headquarters, inaugurated by the Director General, Mrs Irena Bukova

Mohenjo daro (N27°19'45" E68°08'20"), located on the right bank of the Indus River, around 400 kilometers north of Karachi, in Pakistan's Sindh Province, bears witness to one of the earliest civilizations in the world, the Indus Civilization. It flourished for about 500 years during the 3rd and 2nd millennium BC. Its rediscovery in 1922 brought to light one of the 'earliest manifestations of urbanization in South Asia'.

The Government of Pakistan in the 1960s recognized the global significance of this cultural treasure, and faced with the immense task of ensuring its conservation turned to UNESCO for assistance. The International Campaign for the Safeguarding of Mohenjo daro was officially launched in 1974. Just one year later the World Heritage Convention adopted in 1972 eventually came into force and Pakistan presented the archaeological ruins for nomination to the World Heritage List. In 1980, during its 4th session, the World Heritage Committee acknowledged the outstanding universal value of the Archae¬ological Ruins at Mohenjo daro by inscribing this masterpiece of a vanished civilization on the World Heritage List, to be among the first 85 properties.

The structural remains of this Bronze Age metropolis cover an estimated area of 400 ha, of which to date only 2,5% have been excavated. Built almost exclusively of burnt brick according to a carefully designed urban plan, Mohenjo daro presents a high degree of social organization. Despite the wealth of information this property provides about what life looked like in

the 3rd millennium in the Indus Valley, Mohenjo daro has not revealed all its secrets. The specific reasons for the decline and eventual disap¬pearance of the Indus civilization has to date not been fully understood but archaeological findings indicate no sudden end but a gradual abandonment.
Destructive effects of the environment were threatening to destroy Mohenjo daro in the 1970s – it was in danger of "dying a second death!" The focus of the world's community was turned to Mohenjo daro, during the international campaigning which started with the 1973 International Symposium at Mohenjo daro. The conservation program which was initiated then ultimately led to one of the largest campaigns in the history of UNESCO: "Save Mohenjo daro".

This exhibition revisits one of the world's greatest riverine civilizations and seeks to illustrate the achievements of the UNESCO International Safeguarding Campaign from 1974 – 1997. It also pays particular attention to local communities and the future prospect of the archaeological site for sus¬tainable tourism development and poverty alleviation.

Mohenjo daro in the Context of the Early Civilisations

In the history of mankind the appearance of writing marks a major development significant with the first civilizations. The first forms of writing appear around 3100 BC (proto Elamite cuneiform) in Mesopotamia, followed by the invention of the hieroglyphs around 3000 BC in Egypt and approximately 2500 BC with the Indus civilization, while the latter has not yet been deciphered.

The existence of writing represented one of the preconditions for what the British archaeologist Vere Gordon Childe (1892-1957) termed the "Urban Revolution". The revolution occurred at the end of the Neolithic Period, when humans had shifted from the nomadic way of life as hunters and food gatherers to a sedentary lifestyle, founding villages and building houses, progressing towards farming and cattle breeding. This is particularly true for the large civilizations of the alluvial valleys of the Euphrates-Tigris, Nile and Indus. The "Urban Revolution" in the Indus Valley can, among other indications, be proven by the appearance of writing on a substantial number of remaining seals produced of steatite.

Mohenjo daro and its Rediscovery

The history of the rediscovery of the Indus Civilization is also part of the history of the Archaeological Survey of India that was founded in 1861 under the British colonial administration by Sir Alexander Cunningham (1814-93). His first serious investigations were based on a primary interest to discover traces of Alexander the Great's invasion of the Indian Subcontinent between 327-324 BC.

Within a wide approach in the 1880s the site of Harappa was inspected yielding proofs for its Neolithic roots and several Harappan seals. Though their indigenous value was not yet recognized at that time, they were published. Only forty years later in 1922, when Rakhal Das Banerjee (1885-1930) found similar seals some 600 km further south in Mohenjo daro, it became clear to Sir John Marshall (1876-1958) the then Director General of the Survey, that a so far unknown civilization had been discovered. The excavations in Mohenjo daro continued until 1931 with different excavators working at different areas, which are still named after them respectively: DK area after K. N. Dikshit (Kashinath Narayan Rao Bahadur), SD area after A. C. Siddiqui, HR area after Harold Hargreaves, and MN area after Q. M. Moneer.

At the end of the 1930s both the Archaeological Survey of India as well as the site of Mohenjo daro were in deplorable condition, so the British Parliament intervened. Consequently, Sir Mortimer Wheeler (1890-1976) became Director General of the Survey. Within a short time he reorganized the administration and pursued his first campaign in Harappa. After the separation of the British Raj into the Indian Union and Pakistan in 1947, Wheeler came to Mohenjo daro, where he in 1950 excavated parts of the 'Citadel' and the so-called 'Granary'. With respect to his initials – Raymond Eric Mortimer – these excavation areas were named REM. Wheeler also made major contributions to the interpretation of the Indus Civilization. His training camps were visited by many later famous archaeologists such as B. K. Thapar, A. H. Dani and F. A. Khan, to name only a few.

The last excavations were carried out by George Dales (1927-92) in 1965, in search of the harbor of Mohenjo daro. These excavation areas are designated with the initials UPM, the University of Pennsylvania which he was affiliated with. In the 1980s the German Research Project Mohenjo-Daro under the directorship of Michael Jansen, jointly with the Italian mission of Maurizio Tosi, completed the general survey and the reevaluation of the excavation areas. Today's knowledge of the site stems from their geophysical survey and aerial photographs, taken from a hot air balloon.

UNESCO- The Outstanding Universal Value Mohenjo daro and its Water Splendor

Compared to the cities in the other early civilizations such as Mesopotamia and Egypt, the living standard in Mohenjo daro must have been rather high. The houses showed a comfortable lay-out and were built out of clay- and burnt bricks. Their shady façades opened over some steps into the narrow zigzag lanes. Most houses featured their own bathrooms with brick-paved bathing platforms, whose drains emptied into street drains and later in soak jars, altogether producing a comprehensive sewage system. The importance of water drainage, developed from extensive technological knowledge, is particularly visible in the accurately constructed gradients, as well as the use of finely cut burnt bricks for the bathing platforms and the attached drains.

Mohenjo daro is the city with the highest density of wells – not only within the Indus Civilization, but also in comparison with any other city in the world at the time. The average access radius to the wells is approximately 25 meters, with almost every house having its own well! In the citadel area, one particular well was investigated to a depth of 18 meters, without successfully reaching the bottom. Using special cuneiform burnt bricks, these wells were constructed to the shape of a tube, with an average inner diameter of 1 meter. This construction was then sunk in the ground while an experienced worker in the tube hollowed out the soil from the inside. This technique is still in use today in the region of Sindh.

The most prominent architectural element of Mohenjo daro is the 'Great Bath' located in the 'Citadel' area near the 'Stupa', discovered in 1924. Its structure measures almost 60 by 30 meters with a prominent southern entrance that once lead into an inner courtyard surrounded by a colonnade. Two flights of stairs placed on opposite sides lead to the 7 by 12 meters large water basin. The water for the basin was supplied from a large well in a side chamber and could be emptied by a drain, whose opening on the bottom surface of the basin was normally blocked by a wooden plug. It may have been a public bath, but it is speculated that it may also have served for ritual purposes. The audacious use of water cannot be only explained simply by hygienic reasons but the daily washing as a ritual seems to be an obvious conclusion, a cult which is perceptible in all settlements of the Indus Civilization.

Mohenjodaro and its Complex Simplicity

In 1924 Sir John Marshall announced for the first time the great discovery of a new civilization. In the same year Howard Carter found the tomb of Tutankhamen with its legendary gold treasury. Perhaps with similar expectations Marshall continued his excavations at Mohenjo daro. But even after several years of digging, neither in Mohenjo daro nor in any of the other sites, major sensational findings were made. Instead, they discovered endlessly long burnt brick walls devoid of decoration and paintings, hundreds of houses with thousands of sherds, earthen pots, some copper or bronze tools, small clay and bronze figurines, and hundreds of small seals with figurative depictions and unknown script. Special attention, however, was given to a small steatite figure – hardly 15 cm high – that in the absence of any ancient recording or comparable artwork was named the 'priest king'.

Since the days of Marshall no further findings of particular artistic or material value have been made. Until today the experts are puzzled, what religion the Indus Civilization had and which political power structure they may have established. Compared to Egypt with its pharaohs, who were god-kings buried in their pyramids built by thousands of labors over decades, and to Mesopotamia with its glorious cities like Uruk and the gigantic artificial temple mountains of the ziggurats, built under Sargon of Akkad, Mohenjo daro as the largest of the Indus cities appears extremely modest – and modern!

Instead of having built their architecture with stone, they developed the brick. Its proportion 1:2:4 is based on the size of our hand width (approx. 13-15 cm), which enables the worker to grip it with one hand: the first prefabricated, fully rationalized construction element, which we use until today with the same proportions and size! The figurative art also remained modest. Clay figurines were made by layman, perhaps even by children. Only the seals show highly sophisticated craftsmanship: the minimalistic dimensions of the square seals, measuring 4-6 cm, beautifully depict animals, always in standing position; rhinos, buffalos, unicorns, composite animals, tigers and in one case a narrative scene with a 'goddess' in a pipal tree. It is no surprise that so little is known about the background of this civilization, since the few endeavors to decipher the script has so far not been scientifically supported. Even if the script could be read, the written information available would be insufficient to provide a general understanding of this culture.

The International Safeguarding Campaign
Danger of a Second Death

Soon after the first excavations and exposure of the brick walls to the air an alarming decaying process started. The brick capillaries were destructed by salts, resulting from an evaporation of the salty groundwater on the bricks' surfaces. This deterioration process was so rigorous that already in the late 1920s several bricks had to be replaced by new ones. Later the tops of the walls were to be covered with layers of clay to protect the crowns of the walls against the hot sun. In addition over the years many conjectural reconstructions took place as can be seen from the documentary evidence.

While checking the floating ground water table over the seasons, it became clear that there was an immense fluctuation. This was caused by the high flood level of the Indus for more than four months when during summer the river carried the melted snow water from the Himalayas. How could the site 4500 years ago have survived under such conditions? After further deep excavations by Wheeler in 1950 it became clear that the ancient surface of the surrounding plain was more than seven meters deeper than what is seen today, while the city itself was constructed on artificial platforms safely raised up against the floods.

In 1957 a disastrous flood broke the Indus dams and flooded hundreds of villages in the Sindh Province including the site of Mohenjo daro. Concerned with the conservation of this site, the Government of Pakistan approached UNESCO for advice. In 1964 international experts, such as Sir Mortimer Wheeler, the last Director General of the British Archaeological Survey of India (until 1947) and Harald Plenderleith, one of the first directors of ICCROM Rome, visited the site and initiated the conservation programme. In 1965 the UNESCO Courier published the article titled: 'Mohenjo daro, a 5000 years old heritage menaced by destruction' which in due course lead to the UNESCO 'Save Mohenjo daro' campaign.

As a result the 'danger of a second death' of Mohenjo daro through destruction of salts and humidity was widely acknowledged and addressed. Massive interventions were implemented to safeguard the site, while eventually new approaches by scientists from the beginning of the 1990s successfully impeded further decay.

The International Safeguarding Campaign
The World Helps

The preparation and success of one of UNESCO's largest campaigns was made possible by the Prime Minister of Pakistan at the time, Zulfikar Ali Bhutto (1928-79), whose home town Larkana was only 40 kilometres away from Mohenjo daro. Owing to the government's concern for the site, while also looking to improve infrastructural access to the region by commissioning the airport, it received the attention it deserved. In 1972 a first draft Master Plan was prepared and 1973 presented at the First International Symposium held at Mohenjo daro, chaired by HIH Prince Takahito Mikasa, on the occasion of the 50th anniversary of its archeological excavation. The four major components of the plan comprised: the control of the ground-water table at Mohenjo daro, the protection against river erosion, the conservation of structural remains and the promotion of cultural tourism.

A number of people were paramount in the success of the works such as the directors of the Department of Archaeology in Pakistan like Fazal A. Khan, Syed A. Naqvi and M. Ishtiaq Khan. Additional prominent protagonists were the Judge Feroz Nana and Supreme Court Judge Mr Abul Kadir Shaikh, who became the chairman of the authority for the preservation of Mohenjo daro, established by the Pakistani Government in 1976 to run the campaign.

'Save Mohenjo daro' was one of the longest campaigns in UNESCO history terminating only in 1997, after more than 20 years with national and international donations. Some 8 million US Dollars were contributed by the Governments of Australia, Bahrain, Chile, Egypt, France, Germany, Greece, India, Indonesia, Iraq, Japan, Jordan, Kuwait, Malta, Mauritius, the Netherlands, Nigeria, Qatar, Oman, Saudi Arabia, Thailand, Turkey, United Republic of Tanzania, United States of America, as well as from UNDP and private contributions.

Moreover, substantial national financial contributions were made by the Government of Pakistan in addition to the efforts made by many international organizations, such as ICCROM (International Centre for the Study of the Preservation and Restoration of Cultural Property), ICOMOS (International Council on Monuments and Sites) and ICOM (International Council of Museums), as well as national agencies who strongly supported the

Mohenjo daro campaign.

The International Safeguarding Campaign
From the Technocratic to the Sustainable

The first activities that started in the 1980s concentrated on the control of the groundwater table and the protection of the site against river erosion. In 1972 Pakistan jointly with UNESCO experts developed a Master Plan which guided, among others, the installation of around 56 tube wells to pump out the ground water below the site, to avoid further humidity rising into the brick walls. The project started in 1979 and by end of the 1980s the drainage project was completed. The improvements against the river erosion can be observed in today's satellite images of the river and the region: the river, dangerously moving close to the site with the danger of a breech of the 19th century dam and possible damage to the ancient structures, is trained by five enormous spurs that extend into the flood plain, until today providing protection to the property.

The conservation of the structures on the other hand was more troublesome. The destruction by salts continued and the bricks turned red due to the impairment of the capillaries on their surface. Damp proof courses were horizontally and vertically inserted into the walls, but were not successful, due to the fact that they were placed above ground, causing further deterioration of the lower bricks. Moreover, the monthly costs of electricity for powering the tube wells became exorbitant, whilst the laboratory monitoring of the water level in the site clearly showed an alarming increase of salinity in the ground water.

Tests carried out by the team from RWTH Aachen University in Germany brought about a new approach. The analysis of bricks clearly showed that the salts in the bricks were composed of two phases, Thenardite and Mirabilite. While the first is harmless, the second absorbs 300 mol of water below 32°C degrees acting as the destructive agent. However, more tests revealed that despite the lowering of the groundwater table the humidity levels in the very fine soil remained the same notwithstanding the differing ground levels on the site. Eventually the actual problem was recognized. It is not the water from the ground but the humidity in the air that especially in the colder season condensates and reacts with the salt present in the bricks and thus workes as the actual catalyst for the destruction.

As a result, the measures that had been taken so far were discontinued and all structures were 'reburied' under a thin layer of silt. The harmful crystallization now materializes in the silt cover rather than in the original fabric. This has considerably reduced annual running costs by using local material (silt) and low-tech labour intensive methods; in addition, local people are employed, consequently leading to sustainable employment and conservation.

The Present
Mohenjodaro Alive

Since the very beginning, the people living around Mohenjo daro were directly involved in the further destiny of the site. Employed by the different excavators and researchers they traditionally offered their services for the different programs and campaigns. They also serve, now in the third generation, as watchmen and workers for the conservation and guarding of the site.

Sindh has a rich cultural tradition which, unfortunately, only few tourists encounter. Beyond the main roads hardly anybody comes to Sindh to visit the shrine of Lal Shabaz Kalandar in Sehwan or to see the Mohanas on Lake Manchhar. Mohenjo daro is still a favorable place to go, also, because the airport is in close vicinity to the site. Mohenjo daro's museum is in walking distance. But the villages around Mohenjo daro are expanding rapidly. An average family has 5- 8 children and the means of income are very limited. The World Heritage Site does not yet offer enough opportunities to earn an income. Recent private initiatives were providing assistance to the building schools and providing education for girls. Some people have commenced the production of local handcraft to improve their income.

Obviously, there is a desire for doing more than just saving bricks and conserving ruins – more so because Mohenjo daro is the most important Bronze Age city of the world. An updated master plan for the development of the site is urgently needed, including the promotion of the presently living and not only to safeguard the dead past. The World Heritage Site can be preserved for the future by creating a stronger link to the people living at Mohenjo daro.

Deciphering Indus Script

Kaleemullah Lashari

The Rosetta Stone a tri-script inscription found in the desert of Egypt, near the village Rashid, by French soldiers, has acquired a meaning that denotes the sort of key, a decoding mechanism, a formula that may assist solve the riddle. But as you know even the Rosetta Stone with the three parallel scripts and two languages incised on it, didn't cause an instant decipherment of Hieroglyphs. It took around 60 years to solve the difficulties involved in the reading of the Egyptian story. Anyone considering the decipherment of Indus script/ signs/pictographs etc. in a century's time may very well be considered over enthusiast.

The enigmatic Indus Script has remained a challenge since quite sometimes, and it is likely that it may evade the attempts of the archaeologists, linguists and scientists yet for another considerable period.

Since 1872-3 when the first so called Indus Seal was found from Harappa it was instantly felt that it represented a new script, which was associated with an ancient language.

So for many attempts have been made to its decipherment, bringing back very interesting set of argument. The reasoning based on the comparative study with the ancient scripts, the efforts to identify the language it represents was the major focus.

It was argued that it holds the key to under stand the great Indian civilization; the comparison was made with many ancient scripts, which included the one nearer home like Brahmi, and such examples situated as far away as Easter Island, and also the Old Slavic; the list is not only long but pretty interesting. Dozens and dozens of the acclaimed decipherments were brushed aside by ever emerging scholars, but there has never been any dearth of new attempts at it.

Impression of a square Indus seal from Harappa (H-103) inscribed along three sides.

It was never doubted that the Indus was a literate civilization (Kenoyer 1998; Possehl 2002), no one seems to doubt this fact that it was not representing language/languages (Daniels and Bright 1996; Pope 1999; Robinson 2002).

Impression of a seal (M-735) from Mohenjodaro with comparing of the last inscribed sign.

The hope for finding larger inscriptions, say a library of Indus, is a dream desire of many of our colleagues, or else finding any multi lingual/script piece may help take us on a new course of discoveries.

Impression of a longest continuous Indus inscription a seal from Mohenjodaro (M-314)

As we know very well that the scholars based in the sub-continent as well as abroad remained involved in such efforts from very beginning.

Fairservis's model of decipherment based on the Dravidian hypothesis (published in 1992) has not been taken seriously because of his lack of familiarity with the Dravidian languages and linguistic techniques.

Inscription consisting of just the sign "7"+ fish on an Indus seal from Harappa (H-9)

There is no doubt that the so called Dravidian model remained a very convincing way, till the end of the century, to be followed for many more attempts.

Some very serious efforts went on to point out that the Indus Script represents Dravidian language/languages.

The computer arrived on the scene in the mid-Sixties. Its contribution in computing the positions of Indus signs was greatly sought. The computer-based analyses of regularities observed in the sign positions were considered convincing and it was believed that these signs represented a spoken language.

Many embarked on this journey; these included a prominent Soviet scholar whose work has also remained associated with decipherment of Mayan writing (Knorozov 1965; 1968) Knorozov published a series of papers entitled Protoindica, and a team of Finnish linguists and computation experts (Parpola, Koskenniemi, Parpola, Aalto 1969) embarked on a project that protracted for a considerable period.

The Parpola and the team went on to state that they had 'broken the code' (Parpola 1970).

Impression of a seal from Mohenjodaro (M-66) with cramping of the last sign of the line and one sign written beneath them.

Despite differences in detail there is a clear convergence of results flowing from the Soviet, Finnish and Indian computer-aided structural analyses.

The Finnish team also made use of computational linguistic techniques to deal with structural problems like word-division procedures and synctical analysis. There is already well-established evidence available proving the general direction of the Indus script to be from right to left.

This evidence is provided by the shorter inscriptions starting at the right edge leaving blank space nearer the left edge, and the displacement of the left-most signs of the longer inscriptions to the second line for want of space. Internal evidence for the direction of writing is obtained by comparing single-line and two-line sequences of identical inscriptions.

The history of efforts at its decipherment is as rich as it is interesting; many claims of its decoding has been very ably reviewed by scholars, more elaborately by Gregory L Possehl (see also [Mahadevan, 2002; Parpola, 2005]). It is a fact that all the 'decipherments' remained unconvincing with no universal consensus on any of the interpretations.

We here were much exposed to one of the remarkable attempts in the recent past, the one made by Asko Parpola. The effort was well supported both by India and Pakistan. But there has not been substantial break through; it in a way sounded like a failure, eating away the hopes of any success in the years to come.

Experts considered implausible identification of pictorial signs, arbitrary assignment of values to non-pictorial signs and diacritic-like marks unconvincing. Even the classification of composite and variant signs was considered to be not beyond doubt. [Harappan.com]

Parpola was considered to be slightly obsessed with the ideas of the 'Harappan religion', and the inexplicable absence of matters relating to the social life and administration of the Harappan polity was considered as weak part in his scheme of decipherment.

It was clear that his interpretations rely more on mythology than on textual or linguistic analysis. There has been another school of thought, which expounded theory of the Indo-Aryan hypothesis. Parpola took no notice

of these models, presumably because there is hardly anything in common between them and his own work. Certain class of scholars described his work as more or less a treatise on Harappan religion rather than decipherment of the Indus script. The absence of any convincing decipherment raised many skeptical comments; the argument was rather strong and it went up to the level to even deny the litracy in the Indus Valley in the third millennium BCE.

The absence of the longer text was at the base of it, this criticism even lost sight of the fact that there were pretty established centralized administrative structures in the Harappan cities and these can not possibly be made functional with out any formal communicational link.

Three seals with an inscription on the knob of the reverse repeating (in the case of f only partly) the initial portion of the inscription on the obvesre (a-b) H-102 from Harappa; (c-d) M-318; (e-f) M-1203 from Mohenjodaro.

Granting that the seal-texts are probably only strings of names and titles, and assuming that the writing is mostly logo-graphic, it would still be necessary to employ minimally parts of speech like pronouns, conjunctions and verbal participles and also grammatical morphs to indicate person, number, gender and case [Harappan.com].

There has been scholars who have taken unconventional course and have made very interesting attempts at understanding the character of the Indus signs.

The controversy over the status of the Indus signs has been quite grim, line of arguments, outlining the reasons for failure of its being understood are interesting as well as outlining many controversies. For example a group of scholars considers it to be the signs only, not representing any language.
The other group considers that non-decipherment is simply because there is no bilingual inscription available. They also argue that the absence of long enough writing is minimizing the chances of its decipherment.

In actuality no knowledge exists about the kings, or the names of the cities, thus looking for such names may help devising some key to understand the characters.

The objects on which these signs appear are 'in terms of art, aesthetic sense and expressions of symmetric, geometric as well as abstract patterns, these objects are unsurpassed in their quality [Yadav & Vahia, 2011; Vahia & Yadav, 2010];

Major among these are the seals, 'inscribed with the Indus script (these) are generally a few square centimeters in size. They are catalogued in the three volumes of the Corpus of Indus Seals and Inscriptions [Joshi & Parpola, 1987; Shah & Parpola, 1991; Parpola, et al., 2010].

Some examples of Indus seals with the Indus script (Copyright Harappa Archaeological Research Project/J.M. Kenoyer, Harappa.com, Courtesy Dept. of Archaeology and Museums, Govt. of Pakistan).

The matter of great interest is that even the usage and purpose of the material on which the inscriptions are appearing is not clear [Possehl, 1996, 20]. The Indus signs are present on variety of artifacts like Seals, sealings, tablets, pottery etc. Seals, as these are called, due mainly to its having the hub like device at its back have been unearthed from number of sites, larger quantity comes from Mohenjodaro. The script therefore holds a vital clue to understanding the Indus culture.

Of all the attempts many were clearly very systematic, logical and were argued well; few were such that could be termed below the scholarly tradition. However all these could not agree to any common point nor could help resolve the issues of meaning and purpose.

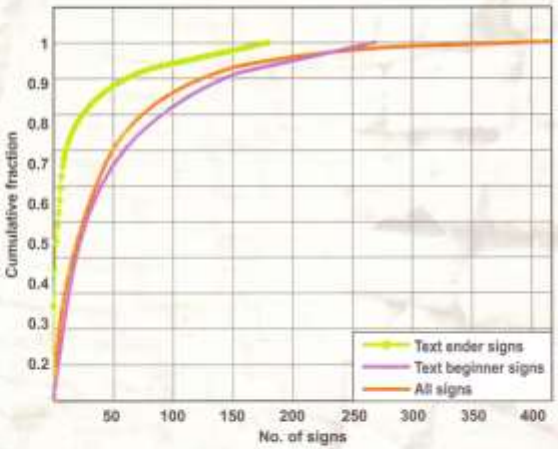
'Reasons that make the problem of Indus script challenging are the brevity of the Indus texts, paucity of the data, lack of definitive knowledge about the language(s) that the Indus people spoke, and absence of bilingual inscriptions.... "[Yadav]" It is the reason that many people consider that the Indus script may remain un deciphered for another score of years. Yadev and team worked to understand the basic construction and mechanics of Indus sign. They are of the view that 'the empirical frameworks are unlikely to provide satisfactory decipherment without a proper understanding of the syntax to guide and validate such frameworks in an objective manner. They 'used various computational techniques to identify aggregate characteristics of the Indus script without making any assumptions about its content' [Yadav].

They employed computational techniques related to machine learning, data minning and information theory to understand the characterstics and the syntax of Indus script; The team thinks this '..will provide an objective testing ground for any claims of decipherment of Indus script [Yadav].
They argued that systematic writing would have specific ordering of signs. The frequency of signs and sign combinations as well as their pattern of appearance in the texts elucidate the syntax of the writing.

Analysis of syntactic patterns

The study went on to suggest 'limited number of signs for text beginners and enders and significant constraints on the pairing of signs.

'This suggests that in the Indus writing only a small number of signs were allowed to end the texts while a relatively larger number of signs could begin the texts.



Cumulative frequency plot for all signs, text-beginners and enders [Yadav, et al., 2010].

Sequencing of signs in Indus texts: 'sign combinations of two, three and four signs appear with far higher frequency in the Indus script dataset than expected by chance.

Segmentation of Indus texts

a) length of text in Indus script varies from 1 to 14 signs per line.
b) text beginners and enders are well defined.
c) 88% of all texts of length five or more can be segmented into segments of length not exceeding four.
d) multiple units of information written in a text.
e) longer strings of writing are a collection of several smaller units of information and not a long unit of complex information.

Flexibility in sign usage across different sign systems

They consider that the results of their findings increase the evidence in favour of the linguistic hypothesis of the Indus script. It should however be noted that it does not prove it to be linguistic.

Design of Indus signs

Mahadevan records 417 distinct signs in the sign list of Indus script [Mahadevan, 1977] in 3573 lines of 2906 texts.

Several signs seem to have been designed by adding modifiers to signs or merger of several individual signs.
Types of signs:

1. basic signs,
2. provisional basic signs
3. and modifiers

Sign compounding (ligaturing) and sign modification seem to change the meaning or add value to basic signs rather than save writing space.

"There is hardly any doubt that the Signs and their appearance on various objects have some linkage, this sensitivity has:"
(1) Distribution of inscribed objects:
(2) Sensitivity of the Indus script to site and type of object:
(3) Clustering of sites and types of objects:

However there exists a very strong view against the understanding that Indus signs are representing a written language/languages. It went on to analyze in details the: impossibility of the manuscript thesis, as the Indus Symbols were not even evolving in linguistic direction after at least 600 years of use. [Collapse of Indus Script Thesis: The Myth of Litrate harappan Civilization: Steve Farmer, Richard Sproat, and Michael Witzel; Electronic Journal of Vedic Studies (EJVS) 11 – 2 (2004) pp.19-57]

This small overview brings us to the clear understanding that the Indus texts have an underlying logic and syntax indicative of writing; the ordering of signs is also more rigid than random writing. There is significant asymmetry in the usage of text beginners and text enders [Kenoyer & Meadow 2010]. It leaves hardly any doubt that the manner of writing remained highly standardized over the entire civilization.

The studies on the Indus script can be fruitful when the whole context is re-questioned; more detailed analysis is bound to provide certain information that could lead to better understanding of the Indus culture.

"The intelligent writers carefully differentiated between different signs, which were clearly showing their distinct shape, and all such signs were brought together to form 'a corpus' of the Indus signs. This logically a dangerous exercise became the base of the studies of the Indus signs."

Besides the minute observations on the seals and its production have given meaningful insight in the evolution of seal forms over time. "This and similar other investigative observations must become the part of study to ascertain the possible development of signs in their form, combinations and sequencing.

The new excavations produce stratigraphically controlled and well-dated inscribed pieces, it becomes both possible and increasingly important that the script and accompanying iconography be subjected to rigorous analysis at the site, regional, and cross-regional levels to investigate trends of change through time and variability across space.

The correlation of script variations and the types of the objects bearing the signs are to be seen in context, as the sites relevant were constantly undergoing changes, transforming, expanding or and declining, Kenoyer feel that script shows the transformation as well [Kenoyer & Meadow 2010]

It was a diligent exercise that improved the description of Mahadevan when Parpola lays down clear guidelines for the recognition of basic signs, graphic variants and composite signs. The numerals are identified as a set of short stroke signs comprising up to nine strokes arranged in one or two tiers. Group of small inverted semi-circles which occur along with the 'stroke' numerals are very likely to be tens.

Experts may differ whether a given sign is basic or provisional or modifier. However Parpola has now provided the most complete documentation enabling other scholars to draw their own conclusion. [Harappan.com]

Further studies are imperative, thus there shall be no dearth of attention to the Indus script, there is always a reason to believe that further discoveries may produce some fateful material that may help assist the efforts of the scholars. However there is need that the script itself shall be given some more attention to look in to computational possibilities to help in arriving at some understanding of the context.

The Indus signs have been largely used as drawn images in computational analysis and studies. The measure has been taken to make this script as normal computer friendly font, useable as the font for future computational exercises. Thus the Indus signs are transformed in Scalable Vector Graphics (SVG) based font for installing in computers.

The Indus signs could be used in studies, in writing, as it is now available to be incorporated in writing as easily as Arabic letters or words could be typed in the text format.

Likewise these signs are now computer program, a font that could be used in computing exercises, statistical counts, as the computers easily recognize each sign.

The Indus script can be downloaded for use and computations etc. web version of this font has been developed and placed at the website of the mohenjodaroonline.net, for downloading by bloggers, researchers and web developers, free of cost.

This web version font is comprised on cascading style sheets (CSS), all versions of universal accessing fonts of the Indus Script font including tutorial of web embedding. This version of the font could be helpful to the researchers and developers universally, enabling placing these signs as text rather than the drawn images.

Technically another advantage of this web version is that the Google or other such search engines could carry it in their research algorithms.
It is being reasonable to hope that placing the script this way it shall be fully exposed to "neural networking," the computing identifier of similarities, serial sequencing and of inherent characteristics.

This feature may become instrumental further in studies by intelligent users. It may further help increase the chances of computational assistance in varied sets of reorganized reasoning, behind the use and its sequencing in the antiquity.

This font has been prepared and made available for installing on computers and embedding on websites by researchers and users around the world. It has been developed under the umbrella of NFM, by Mr. Shabir Kumbhar, engineering / embedded and mapping by Mr. Amar Fayaz Buriro, under the advise of present writer, thus any lacuna remaining may be not for want of their efforts, but shall solely be fault of this writer.

NFM-Indus Script
Unicode Private Use Area (PUA) Table of Codes

HOW TO USE THE INDUS SCRIPT FONT

For using specific sign of Indus Script font in word document, please follow these instructions:

1. Install NFM Indus Script font.

2. Find the value code of the required sign from table; vertical value & horizontal number: (For example the sign  has value E07 horizontal and 5 number in vertical. So the value code will be E075.)

3. Just type this code and then press Alt+X, without space.

4. A rectangle symbol will appear. Just select that rectangle symbol.

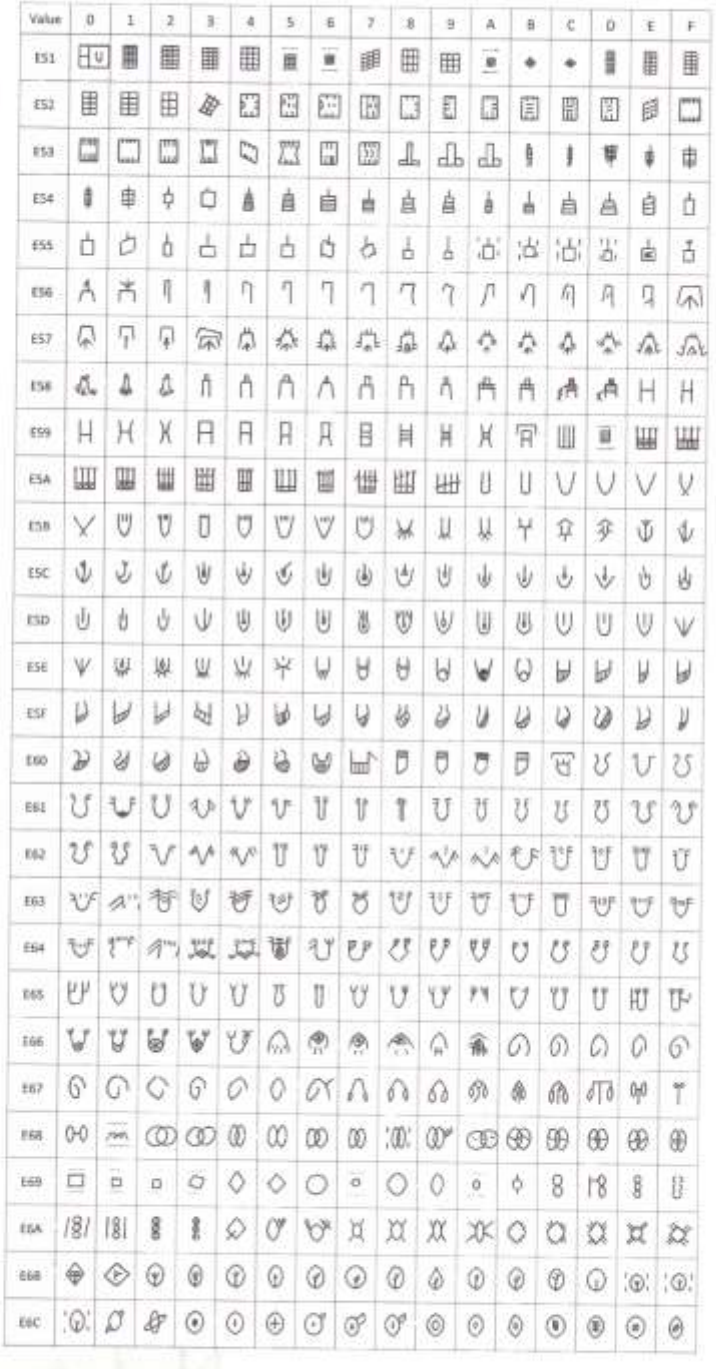
5. In formatting toolbar, select "NFM Indus Script" font. Required sign of Indus Script will appear at document in text format.

NFM-Indus Script Signs with the table of codes:

Value	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E00	𒀀	𒀁	𒀂	𒀃	𒀄	𒀅	𒀆	𒀇	𒀈	𒀉	𒀊	𒀋	𒀌	𒀍	𒀎	𒀏
E01	𒀐	𒀑	𒀒	𒀓	𒀔	𒀕	𒀖	𒀗	𒀘	𒀙	𒀚	𒀛	𒀜	𒀝	𒀞	𒀟
E02	𒀠	𒀡	𒀢	𒀣	𒀤	𒀥	𒀦	𒀧	𒀨	𒀩	𒀪	𒀫	𒀬	𒀭	𒀮	𒀯
E03	𒀰	𒀱	𒀲	𒀳	𒀴	𒀵	𒀶	𒀷	𒀸	𒀹	𒀺	𒀻	𒀼	𒀽	𒀾	𒀿
E04	𒁀	𒁁	𒁂	𒁃	𒁄	𒁅	𒁆	𒁇	𒁈	𒁉	𒁊	𒁋	𒁌	𒁍	𒁎	𒁏
E05	𒁐	𒁑	𒁒	𒁓	𒁔	𒁕	𒁖	𒁗	𒁘	𒁙	𒁚	𒁛	𒁜	𒁝	𒁞	𒁟
E06	𒁠	𒁡	𒁢	𒁣	𒁤	𒁥	𒁦	𒁧	𒁨	𒁩	𒁪	𒁫	𒁬	𒁭	𒁮	𒁯
E07	𒁰	𒁱	𒁲	𒁳	𒁴	𒁵	𒁶	𒁷	𒁸	𒁹	𒁺	𒁻	𒁼	𒁽	𒁾	𒁿
E08	𒂀	𒂁	𒂂	𒂃	𒂄	𒂅	𒂆	𒂇	𒂈	𒂉	𒂊	𒂋	𒂌	𒂍	𒂎	𒂏
E09	𒂐	𒂑	𒂒	𒂓	𒂔	𒂕	𒂖	𒂗	𒂘	𒂙	𒂚	𒂛	𒂜	𒂝	𒂞	𒂟
E0A	𒂠	𒂡	𒂢	𒂣	𒂤	𒂥	𒂦	𒂧	𒂨	𒂩	𒂪	𒂫	𒂬	𒂭	𒂮	𒂯
E0B	𒂰	𒂱	𒂲	𒂳	𒂴	𒂵	𒂶	𒂷	𒂸	𒂹	𒂺	𒂻	𒂼	𒂽	𒂾	𒂿
E0C	𒃀	𒃁	𒃂	𒃃	𒃄	𒃅	𒃆	𒃇	𒃈	𒃉	𒃊	𒃋	𒃌	𒃍	𒃎	𒃏
E0D	𒃐	𒃑	𒃒	𒃓	𒃔	𒃕	𒃖	𒃗	𒃘	𒃙	𒃚	𒃛	𒃜	𒃝	𒃞	𒃟
E0E	𒃠	𒃡	𒃢	𒃣	𒃤	𒃥	𒃦	𒃧	𒃨	𒃩	𒃪	𒃫	𒃬	𒃭	𒃮	𒃯
E0F	𒃰	𒃱	𒃲	𒃳	𒃴	𒃵	𒃶	𒃷	𒃸	𒃹	𒃺	𒃻	𒃼	𒃽	𒃾	𒃿
E10	𒄀	𒄁	𒄂	𒄃	𒄄	𒄅	𒄆	𒄇	𒄈	𒄉	𒄊	𒄋	𒄌	𒄍	𒄎	𒄏
E11	𒄐	𒄑	𒄒	𒄓	𒄔	𒄕	𒄖	𒄗	𒄘	𒄙	𒄚	𒄛	𒄜	𒄝	𒄞	𒄟
E12	𒄠	𒄡	𒄢	𒄣	𒄤	𒄥	𒄦	𒄧	𒄨	𒄩	𒄪	𒄫	𒄬	𒄭	𒄮	𒄯
E13	𒄰	𒄱	𒄲	𒄳	𒄴	𒄵	𒄶	𒄷	𒄸	𒄹	𒄺	𒄻	𒄼	𒄽	𒄾	𒄿
E14	𒅀	𒅁	𒅂	𒅃	𒅄	𒅅	𒅆	𒅇	𒅈	𒅉	𒅊	𒅋	𒅌	𒅍	𒅎	𒅏
E15	𒅐	𒅑	𒅒	𒅓	𒅔	𒅕	𒅖	𒅗	𒅘	𒅙	𒅚	𒅛	𒅜	𒅝	𒅞	𒅟
E16	𒅠	𒅡	𒅢	𒅣	𒅤	𒅥	𒅦	𒅧	𒅨	𒅩	𒅪	𒅫	𒅬	𒅭	𒅮	𒅯
E17	𒅰	𒅱	𒅲	𒅳	𒅴	𒅵	𒅶	𒅷	𒅸	𒅹	𒅺	𒅻	𒅼	𒅽	𒅾	𒅿
E18	𒆀	𒆁	𒆂	𒆃	𒆄	𒆅	𒆆	𒆇	𒆈	𒆉	𒆊	𒆋	𒆌	𒆍	𒆎	𒆏
E19	𒆐	𒆑	𒆒	𒆓	𒆔	𒆕	𒆖	𒆗	𒆘	𒆙	𒆚	𒆛	𒆜	𒆝	𒆞	𒆟
E1A	𒆠	𒆡	𒆢	𒆣	𒆤	𒆥	𒆦	𒆧	𒆨	𒆩	𒆪	𒆫	𒆬	𒆭	𒆮	𒆯

Value	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E1B																
E1C																
E1D																
E1E																
E1F																
E20																
E21																
E22																
E23																
E24																
E25																
E26																
E27																
E28																
E29																
E2A																
E2B																
E2C																
E2D																
E2E																
E2F																
E30																
E31																
E32																
E33																
E34																
E35																


Value
0
1
2
3
4
5
6
7
8
9
A
B
C
D
E
F
E36
E37
E38
E39
E3A
E3B
E3C
E3D
E3E
E3F
E40
E41
E42
E43
E44
E45
E46
E47
E48
E49
E4A
E4B
E4C
E4D
E4E
E4F
E50


Value
0
1
2
3
4
5
6
7
8
9
A
B
C
D
E
F
E51
E52
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E54
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E56
E57
E58
E59
E5A
E5B
E5C
E5D
E5E
E5F
E60
E61
E62
E63
E64
E65
E66
E67
E68
E69
E6A
E6B
E6C

Value	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E6D																
E6E																
E6F																
E70																
E71																
E72																

STATISTICS

(The table showing statistical data of varied Indus Signs in NFM Indus Script font as identified by Asko Parpola in his compiled corpus)

NFM-Indus Script Unicode PUA Table of codes:

Value	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	Total
E00	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	256
E10	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	256
E20	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	256
E30	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	256
E40	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	256
E50	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	256
E60	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	256
E70	16	16	15	0	0	0	0	0	0	0	0	0	0	0	0	0	047
Total	128	128	127	112	112	112	112	112	112	112	112	112	112	112	112	112	1839