

Origin and Development of the Indus Script: Insights from Harappa and other sites

Jonathan Mark Kenoyer

Origin and Development of the Indus Script: Insights from Harappa and other sites

Introduction

The origin of the Indus script has been a source of considerable discussion ever since the discovery and excavation of the Indus cities of Mohenjo-daro and Harappa in the 1920s to 1930s (Marshall 1931; Vats 1940). When the Indus civilization was discovered the only other early civilizations known to have writing in the Old World were the ancient Sumerians along the Tigris and Euphrates Rivers in southern Mesopotamia (Nissen 1993), the ancient Egyptians along the Nile (Baines 2004) and the ancient Chinese along the Huang He (Yellow) River in north central China (Haicheng 2015). The oracle bone inscriptions at the site of Yinxu in Anyang were being discovered around the same time that Mohenjo-Daro and Harappa were being excavated (Bagley 1999, 127). Although at first some scholars thought that there might be some influence from Mesopotamian writing systems, in the first major report on the excavations at Mohenjo Daro in 1931, Gadd clearly states that there was no connection between the Indus script and the writing of Sumer or for that matter Egypt (Gadd 1931, 411). Surveys and test excavations in Baluchistan (Stein 1929; Hargreaves and Sewell 1929 (reprint 1981); Stein 1931) and Sindh (Majumdar 1934; Stein 1942) had recovered pottery that appeared to be older than that found at Mohenjo Daro, but little attention was paid to the presence of potter's marks or graffiti on these different types of pottery. It was not until the 1950s, after surveys of the Quetta Valley, Zhob and Loralai Districts, that Fairservis proposed that the earlier graffiti on pottery found in the regions of Baluchistan and the wider Indo-Iranian region might have some influence on later Indus writing systems (Fairservis 1959). B. B. Lal was among the first to argue that the origins of the Indus script were local and that the script continued to be used into the Late Harappan as seen on OCP pottery and on later Megalithic pottery (Lal 1975). However, many scholars

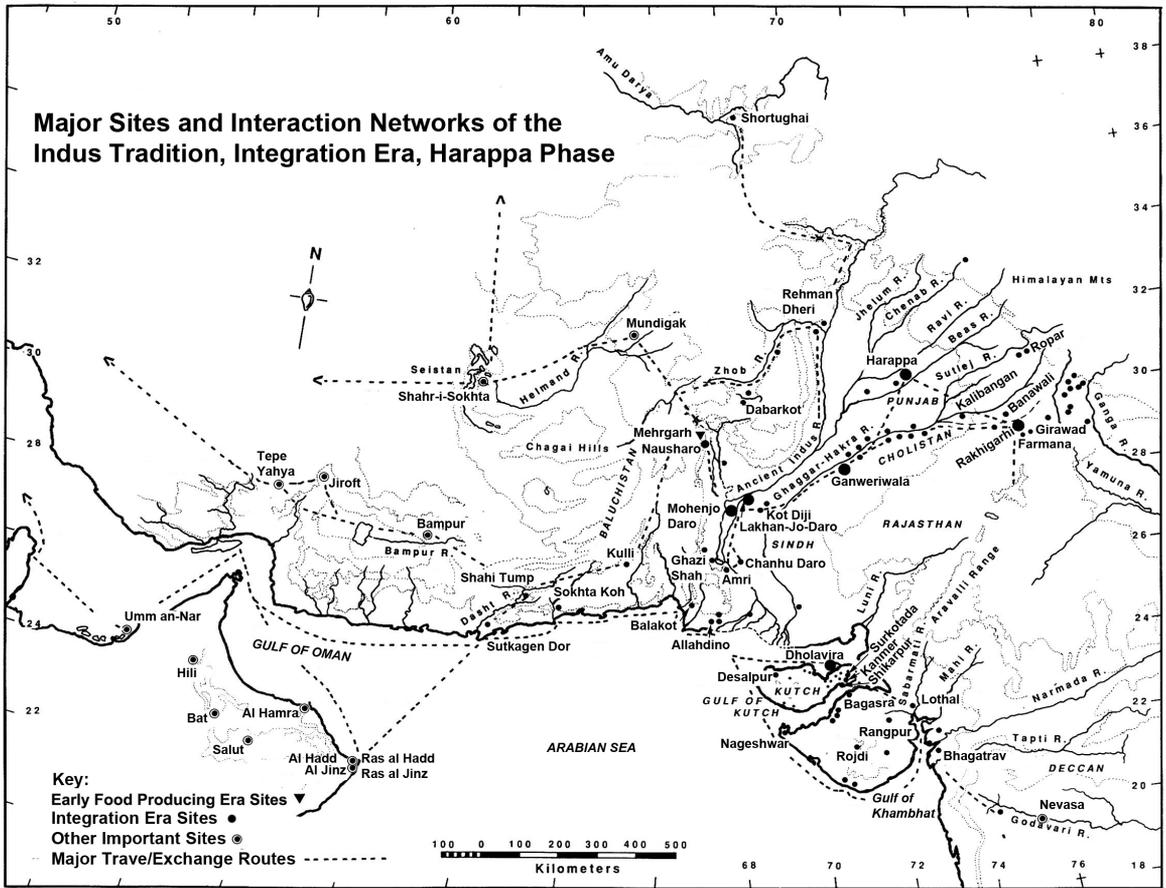


Figure 1. Map of the Indus

were not convinced with the scattered evidence of earlier writing and even after the discovery of Early Harappan writing Rehman Dheri and other sites (see discussion below), some scholars still assumed that the script appeared relatively fully formed around 2500 BCE (Possehl 1990; Possehl 1996).

At present, however, on the basis of numerous excavations and analyses of earlier survey materials there is increasing evidence that the Indus script did in fact evolve in the Indus and Ghaggar-Hakra River Valleys and Baluchistan (Figure 1) beginning in the Early Harappan Period, between 4000 and 2600 BCE (Table 1)(Kenoyer 2006). It is possible that Kutch and Gujarat also played an important role in terms of specific regional styles of graphic symbols, but more research needs to be done in these regions to determine the chronology and continuity of specific symbols. As will be discussed below in more detail, the regional and chronological changes in types of symbols and how they were used suggest that there were significant changes in the writing system over time (Kenoyer and Meadow 1997; Kenoyer and Meadow 2008; Kenoyer and Meadow 2010). Since the script has not yet been deciphered it is not

possible to understand the details of these changes, but comparisons can be made with the evolution of proto-cuneiform and cuneiform to determine some of the general processes of change (Damerow 2006,7). During the Harappa Phase, circa 2600-1900 BCE, the Indus script was used throughout the Indus and even adopted for use in the Gulf region, which suggests that it was used to write names and commodities in many regional dialects and even different languages (Kenoyer and Meadow 2010). The question of whether it was simply a system of notation rather than a writing system has been effectively addressed in other publications (Vidale 2007; Parpola 2008). Today, most scholars implicitly or explicitly agree that the Indus script was a distinctive and unique writing system indigenous to northwestern South Asia or the greater Indus Valley region (Parpola 1994; Possehl 1996; Wells 1998; Kenoyer and Meadow 2010; Yadav *et al.* 2012; Mahadevan and Bhaskar 2018; Rao 2018).

Table 1. Chronology of the Indus Tradition (Possehl 1994; Meadow and Kenoyer 2005; Kenoyer 2015).

Early Food Producing Era (Neolithic)	ca. 7000 to 5500 BCE
<i>Mehrgarh, Period IIa - Ceramic</i>	<i>6000-5500 BCE</i>
<i>Mehrgarh, Period I, Aceramic</i>	<i>7000-6000 BCE</i>
Regionalization Era (Chalcolithic/Bronze Age)	
Early Harappan Phase ca.	5500 to 2600 BCE
<i>Harappa: Period 2, Kot Diji Phase</i>	<i>2800-2600 BCE</i>
<i>Harappa: Period 1, A & B, Ravi Phase</i> = <i>Mehrgarh, Period IV to V</i>	<i>>3700-2800 BCE</i> <i>3500-3000 BCE</i>
<i>Mehrgarh, Period III</i>	<i>4400--3500 BCE</i>
<i>Mehrgarh, Period IIb</i>	<i>5500-4400 BCE</i>
Integration Era (Indus Civilization) (Bronze Age)	
Harappan Phase	2600 to 1900 BCE
<i>Harappa: Period 3C, Final</i>	<i>2200-1900 BCE</i>
= <i>Nausharo, Period IV</i>	<i>2100-2000 BCE</i>
<i>Harappa: Period 3B, Middle</i>	<i>2450-2200 BCE</i>
= <i>Nausharo, Period III</i>	
<i>Harappa: Period 3A, Initial</i>	<i>2600-2450 BCE</i>
= <i>Nausharo, Period II</i>	
Localization Era (Bronze Age)	
Late Harappan Phase	ca. 1900 to 1300 BCE
<i>Harappa: Periods 4 and 5</i>	<i>1900- 1700 BCE</i>
= <i>Mehrgarh Period VIII</i>	<i>2000-1700 BCE</i>
Jhukar, Rangpur, Cemetery H Phases	

Stages of Indus Writing Development

Based on the current archaeological evidence the development of writing in the Indus region can be divided into four major stages that can be correlated to the major chronological Phases at Harappa and other sites (Table 2). During the Regionalization Era, Early Harappan Phase there are two stages of script development. The first stage, which dates to around 4000-2800 BCE, sees the widespread and regionally diverse use of pre-firing potter's marks as well as post-firing graffiti. These single and sometimes multiple graphic symbols may represent a form of proto-writing similar to that seen in other world regions. These symbols continued to be used throughout the later periods in some sites, indicating that they reflect a parallel use of symbols that did not cease to function even with the introduction of a more complex writing system. The fact that they continued to function does not preclude the possibility that they also provided some form of stimulus to the development of specific signs that became incorporated into the writing system. During this first stage, geometric button seals were produced using terracotta, bone and eventually carved steatite and fired and glazed steatite (Kenoyer 2009). There is considerable regional variation in the types and designs of button seals during this early phase and to date no seals with what could be identified as script have been reported.

The second stage of development during the Early Harappan Phase, dating from around 2800-2600 BCE sees the continuation of pre-firing potter's marks, and the first use of pre-firing inscriptions that include multiple graphic symbols (Kenoyer 2006). Post-firing graffiti also continue to be used but there are more examples of the use of one or more symbols that are definitely found in the later Indus script. For the first time, there is evidence for the use of script on seals that were impressed into clay, as well as script combined with motifs on carved bone pendants as seen at the site of Rehman Dheri (Kenoyer 2020). This second stage has been referred to as Early Indus script since it develops during the last part of the Early Harappan or Early Indus period.

The third phase of writing development is sub-divided into three phases that will be discussed in more detail below. This is the more commonly known Indus Script that is seen inscribed on pottery, seals and a wide range of other items (see Table 2). The fourth and final phase of Indus script is during what is commonly referred to as the Late Harappan Phase. There is no evidence for the use of writing on seals and geometric seals become widespread once again. Some evidence for graffiti on pottery is reported from Late Harappan and post-Harappan sites during this time period, but there is no regional pattern of writing use and the dating of some sherds with graffiti is problematic. However, during this transition phase there is evidence for the use of post-firing graffiti on non-Indus pottery in peninsular India broadly associated with Megalithic cultures that extend into the southern and central Deccan Plateau (Lal 1962; Lal 1975).

Table 2: Chronology of Indus Script and Seal types from Harappa and other major Indus Sites - modified from (Kenoyer 2020)

Harappa - Period 1- 3700-2800 BCE

Seals:

-Button seal with geometric design, no clear evidence for script

Positive script

-Inscribed pottery – post-firing graffiti, one to three signs, pre-firing potter's marks

-Pre-firing potter's marks, include some signs that later become incorporated in Early Indus Script

Period 2 – 2800-2600 BCE

Seals: inverse script

-Square steatite seal – animal motif facing left, irregular carving, irregular script placement (1 or 2 signs), seal boss is circular or square

-Steatite button seal – symbol, no script, seal boss is circular or square

-Sealing – square seal with script, plant motif and ladder motif

Pendant or Ornament with Script

-Carved ivory pendant (Rehman Dheri) with motifs and script signs

Positive script

-Inscribed pottery – post-firing graffiti, pre-firing script?, one to three signs

Period 3A – 2600-2450 BCE

Seals: inverse script

-Square steatite seal – angular carving of animal predominantly facing right, linear script placement (1 to 3 signs), curved script above animal motif, one script sometimes below animal head, seal boss is square

Positive script

-Inscribed pottery – post-firing graffiti, pre-firing script (1 to 3 signs)

Period 3B – 2450 -2200 BCE

Seals: inverse script

-Square steatite seal – animal motif predominantly facing left, linear but irregular script above animal motif, seal boss is circular, domed with single or double groove

-Square steatite seal – only with script, linear regular script size

-Steatite button seal – symbol, no script

Positive script

-Incised steatite tablets - regular and irregular script, motifs and symbols

-Molded faience tablet - script, motifs and symbols

-Molded terracotta tablet - seal impression with animal motif and script

-Inscribed pottery - post-firing graffiti, pre-firing script (1 to several signs, sometimes in more than one line)

Period 3C – 2200-1900 BCE

Seals – inverse script

- Square steatite, copper and silver seals – animal motif facing left, bold, rigid, regular script, seal boss is circular, domed with single, double or triple groove
- Long rectangular steatite seal – no animal motif, bold, rigid, regular script
- Terracotta seal – regular script
- Faience button seal – symbols, no script

Positive script

Trade and Accounting devices

- Incised steatite tablets - script, motifs and symbols
- Incised terracotta tablets/ shaped sherds – incised irregular script

- Molded copper tablets – regular script, raised in positive
- Molded faience tablet – narrative scenes, script, motifs and symbols
- Molded terracotta tablet – narrative scenes, seal impression with animal motif and script
- Molded terracotta token – circular with script on one or both sides, low fired
- Terracotta flat sealing – molded script from various types of seals
- Inscribed terracotta conical sealing – irregular script

Pottery

- Pointed base goblets – impressed with script seal
- Inscribed pottery – large and small, generally irregular post-firing graffiti, large and small refined and regular pre-firing script (1 to several signs, sometimes in more than one line)

- Inscribed stone vessel – bold regular script

Architecture

- Inlaid signboard with large script (Dholavira)
- Inscribed ringstone – regular script

Tools / weapons

- Inscribed copper tools / weapons – bold, rigid, regular script
- Inscribed bone point – irregular script

Ornaments

- Inscribed gold jewelry – miniature irregular script
- Inscribed stoneware bangles – miniature irregular script
- Inscribed shell bangle – irregular script
- Inscribed terracotta bangle
- Molded terracotta bead – irregular script
- Molded faience bead (or perforated tablet) – regular script

Domestic, ritual and other

- Inscribed bone and ivory dice – irregular script
- Inscribed terracotta conical object / gaming piece – irregular script
- Inscribed terracotta top, wheel, figurine
- Inscribed terracotta triangular cake
- Inscribed pebble – irregular script

Late Harappa Phase

- Inscribed pottery - post-firing graffiti,

Pre-Firing Potter's Marks and Post-Firing Graffiti

The use of pre-firing symbols on pottery, which I will refer to here as “potter’s marks” is a technology that is found throughout the world in regions that have never developed any writing system. In most early reports both pre-firing marks as well as simple post-firing marks are sometimes lumped together and referred to as “potter’s marks” but this conflation needs to be avoided in the future to determine, which marks were made by the producer of the vessel and those that were added by the user or consumer. Some potter’s marks may simply be symbols used to distinguish the identity of the vessel maker or batch of vessels that were being produced and not be linked to a specific name or commodity. When multiple pre-firing marks are found on a vessel, it is more likely that they reflect a more complex message that could indicate a name or specific ritual or function that would also have been expressed verbally. Post-firing graffiti are incised with a stone or metal tool into the fired surface of the vessel, usually on the shoulder, rim or occasionally the lower body and under the base. Some graffiti are made with a single stroke, others include multiple strokes to create unique shapes, and then there are more complex graffiti that include more than one set of symbols. The longer the sequence of symbols the more likely that these graffiti reflect complex forms of communication that represent names, commodities or ritual formulae.

Some scholars suggest that there cannot be any link between these early potter’s marks and later writing because they were used for such a long time and continue after the introduction of writing (Boltz 1986,430-432). Boltz’s main arguments against the link between early potter’s marks in Neolithic China and later writing during the Shang Period include the following points; 1) that most of the potter’s marks are very simple graphic symbols and there is no way to link the form with meaning in the later writing system, 2) that most early writing that emerges starts first as pictographic images, and 3) the long time during which the potter’s marks were used before the development of writing precludes their link to the later writing. “On the face of it, it would appear virtually impossible that the nascent seeds of writing could have germinated in the mid-fifth century B.C. but not grown into anything approaching a real writing system until more than three thousand years later. Writing systems do not evolve that way. If a potential for writing arises in the form of graphs or marks standing for names or works, no matter of what kind or how limited, that potential must either fulfill itself in apace, culminating in a viable full-fledged system, or wither and die. A ‘half-way’ writing system is no system at all, and there is not way it could remain in a kind of ‘limbo’ or ‘suspended animation’ for such a long time. If it did not develop into a real writing system reasonably expeditiously, there would be

no reason for people to preserve its embryonic bits and pieces. As a practical matter a writing system is something that is achieved either relatively quickly, or not at all” (Boltz 1986,430-432).

This argument is flawed in assuming that all writing systems evolved in the same way or had the same function. The Indus script clearly functioned very differently than the writing systems of other early urban societies. From its use in the Early Indus Period and during the beginning of the Harappa Period it was dominated by short inscriptions on both pottery and seals. In later periods it was never used to write long inscriptions, and it does not appear to have been limited to only one community in that we see it associated with trade, ideology, personal identification and common materials (Parpola 1994; Kenoyer 2020). In contrast the earliest writing in Mesopotamia started out being used for basic accounting and was strongly associated with ideology and political power (Michalowski 1996; Cooper 2004; Damerow 2006); in Egypt the earliest writing was associated with royal burial offerings and continued to be used almost exclusively by elites for ritual and ideological purposes (Baines 2004), and that of ancient China was linked to recording communication with ancestors and was also strongly linked with elite culture and legitimation of both ideology and political authority (Keightley 1989; Boltz 2000; Haicheng 2015).

In terms of the discoveries of potter’s marks and graffiti, the earliest surveys that drew attention to these were made by Walter Fairservis in the Quetta Valley as well as in the Zhob and Loralai regions of Baluchistan (Fairservis 1956; Fairservis 1959). Fairservis also excavated at the important pre-dynastic site of Hierakonpolis in Egypt where he also noted the importance of graffiti and its link to later Egyptian writing (Fairservis 1983). The only published images for the potter’s marks from Fairservis’ surveys are the ones from the surface of the site of Periano Ghundai (Fairservis 1956, Fig. 59). These few sherds have signs that are similar to ones found at the site of Mehrgarh and also other later Indus sites, but do not really provide any clear pattern or provide any chronological information. Nevertheless, they show that these types of marks were found in Baluchistan and that detailed excavations could provide more detailed information in the future.

Other early excavations that provided additional evidence for potter’s marks and graffiti come from the site of Mundigak, Helmand Valley, Afghanistan, excavated by J. M. Casal (Casal 1961; Casal 1961). Again the symbols found at Mundigak pre-date the Indus script but there is no clear pattern or link that can be shown between these signs and those of later Indus writing. Even further to the west, excavations at the site of Tepe Yahya, Iran revealed similar use of potter’s marks and graffiti that was summarized in a study by D. Potts (Potts 1981). However, most of the potter’s marks found at the site date to the time period of the Indus cities and only a few simple signs were found in the earlier periods the site (Potts 1981). The study has a major flaw in that it combines all signs from the period prior to emergence of the Indus Script and those that are contemporaneous with the Indus script. Consequently the comparative tables are not that useful. It can be noted that none of the signs found in the phases that predate the Indus appear to have any similarity with later Indus signs. Some of the potter’s marks found in Period IVA3-1 are similar to ones found

in the Indus as well as Proto-Elamite. So far there is no evidence for any connection between potters at Tepe Yahya and Indus pottery traditions or Proto-Elamite scribal traditions, so we can assume that the similarities in design are simply coincidental.

Excavations at Mehrgarh by J.-F. Jarrige (Jarrige 1991) provided additional evidence that there were earlier periods where graphic symbols were incised on pottery. The comprehensive study of potter's marks from the first several seasons of excavations at Mehrgarh by G. Quivron (Quivron 1980; Quivron 1997) was perhaps the most important development that drew attention to the extensive use of graphic symbols on pottery. He was one of the first to argue that perhaps the early pre-firing making on pottery at Mehrgarh might be a predecessor to the later Indus script (Quivron 1980). Most of the signs studied by Quivron were clearly used as potter's marks, incised on the pottery prior to firing and he does not identify any signs that were post-firing graffiti. Additional post-firing graffiti were identified in the course of later excavations at Mehrgarh and additional discoveries were made in the course of excavations at Nausharo (Quivron 1997). Excavations at Amri by Casal also identified the presence of earlier pottery styles that had evidence for the use of potters' marks and post firing graffiti (Casal 1964).

The site of Kot Diji, Sindh originally excavated by F. A. Khan (Khan 1964; Khan 1965) has one of the most important chronological sequences beginning with the Early Harappan occupation and ending with the Harappan occupation. Only one sherd with graffiti was published in the original report (Khan 1964, Fig 14) but it is not unlikely that more sherds would have had both potter's marks and graffiti. This site is significant because the reanalysis of the pottery and other artifacts led to the initial definition of the Early Harappan, Kot Dijian Phase (Mughal 1970; Shaffer 1992). Another important Early Harappan settlement is the site of Rehman Dheri, in the Gomal Valley. First excavated extensively by F. A. Durrani, this settlement provided numerous examples of both potter's marks as well as graffiti on pottery, and the first example of script on a bone pendant combined with antelope and scorpion motifs (Figure 2)(Durrani 1976; Durrani 1986). Durrani identified numerous signs on the pottery and pendant from Rehman Dheri that he felt were linked to the later Indus script, but unfortunately, no detailed quantification of the signs were provided or their chronological context, and it was not always clear if the signs were pre-firing potter's marks or post-firing graffiti. Future reanalysis of the signs from Rehman Dheri is needed to develop a more robust study and determine which signs may have some linkage to the later Indus script.

The site of Kalibangan, Rajasthan also revealed the use of both potter's marks and graffiti during the Early Harappan Period. In some of the earlier publications, Lal identified some sherds as coming from the lower levels of the site, which presumably referred to the Early Harappan (or pre-Harappan) levels. Three sherds had the single sign that is the most common sign found in the later Indus script (Mahadevan 342) (Figure 3) (Mahadevan 1977; Lal 1979,33). In the more comprehensive publication of the Early Harappan levels of the site, there is no mention of these sherds so it is possible that they actually date to the Harappan period (Lal *et al.* 2003, 243-245).

The other symbols found on pottery during the Early Harappan period do include several signs that might be linked to later Indus script, but unfortunately there is no quantification of how many sherds were found or their specific chronological context. Overall the potter's marks and especially the graffiti from Kalibangan are extremely significant and deserve to be studied in more detail in the future. The site of Kunal also has revealed a number of graffiti from the Early Harappan occupation that could provide some important clues regarding the development of the Indus script (Khatri and Acharya 1997; Khatri and Acharya 2005) and hopefully more detailed information will be available in the near future.

The discovery of very distinctive graffiti signs on pottery from the Early Indus levels at Balakot, Period 1, has provided some of the first evidence that signs related to the Indus script were found as post-firing graffiti on pottery dating to the time period prior to the emergence of the Indus script (Figure 4)(Dales 1974, Fig. 11). Symbols painted on the Early Indus pottery could also reflect the use of special graphic symbols but not enough study was carried out on these symbols or their occurrences throughout Baluchistan. This is an area that deserves much more research. In one example, there is a complex symbol inscribed before firing on the concave surface of a specially fashioned terracotta scraping tool that may have been used for shaping pottery or some other scraping activity (Dales 1974, Fig. 14,C). Dales noted that a similar sign has been found on the interior of pottery vessels from the Early Indus site of Jalilpur, in the Punjab. He noticed these similarities when examining the pottery recently excavated by Dr. M. R. Mughal, but unfortunately these sherds from Jalilpur have not yet been published.



Figure 2. Rehman Dheri Ivory Pendant (redrawn by Kenoyer)

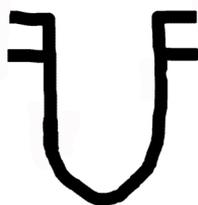


Figure 3. Mahadevan sign 342

Further studies of the graffiti from Balakot Period I were carried out by Ute Franke-Vogt in her doctoral dissertation (Franke-Vogt 2001). Her exhaustive study provided detailed chronological associations between different types of potter's marks, painted motifs and post firing graffiti. Many of the signs found on the Balakot Period 1 pottery have clear links to later Indus script and among them the most important sign is the symbol (Mahadevan 342) (Figure 3) (Mahadevan 1977) that was first reported from Kalibangan by Lal (Lal 1979,33). All of these scattered discoveries have provided clear indication that earlier communities were beginning to use graphic symbols on pottery, both as pre-firing potter's marks or painted motifs as well as post-firing graffiti. With this general background regarding earlier discoveries we can now review the discoveries from the recent excavations at Harappa to better contextualize the development of the writing system during the Early Harappan Phase and trace its development and changes in the Harappa Phase.

Harappa Ravi and Kot Diji Phase Potter's Marks and Graffiti

The pottery found in the Ravi Phase occupation levels at Harappa are all made with hand building techniques and consist of small bowls, globular cooking pots, carinated pots with simple constricted rims, and a range of other relatively small constricted or straight sided vessels. Most were decorated with a red brown slip but some were also painted with white and various shades of red-brown to purple brown to black (Kenoyer and Meadow 2000). The area of excavation for the Ravi Phase, Period 1 and the Kot Diji Phase Period 2 at Harappa is very limited, but the preliminary quantification of potter's marks and graffiti show an important pattern. Based on the tabulation of pottery studied between 1986 and 2003, there are total of 1218 sherds with either simple incised marks or what with more complex signs that might be considered some form of script (Table 3). For the Earlier Periods, more detailed analysis of the sherds differentiated what are pre-firing and post-firing graffiti (Table 4). The percentage of pre-firing potter's marks from Period 1 and Period 2 are about the same. The total number of post firing graffiti from Period 1 is only 16 and while some of the graffiti are simple lines and designs that are not much different than the pre-firing motifs, others appear to be more complex and involve up to three combined symbols (Figure 5). During Period 2, there are 175 graffiti that include some relatively simple signs, but also more examples of multiple signs combined together. Perhaps the most important discovery from both the Period 1 (Figure 6a) and Period 2 (Figure 6b) is the discovery of the sign that later becomes the most common script sign of the Indus script, i.e. Mahadevan sign "342" (Figure 3). Furthermore, this sign is also combined with another sign (Mahadevan sign 347) in a sequence that also appears in later Indus seals and numerous inscriptions (Figure 7). Most of the inscribed pottery and all seals and other inscribed objects from the recent excavations at Harappa have been published in the major volumes edited by Asko Parpola and his colleagues (Shah and Parpola 1991; Parpola *et al.* 2010). The remaining objects found since the last publication are being prepared for publication in the near future.

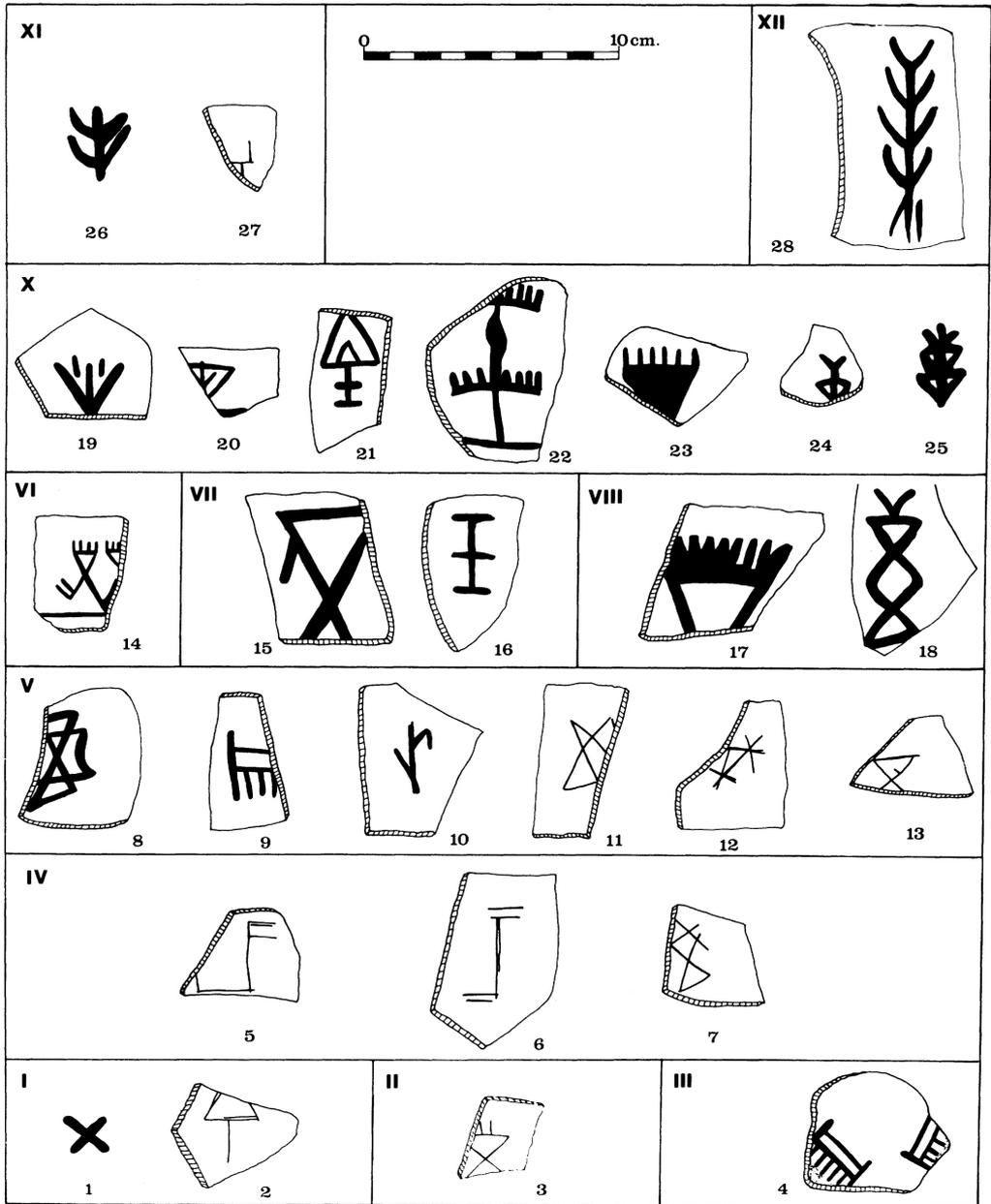


Figure 4. Balakot Potter's Marks, Graffiti and Painted motifs (from Dales 1974, Fig. 11)

HARAPPA
Period 1: Ravi Phase

Post-firing graffiti



Pre-firing potter's marks



Period 2: Kot Diji Phase

Post-firing graffiti



Pre-firing potter's marks



Figure 5. Harappa, Ravi and Kot Diji Phase Potter's marks and post-firing graffiti

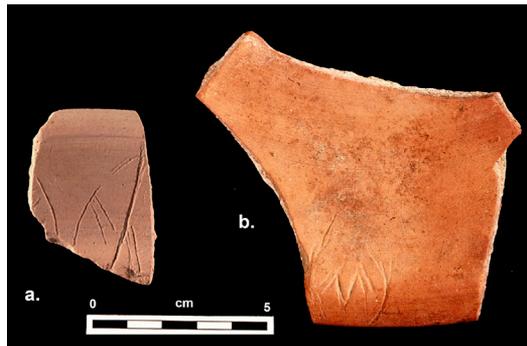


Figure 6. Harappa, a. Ravi sherd with graffiti (H98/8440-202), b. Kot Diji sherd (H99-4367/8946-37)

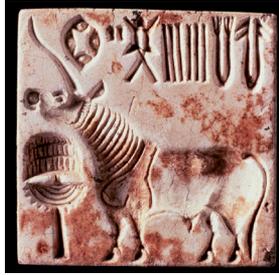


Figure 7. Harappa, Unicorn seal with Indus Script (H96-2736/7134-01)

Table 3. Harappa, All Phases, Potter's Marks and Graffiti

Harappa Graffiti	Total	%
Period 1, Ravi Phase	23	1.89%
Period 1/2	7	0.57%
Period 2, Kot Diji Phase	224	18.39%
Period 2/3	19	1.56%
Period 3, Harappa Phase	941	77.26%
Period 4/5, Late Harappa Phase	4	0.33%
Total	1218	100.00%

Table 4. Harappa, Period 1 and 2, Potter's Marks and Graffiti

Harappa Graffiti	Total	%
Ravi Phase		
Period 1 Pre Firing	7	30.43%
Period 1 Post Firing	16	69.57%
Total	23	100.00%
Kot Diji Phase		
Period 2 Pre Firing	49	21.88%
Period 2 Post Firing	175	78.13%
Total	224	100.00%

Conclusion

Based on the brief discussion presented above I feel that the evidence for a longer period of Indus script development is justified and encourage more extensive excavations of Early Harappan sites in order to increase the sample of early writing on pottery and other objects. More detailed recording and quantification of pre-firing and post-firing marks on pottery and other objects is needed to better understand the developments of these symbols in each major region of the greater Indus Valley.

It is not unlikely that once we have increased our data base it will be possible to link some specific signs to different regions and show how they came to play a role in the overall development of the writing system. The study of changes in the Indus script during the Harappa Phase is also something that needs more work. Future advances in the study of the Indus writing system and its development will only be accomplished through continued collaborations and publication of the data in ways that are easily accessible to interested scholars.

Acknowledgements

I would first like to thank the National Fund for Mohenjo Daro as well as the Culture, Tourism and Antiquities Department, Government of Sindh and all the people who were involved in organizing this conference for their invitation and hospitality. Special thanks to Dr. Kaleemullah Lashari and his staff for all their hard work to make this conference a success. I would especially like to thank the Department of Archaeology and Museums, Government of Pakistan, for letting me study materials at Harappa and other museums in Pakistan. I also wish to thank all the colleagues who have participated in the research at Harappa and have helped to collect and analyze data. In addition I want to thank the Archaeological Survey of India and all my colleagues in India who have been generous with their materials and shared their ideas with me. My ongoing research at Harappa and the Indus Valley Civilization has been supported by numerous organizations: the National Science Foundation, the National Endowment for the Humanities, the National Geographic Society, the Smithsonian Institution, the American School of Prehistoric Research (Peabody Museum of Archaeology and Ethnology, Harvard University), the University of Wisconsin, www.HARAPPA.com and private donors.

Bibliography

- Bagley, R. W. 1999. Shang Archaeology. In *The Cambridge History of Ancient China: From the Origins of Civilization to 221 B.C.*, edited by M. Loewe and E. L. Shaughnessy, pp. 124-231. Cambridge, Cambridge University Press.
- Baines, J. 2004. The earliest Egyptian writing: development, context, purpose. In *The First Writing: Script Invention as History and Process*, edited by S. Houston, pp. 150-189. Cambridge, Cambridge University Press.
- Boltz, W. G. 1986. Early Chinese Writing. *World Archaeology* 17(3): 420-436.
- Boltz, W. G. 2000. The Invention of Writing in China. *Oriens Extremus* 42: 1-17.
- Casal, J. M. 1961. *Fouilles de Mundigak, Volume I: Texte*. Paris, Librairie C. Klincksieck.
- Casal, J. M. 1961. *Fouilles de Mundigak, Volume II: Figures et Planches*. Paris, Librairie C. Klincksieck.
- Casal, J. M. 1964. *Fouilles D'Amri*. Paris, Commission des Fouilles Archaeologiques.

- Cooper, J. S. 2004. Babylonian Beginnings: the origin of the cuneiform writing system in comparative perspective. In *The First Writing: Script Invention as History and Process*, edited by S. Houston, pp. 71-99. Cambridge, Cambridge University Press.
- Dales, G. F. 1974. Excavations at Balakot, Pakistan 1973. *Journal of Field Archaeology* 1(1-2): 1-22.
- Damerow, P. 2006. The Origins of Writing as a Problem of Historical Epistemology. *Cuneiform Digital Library Journal* 1: 1-10.
- Durrani, F. A. 1976. Excavations at Rehman Dheri, Department of Archaeology, University of Peshawar.
- Durrani, F. A. 1986. *Rehman Dheri and the Origins of Indus Civilization* Ph D. Dissertation, Temple University.
- Fairservis, W. A. 1956. Excavations in the Quetta Valley, West Pakistan. *Anthropological Papers of the American Museum of Natural History* 45 (part 2).
- Fairservis, W. A. 1959. Archaeological Surveys in the Zhob and Loralai Districts, West Pakistan. *Anthropological Papers of the American Museum of Natural History* 47 (part 2).
- Fairservis, W. A. J. 1983. *The Hierakonpolis Project, No. II, Hierakonpolis - The Graffiti and the Origins of Egyptian Hieroglyphic Writing*. Poughkeepsie, NY, Vassar College.
- Franke-Vogt, U. 2001. *Balakot Periode I: Kulturelle Interaktion und Integration in Südostbalochistan während der Früh-Harappazeit (ca. 3100-2600 v.Chr.)* Habilitationsschrift, Freien Universitat, Berlin.
- Gadd, C. J. 1931. Sign-List of Early Indus Script. In *Mohenjo-daro and the Indus Civilization: Being an official account of Archaeological Excavations at Mohenjo-daro carried out by the Government of India between the years 1922 and 1927*, edited by J. Marshall, pp. 406-414. London, A. Probsthain.
- Haicheng, W. 2015. Writing and the city in early China. In *Early Cities in Comparative Perspective: 4000 BCE - 1200 CE*, edited by N. Yoffee, pp. 131-157. Cambridge, Cambridge University Press.
- Hargreaves, H. and S. Sewell 1929 (reprint 1981). *Excavations in Baluchistan Sampur Mound, Mastung and Sohr Damb, Nal*. New Delhi, Cosmo Publications.
- Jarrige, J.-F. 1991. Mehrgarh: Its Place in the Development of Ancient Cultures in Pakistan. In *Forgotten Cities on the Indus*, edited by M. Jansen, M. Mulloy and G. Urban, pp. 34-49. Mainz am Rhein, Phillip von Zabern.

- Keightley, D. N. 1989. The Origins of Writing in Ancient China: Scripts and Cultural Contexts. In *The Origins of Writing*, edited by W. Senner, pp. 171-202. Lincoln, University of Nebraska Press.
- Kenoyer, J. M. 2006. The Origin, Context and Function of the Indus Script: Recent Insights from Harappa. In *Proceedings of the Pre-symposium and the 7th ESCA Harvard-Kyoto Roundtable*, edited by T. Osada and N. Hase, pp. 9-27. Kyoto, Research Institute for Humanity and Nature, RIHN.
- Kenoyer, J. M. 2009. Indus Seals: An overview of Iconography and Style *Ancient Sindh* 9 (2006-2007): 7-30.
- Kenoyer, J. M. 2015. The Archaeological Heritage of Pakistan: From the Palaeolithic to the Indus Civilization. In *History of Pakistan*, edited by R. Long, pp. 1-90. Karachi, Oxford University Press.
- Kenoyer, J. M. 2020. The Indus Script: Origins, Use and Disappearance. In *Dialogue of Civilisation: Comparing Multiple Centers*, edited by H. Zhao, pp. in press. Shanghai, Shanghai Guji Press.
- Kenoyer, J. M. and R. H. Meadow 1997. New Inscribed Objects From Harappa. *Lahore Museum Bulletin* IX(1 (1996)): 1-20.
- Kenoyer, J. M. and R. H. Meadow 2000. The Ravi Phase: A New Cultural Manifestation at Harappa. In *South Asian Archaeology 1997*, edited by M. Taddei and G. De Marco, pp. 55-76. Rome/Naples, Istituto Italiano per l'Africa e l'Oriente/Istituto Universitario Orientale.
- Kenoyer, J. M. and R. H. Meadow 2008. The Early Indus Script at Harappa: Origins and Development. In *Intercultural Relations between South and Southwest Asia. Studies in Commemoration of E. C. L. During-Caspers (1934-1996)*, edited by E. Olijdam and R. H. Spoor, pp. 124-131. Oxford, BAR International Series 1826.
- Kenoyer, J. M. and R. H. Meadow 2010. Inscribed objects from Harappa Excavations: 1986-2007 In *Corpus of Indus Seals and Inscriptions, Vol. 3. New Material, untraced objects, and collections outside India and Pakistan, Annales Academiae Scientiarum Fennicae*, edited by A. Parpola, B. M. Pande and P. Koskikallio, pp. xlv-lviii. . Helsinki, Suomalainen Tiedeakatemia.
- Khan, F. A. 1964. Excavations at Kot Diji. *Pakistan Archaeology* no. 1: 39-43.
- Khan, F. A. 1965. Excavations at Kot Diji. *Pakistan Archaeology* no. 2: 13-85.
- Khatri, J. S. and M. Acharya 1997. Kunal: The Earliest Pre-Harappan Settlement. In *Facets of Indian Civilization Recent Perspectives-Essays in Honor of B.B. Lal*, edited by J. P. Joshi, pp. 87-91. New Delhi, Aryan Books International.

- Khatri, J. S. and M. Acharya 2005. Kunal Excavations: New Light on the Origin of the Harappan Civilization. In *In Search of Vedic Harappan Relationship*, edited by A. Agrawal, pp. 104-117. New Delhi, Aryan Books International.
- Lal, B. B. 1962. From the megalithic to the Harappan: tracing back the graffiti on the pottery. *Ancient India* 16 (1960): 4-24.
- Lal, B. B. 1975. The Indus Script: Some Observations Based on Archaeology. *Journal of the Royal Asiatic Society*: 173-177.
- Lal, B. B. 1979. On the Most Frequently Used Symbol in the Indus Script. *East and West* 29(1/4): 27-35.
- Lal, B. B., B. K. Thapar, J. P. Joshi and M. Bala 2003. *Excavations at Kalibangan: the Early Harappans (1960-1969) (Memoirs of the ASI, No. 98)*. New Delhi, Archaeological Survey of India.
- Mahadevan, I. 1977. *The Indus Script: Texts, Concordance and Tables*. New Delhi, Archaeological Survey of India.
- Mahadevan, I. and M. V. Bhaskar 2018. Toponyms, Directions and Tribal Names in the Indus Script. In *Walking with the Unicorn: Social Organization and Material Culture in Ancient South Asia. Jonathan Mark Kenoyer Felicitation Volume*, edited by D. Frenez, G. Jamison, R. Law, M. Vidale and R. H. Meadow, pp. 359-376. Oxford, Archaeopress Archaeology.
- Majumdar, N. G. 1934. Explorations in Sind: Being a report of the exploratory survey carried out during the years 1927-28, 1929-30 and 1930-31. *Memoirs of the Archaeological Survey of India* 48.
- Marshall, J. H. 1931. *Mohenjo-daro and the Indus Civilization: Being an official account of Archaeological Excavations at Mohenjo-daro carried out by the Government of India between the years 1922 and 1927*. London, A. Probsthain.
- Meadow, R. H. and J. M. Kenoyer 2005. Excavations at Harappa 2000-2001: New insights on Chronology and City Organization. In *South Asian Archaeology 2001*, edited by C. Jarrige and V. Lefèvre, pp. 207-225. Paris, Editions Recherche sur les Civilisations - ADPF.
- Michalowski, P. 1996. Mesopotamian Cuneiform: Origins. In *The World's Writing Systems*, edited by P. T. Daniels and W. Bright, pp. 33-36. New York, Oxford University Press.
- Mughal, M. R. 1970. *The Early Harappan Period in the Greater Indus Valley and Northern Baluchistan* PhD, University of Pennsylvania, Dept. of Anthropology.

- Nissen, H. J. 1993. The Context of the Emergence of Writing in Mesopotamia and Iran. In *Early Mesopotamia and Iran: Contact and Conflict 3500-1600 B. C.*, edited by J. Curtis, pp. 54-71. London, British Museum Press.
- Parpola, A. 1994. *Deciphering the Indus Script*. Cambridge, Cambridge University Press.
- Parpola, A. 1994. Indus Script. In *The Encyclopedia of Languages and Linguistics*, edited by R. E. Asher and J. M. Y. Sipsen, pp. 1669-1670. Oxford, Pergamon Press.
- Parpola, A. 2008. Is the Indus Script indeed not a writing system? In *Airavati: Felicitation volume in honour of Iravatham Mahadevan*, edited by Varalaaru.com, pp. 111-131. Chennai, Varalaaru.com.
- Parpola, A., B. M. Pande and P. Koskikallio, Eds. 2010. *Corpus of Indus Seals and Inscriptions, Vol. 3. New Material, untraced objects, and collections outside India and Pakistan*. Memoirs of the Archaeological Survey of India, No, 96, Annales Academiae Scientiarum Gennicae 359. Helsinki, Suomalainen Tiedeakatemia.
- Possehl, G. L. 1990. Revolution in the Urban Revolution: The Emergence of Indus Urbanism. *Ann. Rev. Anthro. Annual Review of Anthropology* 19: 261-282.
- Possehl, G. L. 1994. *Radiometric Dates for South Asian Archaeology*. Philadelphia, University of Pennsylvania Museum,.
- Possehl, G. L. 1996. *Indus Age: The Writing System*. New Delhi, Oxford and IBH Pub. Co.
- Potts, D. T. 1981. The Potter's Marks of Tepe Yahya. *Paléorient* 7(1): 107-122.
- Quivron, G. 1980. Les marques incisées sur les poteries de Mehrgarh au Baluchistan, du milieu du IV^e millénaire à la moitié du III^e millénaire. *Paléorient* 6: 269-280.
- Quivron, G. 1997. Incised and Painted Marks on the Pottery of Mehrgarh and Nausharo-Baluchistan. In *South Asian Archaeology 1995*, edited by B. Allchin and R. Allchin, pp. 45-62. New Delhi, Oxford & IBH.
- Rao, R. P. N. 2018. The Indus Script and Economics. A Role for Indus Seals and Tablets in Rationing and Administration of Labor In *Walking with the Unicorn: Social Organization and Material Culture in Ancient South Asia. Jonathan Mark Kenoyer Felicitation Volume*, edited by D. Frenez, G. Jamison, R. Law, M. Vidale and R. H. Meadow, pp. 518-525. Oxford, Archaeopress Archaeology.

- Shaffer, J. G. 1992. The Indus Valley, Baluchistan and Helmand Traditions: Neolithic Through Bronze Age. In *Chronologies in Old World Archaeology (3rd Edition)*, edited by R. Ehrich, pp. 441-464. Chicago, University of Chicago Press.
- Shah, S. G. M. and A. Parpola 1991. *Corpus of Indus Seals and Inscriptions. 2. Collections in Pakistan*. Helsinki, Suomalainen Tiedeakatemia.
- Stein, M. A. 1929. An Archaeological Tour in Waziristan and Northern Baluchistan. *Memoirs of the Archaeological Survey of India* 37.
- Stein, M. A. 1931. An Archaeological Tour of Gedrosra. *Memoirs of the Archaeological Survey of India* 43.
- Stein, S. A. 1942. Survey Of Ancient Sites Along The “Lost” Sarasvati River. *The Geographical Journal* XCI(4): 173-182.
- Vats, M. S. 1940. *Excavations at Harappa: Being an Account of Archaeological Excavations at Harappa Carried Out Between the Years of 1920-21 and 1933-34*. Delhi, Government of India Press.
- Vidale, M. 2007. The Collapse Melts Down: A Reply to Farmer, Sproat, and Witzel. *East and West* 57(1-4): 333-366.
- Wells, B. 1998. *An Introduction to Indus Writing* Master of Arts, University of Calgary.
- Yadav, N., H. Joglekar, R. P. N. Rao, M. N. Vahia, R. Adhikari and I. Mahadevan 2012. Statistical Analysis of the Indus Script using N-grams. *PLoS One* 5(3 (<http://dx.plos.org/10.1371/journal.pone.0009506>)).