The Collapse of the Indus-Script Thesis: The Myth of a Literate Harappan Civilization

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Abstract

Archaeologists have long claimed the Indus Valley as one of the four literate centers of the early ancient world, complete with long texts written on perishable materials. We demonstrate the impossibility of the lost-manuscript thesis and show that Indus symbols were not even evolving in linguistic directions after at least 600 years of use. Suggestions as to how Indus symbols were used are noted in nonlinguistic symbol systems in the Near East that served key religious, political, and social functions without encoding speech or serving as formal memory aids. Evidence is reviewed that the Harappans' lack of a true script may have been tied to the role played by their symbols in controlling large multilinguistic populations; parallels are drawn to the later resistance of Brahmin elites to the literate encoding of Vedic sources and to similar phenomena in esoteric traditions outside South Asia. Discussion is provided on some of the political and academic forces that helped sustain the Indus-script myth for over 130 years and on ways in which our findings transform current views of the Indus Valley and of literacy in the ancient world in general.

Background of the Indus-script thesis

Ever since the first Harappan seal was discovered in 1872-3, it has been nearly universally assumed that Indus inscriptions were tightly bound to language, the grounds of every major decipherment effort (Possehl 1996) and a requirement of writing according to most linguists who specialize in scripts (DeFrancis 1989; Daniels and Bright 1996; Sproat 2000).[2] Extensive efforts have been spent over the past 130 years in attempts to identify the supposed language (or languages) underlying the inscriptions, which are often said to hold the key to understanding India's earliest civilization (fl. c. 2600 - 1900 BCE). A partial list of the scripts or languages that have been tied to the inscriptions include Brahmi (ancestor of most modern South Asian scripts), the Chinese Lolo (or Yi) script, Sumerian, Egyptian, proto-Elamite, Altaic, Hittite, proto-Dravidian, early Indo-Aryan (or even Vedic Sanskrit), proto-Munda, Old Slavic, Easter Island *rongorongo*, or some lost language or putative Indus *lingua franca*. Starting in 1877, over a hundred claimed decipherments have made it to print; thorough debunkings of past efforts have

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[2] We can leave aside here loose definitions of 'scripts' (e.g., Boone and Mignolo 1994: esp. 13 ff.) that include mnemonic systems like Mexican-style 'picture writing', Incan *khipu*, or Iroquois *wampum*, or early accounting scripts that were not tightly coupled to oral language (Damerow 1999). As noted below, the Indus system cannot be categorized as a 'script' even under such broad definitions of the term, since the brevity of the inscriptions alone suggests that they were no more capable of performing extensive mnemonic or accounting functions than of systematically encoding speech. On the multiple uses of the symbols, beyond the comments at the end of this paper, see the extended analysis in Farmer and Weber (forthcoming).

not kept new ones from taking their place (Possehl 1996; Witzel and Farmer 2000). Speculation regarding 'lost' Indus manuscripts began in the 1920s, when Sir John Marshall and his colleagues created a global sensation by comparing Indus civilization to the high-literate societies of Egypt, Mesopotamia, and Elam (cf. Marshall 1924, 1931; Sayce 1924; Gadd and Smith 1924; Hunter 1929). The view that the Indus Valley was home to a literate civilization has been taken for granted ever since by nearly all historians, linguists, and Indus archaeologists (e.g., Kenoyer 1998; Possehl 2002a). Occasional skepticism on this point is not noted even in passing in book-length critiques of past decipherment efforts (Possehl 1996) or standard reviews of deciphered or undeciphered scripts (Daniels and Bright 1996; Pope 1999; Robinson 2002). So far as most researchers are concerned, the image of a literate Indus Valley is an incontrovertible historical fact. If that image were true, it should be noted, given the vast extent of its archaeological ruins, the Indus civilization would have qualified as the largest literate society in the early ancient world — underlining the importance of the Indus-script story not only for ancient Indian history, but for human history as a whole.

Dravidian and Indo-Aryan models

International expectations that a scientific decipherment was at hand reached their heights in the late 1960s, when a high-profile Soviet research team led by Yuri Knorozov, whose early work led to the later decipherment of Mayan, and a team of Finnish linguists and computer scientists led by the Indologist Asko Parpola, independently claimed that computer analyses of Indus sign positions had "proven" that the inscriptions encoded some early form of Dravidian (Knorozov 1965, 1968; Parpola, Koskenniemi, Parpola, and Aalto 1969), ancestor of over two dozen languages whose modern use is mainly restricted to central and southern India. The early Finnish announcements, which were much bolder than those of the Soviets, were accompanied by sample decipherments and claims that the "secret of the Indus script" or Indus "code" had been broken (Parpola, Koskenniemi, Parpola, and Aalto 1969: 50; Parpola 1970: 91). The appeal of this solution to Dravidian nationalists, the novelty in the 60s of computer linguistics, and fresh memories of the role played by sign positions in deciphering Linear B made the Dravidian thesis the dominant model of the inscriptions for the next three decades.[3] It is easy in retrospect to spot the flaws in those claims: statistical regularities in sign positions show up in nearly all symbol systems, not just those that encode speech; moreover, third-millennium scripts typically omitted so much phonetic, grammatical, and semantic data, and used the same signs in so many varied (or 'polyvalent') ways, that even when we are certain that a body of signs encoded speech, it is impossible to identify the underlying language solely from such positional data. Conversely, by exploiting the many degrees of freedom in the ways that speech maps to scripts, it is possible by inventing enough rules as you go to generate half-convincing pseudo-decipherments of any set of ancient signs into any language — even when those signs did not encode language in the first place. The absurdity of this method

[3] Even John Chadwick, Michael Ventris' collaborator in deciphering Linear B, was briefly convinced by the Finnish announcements, whose effects on later Indus studies cannot be overemphasized; see Clauson and Chadwick (1969, 1970). Ironically, Walter Fairservis, who at the time came close to being the first major researcher to abandon linguistic views of the inscriptions (see Fairservis 1971: 282), was apparently converted by those announcements, and in the last 20 years of his life became one of the most extreme of would-be decipherers. Cf. Fairservis 1971: 282; 1987; 1992 and the summary discussion at http://www.safarmer.com/indus/fairservis.html.

only becomes obvious when it is extended to large bodies of inscriptions, and the number of required rules reaches astronomical levels; hence the tendency of claimed decipherments to provide only 'samples' of their results, prudently restricting the number of rules to outwardly plausible levels. The subtleties of the speech-to-text mapping problem are illustrated by the long line of world-famous linguists and archaeologists, from Cunningham and Terrien de Lacouperie[4] in the nineteenth century to Hrozn (the chief decipherer of Hittite) and Fairservis in the twentieth, who convinced themselves over long periods that they had successfully deciphered the system — in over a half dozen different languages. It should finally be noted that claimed 'positional-statistical regularities' in Indus inscriptions, which have played a key role in the Indus-script thesis since G.R. Hunter's 1929 doctoral thesis, have been grossly exaggerated, and can only be maintained by ignoring or rationalizing countless exceptions to the claimed rules.[5]

The failure of the Dravidian model to generate verifiable linguistic readings of a single Indus sign has renewed claims in the last two decades that the inscriptions encoded some early form of Indo-Aryan or even Vedic Sanskrit (cf., e.g., Rao 1982; Kak 1988; Jha and Rajaram 2000), reviving a thesis that can be traced to the first attempt to decipher an Indus seal (Cunningham 1877). One corollary of recent versions of these claims is the suggestion that Indo-Aryan was native to India and not a later import from Central Asia, as historical linguists have argued for over 150 years on the basis of sound changes, word lending, and related developments in Central Asian, Iranian, and Indian languages (for recent discussions, see Witzel 1999, 2003). A second corollary,

[4] On Lacouperie, who introduced the first faked evidence into the Indus-script story, see Farmer 2003. On other forgeries, most importantly Rajaram's infamous 'horse seal', see Witzel and Farmer 2000.

[5] Recent variations of these claims, which lay at the center of the Soviet and Finnish 'decipherments', show up in Mahadevan 1986, Wells 1999, and many others. Two points here merit special comment. The first is that positional regularities in Indus inscriptions are similar to those seen in countless non-linguistic sign systems, including the Near Eastern emblem systems discussed later and even modern highway and airport signs displaying multiple icons (for illustrations, see Farmer 2004a: 17-8). Similar comments can be made about claimed directionality in the inscriptions. The fact that Indus inscriptions tended to be incised in one direction or another, which is a predictable product of workshop habits, does not mean that they were meant to be 'read' in a fixed direction, although in some mythological inscriptions that was demonstrably the case (Farmer and Weber, forthcoming). On the usual claim that the 'script' was normally 'read' right-to-left, see also the acute remarks by Meadow and Kenoyer 2000: 338-9, n. 3. The second point is that the types of regularity claimed in Indus inscriptions have been routinely distorted to support specific linguistic models of the signs, especially following the work of the Soviets and Finns. Thus the claim is repeated often that positional regularities in the symbols prove that the 'script' encoded an exclusively suffixing language (cf., e.g., Knorozov 1968, 1970; Parpola, Koskenniemi, Parpola, and Aalto 1969: 20-1; Fairservis 1992; Mahadevan 1986; Possehl 1996: 164; 2002a: 136) — which not coincidentally would rule out early Indo-Aryan or Munda languages, since these included prefixing and (in the case of Munda) extensive infixing as well. However, even using the Dravidian proponents' own data (e.g., Mahadevan 1977: Table 1, 717-23), it is easy to show that positional regularities of single Indus signs (and the same is true of sign clusters) are just as common in the middle and at the supposed start (or righthand side) of Indus inscriptions as at their supposed end, which if we accepted this whole line of reasoning could be claimed as evidence in the system of extensive infixing and prefixing — ironically ruling out Dravidian as a linguistic substrate. One of the strangest sides of the Indus-script myth is the fact that claims like this have been passed on from writer to writer uncritically for so long that the thesis that the "script makes extensive use of suffixes, but neither prefixes nor infixes" has even been suggested in an otherwise harsh critique of past decipherment efforts as part of a "common ground" of ideas on which future research might proceed (Possehl 1996: 164).

which is often invoked to support Hindu nationalist (Hindutva) ideas, is the claim that Indus inscriptions embodied Hindu traditions or can even be identified with (much later) Vedic texts.[6]

Political motives linked to the Dravidian and Indo-Aryan models, typically obscured under a thick veneer of 'neutral' scientific language, have played an increasing large role in the Indus-script thesis over the last two decades. Evidence that Indus civilization may have been intensely multilinguistic, ironically undercutting both sides of this debate, is noted at the end of this paper.

The brevity of the inscriptions

Just as political discussion of the 'Indus script' heated up at the end of the twentieth century, evidence was emerging from many directions that Harappan symbols could not possibly have encoded speech or even served as extensive memory aids. Early hints that the Indus civilization was not literate even under loose definitions of that term already existed in Marshall's day, when objects carrying Indus symbols first turned up by the hundreds. Some 4-5,000 such objects are known today on well over a dozen media — including steatite, faience, and metal seals, clay seal impressions, pots, potsherds, copper plates, molded terracotta and copper tablets, incised shells, ivory cones and rods, stone and metal bangles, metal weapons, tools, rocks, and a miscellany of other objects including a famous three-meter wide 'signboard' discovered in the urban ruins of Dholavira (Bisht 1991, 1998-9). All Indus inscriptions on every medium share one striking feature: extreme brevity. The longest on one surface has 17 symbols; less than 1/100 carry as many as 10. Many Indus inscriptions — if 'inscription' is really an appropriate term — contain only one or two symbols; the average length of the 2,905 objects carrying Indus symbols catalogued in Mahadevan's standard concordance is 4.6 signs long.

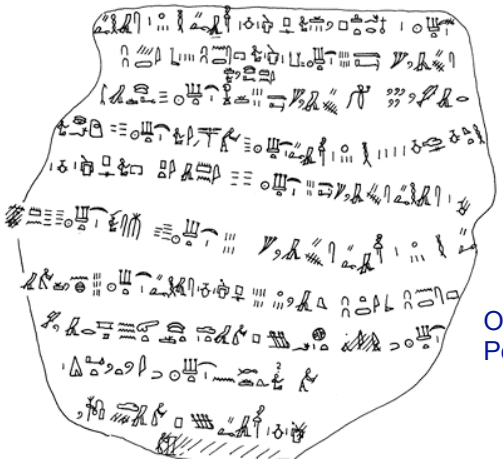
The absence of long Indus inscriptions on any medium is unparalleled in any literate civilization represented by even a fraction of the number of inscriptions in the Indus corpus. One body of inscriptions inviting comparison is written in the largely undeciphered Linear Elamite script, which was briefly used in the last half of the twenty-second century by the Harappans' closest literate neighbors (see, e.g., André and Salvini 1989, Potts 1999). Only 21 (or possibly 22) Linear Elamite inscriptions are known today;[7] most of them are longer than the longest of the known 4-5,000 Indus inscriptions. Despite their tiny numbers, Linear Elamite texts of significant length show up on many durable objects on which we expect such texts from literate civilizations: on sculptures, votive boulders, stairways, and baked-clay cones, disks, and tablets. One exquisitely

[6] The origins of these ideas, minus their political overtones, can be traced again to the 1920s, when Marshall (e.g., 1931, I: chapt. 5) claimed that extensive parallels existed between the contents of Indus inscriptions and much later Indian sources (involving, for example, Marshall's notorious 'proto-Śiva' seal), extending not only to Vedic but even to medieval times. Similar tendencies show up in Western 'Dravidianists' including Parpola (e.g., 1970, 1994: esp. chapts. 10-4), as well as in Hindutva supporters of the Indo-Aryan model. Similarly, native backers of the Dravidian thesis (e.g., Mahadevan 1970, 1999; Madhivanan, 1995) imagine extensive parallels between Indus inscriptions and much later Tamil traditions, whose locus in historical times lay some two thousand kilometers from the Indus Valley.

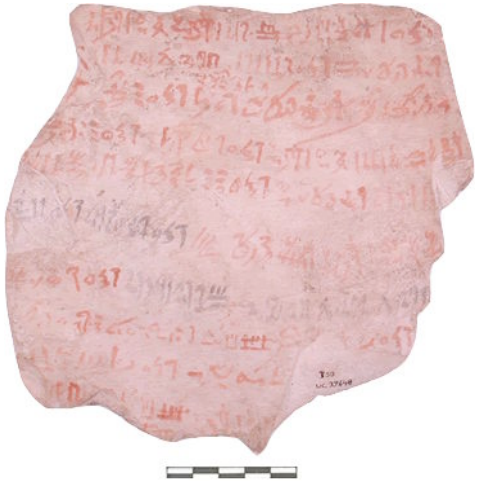
[7] We are skeptical of claims that one small grave jar whose rim carries six symbols, discovered in 1969-70 at Shahdad in S.E. Iran (far from the center of Elamite power, and closer than any other claimed contemporary 'writing' to the Indus Valley) is actually in Linear Elamite. Suggestions that pseudo-decipherments of the Indus type are part of a wider problem are found in the fact that shortly after their discovery the distinguished Iranologist W. Hinz offered a confident decipherment of the six signs, whose transcriptions vary widely in the drawings provided by Hinz (1971), Vallat (1986, 2003), and Hakemi (1997). See Hakemi's excavation report (1997: 67) for a photo of the signs.

Harappa.com, slide 135

Figure 1. **Right**, an Indus sherd from a large broken jar crudely inscribed with a short group of symbols. Inscriptions of this type were normally made before and not after breakage, and when found on the bodies of vessels typically carried oversized signs of the type illustrated here. The anthropomorphic figure carrying two bows also shows up on Indus seal inscriptions, surrounded by plants and other apparent agricultural signs (cf. **Fig. 12**). **Below**, a typical Egyptian hieratic 'ostracon' (a potsherd carrying writing) and its transcription. The ostracon carries over 20 times as many signs as any known Indus potsherd. The inscription, which deals with the distribution of supplies at Deir el-Medina (second millennium BCE), is written in a rapid cursive style, reflecting its use in routine economic records. From the Petrie Museum, UC 39648. Adapted from the Digital Egypt website, Cerny/Gardner 1957 (ostracon Petrie 50). The pictures are close to scale.



Ostracon
Petrie 50



rendered silver vase carries a solitary line of Linear Elamite that on its own is 2 1/2 times longer than any known Indus inscription.

Perhaps the oddest Indus materials to lack long texts are potsherds, which were among the most popular media for writing medium-size (and often quite long) texts even in ancient civilizations that wrote extensively on perishable materials; the reason for their popularity lay in their easy availability and in the fact that most perishable writing materials (including bark and palm leaves, which were favored in later India) required elaborate preparation before they could be used. Inscribed Indus potsherds, most of which have never been published, exist in very large numbers, but all of these differ radically from those in any known literate civilization: the average inscribed potsherd in fact carries far fewer than the 4.6 or so average signs found on Indus inscriptions as a whole. Moreover, with few exceptions, Indus inscriptions of this type were apparently made before and not after the pottery was broken, and when located on the bodies of the vessels (as opposed to on the base or rim) tended to include oversized symbols that few naive observers would be tempted to classify as 'writing' (**Fig. 1**). Good reasons exist for suspecting that at least some of these symbols may have represented deities who were the intended recipients of

offerings in the pots. The evidence overall makes it impossible to credit claims that pottery or potsherds were used by Indus elites to "scribble messages" to one another (Kenoyer 1998: 71), let alone to write longer texts, as was indisputably the case for over three thousand years throughout the Near East as well as in India in later literate times.[8]

The lost-manuscript thesis

Marshall and his collaborators were acutely aware of these problems, but publicly at least passed over them as rapidly as possible, claiming instead the lack of long texts on durable materials as positive evidence, as Marshall suggested in the late 1920s (Marshall 1931: I, 39), that "Indus scribes" must have written their long texts on "birch bark, palm leaves, parchment, wood, or cotton cloth, any of which would have perished in the course of the ages." The same strategy was adopted in G.R. Hunter's 1929 doctoral thesis (reprinted in Hunter 1934), which was the first book-length study of the inscriptions; the work was composed while Hunter was in close contact with Marshall and his colleagues. While all "writing" from the Indus Valley discovered so far shows up only on seals and a few other durable materials, Hunter notes,

> it is obvious that the literature of this people was not confined to the 700 odd seals and amulets etc. unearthed [by 1927]. The absence of lengthier documents among the finds suggests that for ordinary purposes perishable materials were used. That clay was not among them has already been inferred. Perhaps they utilised skins, as Herodotus tells us the Phoenicians did, perhaps papyrus or silk (Hunter 1929: 18-9).[9]

Following its casual birth, the lost-manuscript thesis has been repeated frequently ever since, with the suggestion often added that there once existed a "vast collection of writing on less perishable materials than stone and baked clay" (Dales 1967; cf. Elst 2000), implying the potential existence of buried libraries or archives. The presumed output of the Harappans is sometimes compared to that of the ancient Near East or premodern Mesoamerica (cf., e.g., Parpola 1994: 54; Postgate, Wang, and Wilkinson 1995) or, in studies heavily influenced by Hindutva ideology, with that of much later Vedic traditions (Jha and Rajaram 2000; Elst 2000). While in recent decades many researchers have carefully sidestepped the whole issue — leaving the question of how the Indus Valley was 'literate' oddly unaddressed — the possibility is normally left open that long texts might someday materialize (cf., e.g., Possehl 1996: 63; 2002a: 135), presumably conserved in

[8] Rare cases exist in which Indus symbols were apparently incised on potsherds after the pots were broken, but the evidence again contradicts claims that the sherds carried ordinary 'messages'. One six-symbol inscription of this type is offered at the Harappa.com website (slide #152) as potential evidence that sherds were used as "a form of 'scrap paper' to send notes or serve as temporary records", but on close inspection we find that the six signs cover a space on the miniature sherd less than 2.5 cm wide. The tiny size of the inscription, suggestions that the sherd was reshaped before use, and study of the six signs suggest that the artifact was a crude knock-off of the steatite or faience 'miniature tablets' found in large quantities in Harappa, which had still uncertain ritual or administrative uses. On these inscribed artifacts, which were long mistaken for the earliest inscriptions known, see the important recent study by Meadow and Kenoyer (2000).

[9] Hunter goes on to suggest that some signs on seals are "splayed at the extremities", supposedly suggesting the influence of painted manuscripts, but not even his own drawings offered to back this claim (Plate I, nos. 89, 301, 409) provide evidence of this, and his thesis has no serious supporters.

protected environments, like the early Buddhist manuscripts recently found in or near former Indus territories, or far older Aramaic texts (written on leather and wood) recently discovered in Bactria.[10] Even Fairservis, who never endorsed the lost-manuscript thesis, in his early writings acknowledged the possibility that [long] tablets might someday be discovered (Fairservis 1971: 282), and in his later works left no doubt, long texts or not, that he believed that the Harappans possessed a fully enabled script that was capable in principle of producing such texts (Fairservis 1987, 1992).

The first direct challenge to the lost-text thesis emerged from recent predictions of a general model of the evolution of manuscript traditions, whose origins lay in cross-cultural studies of premodern Indian, Chinese, and Western thought (Farmer, Henderson, and Witzel 2002; cf. Farmer 1998). The model traces parallels in the long-range patterns of growth in premodern religious, philosophical, and cosmological systems to a combination of neurobiological and literary forces; one of the latter involved repetitive attempts by scribes to harmonize conflicts accumulating over long periods in stratified manuscript traditions. The absence of expected byproducts of these processes in Indus artifacts and in the oldest layers of Vedic sources suggests that no written texts (not even in the sense of fixed oral 'texts' of the later Vedic type) showed up in northwest India until long after the fall of Harappan civilization.

This theoretical suggestion can be tested empirically by searching in Indus remains for archaeological markers of manuscript production, guided by findings in ancient civilizations that we know for sure wrote extensively on perishable media. Civilizations in this class include those of the Egyptians, Chinese, Neo-Assyrians, Neo-Babylonians, Persians, Hebrews, Greeks, Etruscans, Romans, Mesoamericans, and Indians after writing was introduced in northwest South Asia (by the Persians) around the middle of the first millennium BCE. The most important markers of manuscript production in these societies include finds of long texts on pots, potsherds, vases, and similar durable goods; long inscriptions on cave walls or cliff faces, frescoes, stelae, statues, stairways, plaques, cylinders, bricks, buildings, and similar media; unambiguous remains of inkpots, brushes, palettes, styli, pens, and other literate paraphernalia; representations of scribes, texts, and writing instruments in art or pictographic scripts; and major changes in the shapes and orientations of signs tied to scribal attempts to increase the efficiency of copying long texts.

Findings of markers like these have confirmed the existence of manuscript traditions in a variety of civilizations in which not a trace of perishable manuscripts have survived, most notably in those of the Neo-Assyrians and Neo-Babylonians. Sporadic claims of such finds in Indus sites from the 1920s through 1960s (Mackay 1938; Dales 1967; Konishi 1987) are no longer accepted by any active researchers, although one of Mackay's least credible claims — involving two small terracotta pieces of unknown use that reminded him of large wooden/waxed writing tablets (Mackay 1938: I: 430) — has recently been revived in one popular book strongly influenced by Hindutva ideas (Lal 2002: 135; for photos and discussion, see Farmer 2004a: 60). In contrast to the Indus situation, numerous remains of ancient wooden/waxed tablets (not at all resembling these

[10] On the Buddhist manuscripts, which date from the early common era, see Salomon 1999. On the older Aramaic texts, dating reportedly to the fourth century BCE, see Shaked 2004. It is worth noting that even the jars that preserve the Buddhist manuscripts discussed by Salomon carry inscriptions much longer than any inscriptions in the 'Indus script'. The earliest Tamil inscriptions, recently collected in a major study by Mahadevan (2004), are also far longer than any known Indus inscriptions.

very small terracotta pieces) have been found in the Near East, including several examples from the famous fourteenth-century BCE Uluburun shipwreck off the coast of Anatolia (Payton 1991; Symington 1991; Pearce 1995; Maruzzi 2000).[11] Finds of writing utensils from early historical times are also common not far from Indus territories, as shown for example in Marshall's own reports of his long-term excavations at Taxila (Marshall 1951).

The most obvious missing marker of Indus manuscript production is sufficient to close the case: the complete absence of Indus texts of any length on durable goods, which show up in abundance in every premodern civilization that is also known to have written on perishable materials. Ironically, some of the ancient world's richest finds of this type show up again in northwest South Asia — most dramatically in the thousands of rock and cliff inscriptions from post-Indus times, written in at least ten languages or scripts, found in the passes of the upper Indus Valley linking South Asia to China through one branch of the so-called Silk Road (Jettmar et al. 1989-94; for longer inscriptions in this general region, cf. Marshall 1951; Salomon 1998, 1999).

A strong case can be made on this evidence alone that the Indus civilization could not possibly have been literate. If it had been, it would be the only known literate society in the world, ancient or modern, that did not produce texts of significant length somewhere on durable materials.

Paradoxical sign frequencies

In the absence of 'lost' manuscripts, the brevity of Indus inscriptions contradicts the old view that the Indus Valley was home of one of the four major literate civilizations of the early ancient world. A comparison of Indus sign frequencies with those in ancient scripts confirms a deeper suggestion of this evidence: that the Indus system was neither able to (nor apparently meant to) record speech, contradicting 130 years of claims that Indus symbols were part of a true 'script'.

Estimates of the number of distinct Indus symbols vary, but most counts since the 1960s have run from a little below to a little above 300-400 signs (Parpola, Koskenniemi, Parpola, and Aalto 1969; Parpola 1994; Mahadevan 1977; Fairservis 1992; Possehl 1996; Robinson 2002). Varying percentages of that number are typically represented as 'complex' or 'compound' signs that combine two or rarely three symbols in relatively straightforward ways. One Canadian researcher, B. Wells (1999), counts over 600 signs by classifying far more variants than other scholars as separate signs; the result of Wells' procedure, which has been widely criticized, is that 50% of his signs turn up only once. S.R. Rao (1982) went to the opposite extreme, arguing that mature Indus inscriptions included no more than 20 signs; Rao arrived at this number by decomposing Indus pictographs into simple strokes that he associated in turn with Sanskrit phonemes; the underlying aim was to suggest that the first alphabet was invented in the Indus Valley by what Rao pictured as Vedic 'scribes'. Rao's views have no serious backers today even among extreme Hindu nationalists, in part since the pictographs he decomposed in this fashion often depict obvious human or divine forms, animals, plants, farm instruments, and other recognizable objects.

Whatever the total counts of signs, all major studies agree that a small number of symbols dominate in Indus inscriptions. Just four of 417 signs account for 21% of the 13,372 sign occurrences in Mahadevan's concordance; eight signs make up 31%; and twenty signs over 50%.

[11] The Uluburun examples are the earliest recovered artifacts of this sort, but literary references to such tablets can be traced to the Akkadian Ur III period, at the end of the third millennium. See Symington 1991.

Parpola (1994: 78; cf. also Possehl 1996) provides the same figures as Mahadevan. Wells (1999) covers a different set of inscriptions than Mahadevan, and distinguishes hundreds of more signs, but study of his raw data yields nearly identical results in the high-frequency range. Our statistical

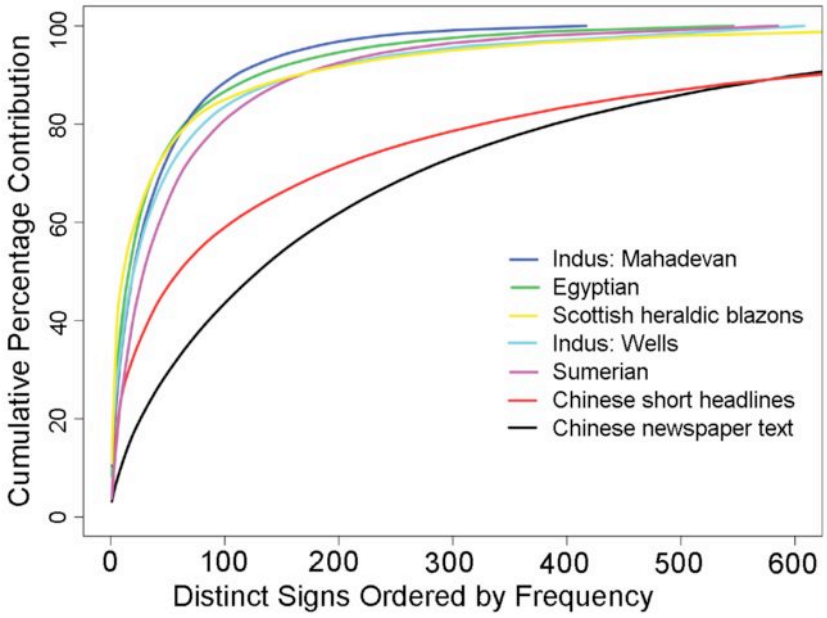


Figure 2. Cumulative frequencies of signs in various linguistic and nonlinguistic corpora. The horizontal axis represents distinct signs ordered by decreasing frequency. The vertical axis represents the contribution of all signs up to a given rank. Only the first 600 or so signs are mapped for scripts like Chinese that contain higher numbers of signs. For the sources of our data, see n. 12.

studies of different classes of Indus inscriptions, including those dating exclusively to the late-mature Harappan period (see *infra*), confirm that the dominance of high-frequency signs is typical of all inscription types, and is not an artifact of the artificial conflation of inscriptions of different classes in the existing concordances and catalogs.

In the late 1960s, the Soviets (see especially Kondratov 1965) pointed to frequencies similar to these in Egyptian hieroglyphs, and initially at least (the claim was dropped in Knorozov 1968) argued that deep links of some sort must have existed between the two systems. As Zide and Zvelebil rightly suggest in their critique of the Soviet research (1976: 50-3), too many variables exist in the structures of languages and in the ways speech maps to scripts to support such a conclusion: the implication is that similar frequencies may have arisen in the two cases from the interaction of different sets of variables. In **Fig. 2** we extend these findings to the non-linguistic domain, comparing sign frequencies in the Indus corpus with those in a large body of Scottish heraldic signs (encoded in the 'blazon' system used since the middle ages to analyze coats-of-arms) and in various scripts.[12] The near overlap of frequencies in the heraldic and Indus symbol

[12] Sources of our data in **Fig. 2** include Mahadevan's concordance (417 distinct signs in a corpus of 13,372 symbols); Wells's 1999 catalog of Indus signs (612 distinct signs in a corpus of 7,105 symbols); six Sumerian texts from http://www-etcsl.orient.ox.ac.uk (727 distinct signs [585 after we corrected for sign polyvalency; see n. 19 below] in a corpus of 10,298 symbols); four hieroglyphic texts from http://webperso.iut.univ-paris8.fr/~rosmord/archives (546 distinct signs in a corpus of 14,354 symbols); a selection of Chinese newspaper stories from the Xinhua News Agency, available from the Linguistic Data Consortium (1,312 distinct signs in a corpus of 13,000 symbols); a selection of newspaper headlines from the same source (1,553 distinct signs in a corpus of 12,987 symbols); 2,069 coats-of-arms,

systems and in Egyptian hieroglyphs (and, to a lesser degree, in Sumerian cuneiform) underlines the fact that studies of general sign frequencies cannot reliably distinguish scripts from non-scripts. Comparison of symbol frequencies in Chinese newspaper headlines with those in Chinese news stories further suggests that sign frequencies in some types of scripts may fluctuate widely in different classes of texts.[13] Claims that Zipf's laws (e.g., by Landini and Zandbergen 1998) or statistical tests developed from studies of the undeciphered Phaistos disk (cf. Mackay 1965; Pope 1968; Robinson 2002: 308-11) can distinguish writing from other types of symbol systems similarly fail, in part since many non-linguistic phenomena follow similar statistical distributions.[14]

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encoded as blazons, from the Mitchell Rolls, the Heraldic Society of Scotland, http://www.heraldry-scotland.co.uk/index.htm (838 distinct terms in a corpus of 18,300 total terms).

[13] Variations like this can be expected to be far higher in Chinese and in mixed logographic and syllabic scripts than in 'pure' syllabaries or alphabets, in which phonetic and semantic data are not tightly coupled; one implication of this finding for our present study is noted later.

[14] We can skip discussion of Zipf's law as a putative test of writing, since it is well-known that many non-linguistic phenomena also follow so-called Zipfian distributions or hyperbolic scaling patterns (cf., e.g., Zipf 1949; Mandelbrot 1983: chapt. 38). On the other hand, the claim that Mackay's methods provide such a test requires some comment, since in early online discussions of the findings reported in this paper (in the summer of 2003) the Aegeanist Yves Duhoux and the Indus and Tamil epigrapher Iravatham Mahadevan independently claimed that Mackay's methods confirm the traditional Indus-script thesis. Those claims were based on two errors in applying Mackay's work. The first involved a misunderstanding of the goal of Mackay's methods, which were not originally proposed as a test of whether or not a corpus of inscriptions encoded language, but as a means of predicting from short text samples encoded in apparent syllabaries or alphabets (as noted above, Mackay's original focus was on the Phaistos disk) the total number of signs in those syllabaries or alphabets. The formula that Mackay developed to make this prediction (Mackay 1965; Pope 1968; Robinson 2002: 308-11) was based on empirical studies of a number of more-or-less 'pure' syllabaries or alphabets, none of which contained even 1/3 the number of signs typically distinguished in the Indus system. In 1967, Maurice Pope (1968) did apply Mackay's methods as part of a series of proposed tests of whether or not Cretan hieroglyphic seal inscriptions encoded speech; the point was to see if the results of Mackay's formula made sense when applied to Cretan hieroglyphs, which contain about the same number of signs (roughly 100) found in many syllabaries. Pope concluded from his tests, bolstered by odd symmetries in Cretan sign placements (not dissimilar from those we discuss later in the Indus system), that Cretan seal inscriptions (as opposed to Cretan hieroglyphs on tablets) were not (or at least were not uniformly) encoded in a true script. The result, which challenged claims going back to Arthur Evans' work in the late nineteenth century, has been a long debate on the nature of Cretan hieroglyphs that still remains unsettled (cf., e.g., Olivier 1996, 2000). But again, Pope no more than Mackay claimed that Mackay's formula provided a general test of whether or not inscriptions encoded language, nor did he apply it to inscriptions like those in the Indus corpus, which no serious researcher has ever claimed is encoded in a 'pure' syllabary or alphabet. The second error lay in the fact that Duhoux and Mahadevan both applied Mackay's formula to all 13,372 symbols in Mahadevan's concordance, and not to the small text samples (in all cases less than 1/25th this size) explicitly called for in Mackay's work. By plugging into the formula the 417 Indus signs counted by Mahadevan, and then applying the formula to the whole of the corpus, Mackay's formula not surprisingly ends up 'predicting' that the total number of signs in the corpus is not too distant from (but not all that close to either) the data plugged into the formula (the formula applied this way 'predicts' that 540 Indus signs exist). If we instead apply the formula to small text samples of the size called for by Mackay, the formula 'predicts' that the number of signs in the so-called script is well under half of Mahadevan's 417 signs. (In our tests of Mackay's formula, we used sample texts of the appropriate size made up of a collection of Indus inscriptions containing 10 or more signs, following procedures like those Pope used in his study of the similarly brief Cretan seal inscriptions.) The key point, as Pope also stresses, is that the results of Mackay's formula are highly sensitive to sample size. Beyond the fact that the formula works fairly well in many cases with simple alphabets and syllabaries (on cases where it does not, see Pope 1968), it certainly cannot claim to be a general test of whether or not a corpus of inscriptions encodes language. If we insist that it provides such a test, *pace* Duhoux and Mahadevan, the Indus system fails that test miserably.

In general, statistical overlaps like those seen in **Fig. 2** can be expected frequently whenever we compare systems composed of a few common and many rare things, whether those systems consist of linguistic signs, magical or heraldic symbols, gods in a polytheistic system, or countless similar phenomena. Statistical studies of general sign frequencies can help us eliminate certain possibilities; for example, such studies can show that the Indus system could not have been a Chinese-style script, since symbol frequencies in the two systems differ too widely, and the total numbers of Indus symbols are far too few. But studies of general sign frequencies by themselves cannot determine whether the Indus system was a 'mixed' linguistic script like Egyptian hieroglyphs or exclusively a system of nonlinguistic signs.

Despite this limitation, we can distinguish the Indus system sharply from Egyptian hieroglyphs and similar scripts if we approach the sign-frequency issue from a different angle. High sign frequencies are normally fairly reliable markers of high levels of sound encoding in scripts, reflecting sound repetition at some level in the underlying languages. In the Mesopotamian scripts contemporary with the Indus system, the smallest groups of encoded sounds were full or partial syllables; in Egyptian scripts, which omitted vowels, the smallest units were consonants or consonant sequences; the earliest phonemic (alphabetic) encoding did not appear until the second millennium. The dominance of high-frequency signs in the Indus corpus is one reason why high levels of sound encoding are normally posited somewhere in the system, most often (but not always) in the form of a full syllabary; the apparent overlaps in general sign frequencies with Near Eastern scripts provide one support for the common view that a full Indus syllabary was invented at one time under the direct or indirect influence of those scripts (cf. e.g., Pope 1965; Parpola 1970; Fairservis 1987: 201). Since the number of Indus signs is much larger than those expected in 'pure' syllabaries, a variety of whole-word signs (or logograms), determinatives, grammatical or function signs, or even diacritics are often claimed to lie somewhere in the system, based again partly on supposed Near Eastern parallels.

But all these views fall victim to a revealing paradox: the high sign-repetition rates in the Indus corpus overall contrast sharply with low sign-repetition rates in individual inscriptions, which suggest that little if any sound encoding existed in the system. This problem is nicely illustrated in the longest Indus inscription found on a single surface, which contains 17 basic signs (**Fig. 3**). The inscription is typical of the Indus corpus in being composed largely of non-repeating high-frequency symbols: 10 of the 18 highest frequency signs in Mahadevan's concordance show up in the inscription (11 of the highest frequency signs, if we follow Wells' catalog), but not one of them shows up twice. Findings like this are not limited to the famous seals, but extend to all inscription types and to the corpus as a whole: among the 20 highest frequency signs in Mahadevan's concordance, 10 have zero or near-zero repetition rates in the entire 2,905 inscriptions covered in the work.[15] Sign-repetition rates in single inscriptions for most of the remaining high-frequency signs are also anomalously low, and oddities in the spatial distributions of the few signs that do regularly repeat in single inscriptions, some of which we illustrate later, make it difficult to picture that any of them involved coding for sound. Most importantly, nowhere in Indus inscriptions do

[15] Among the 20 highest frequency signs in Mahadevan's concordance, signs #65, 67, 72, 249, and 336 never repeat in any inscription, and signs #99, 123, 211, 267, and 343 repeat only in one inscription each. A spot check of photos of the inscriptions used to compile the concordance turns up a few more potential cases of sign repetition, but those cases are exceedingly rare.

we find convincing evidence of the random-looking types of sign repetition expected in contemporary phonetic or semi-phonetic scripts (*infra*). In many ancient scripts, some high-frequency signs can be expected to show up only once in certain types of short inscriptions; in seal inscriptions or name lists, this is true of gender determinatives and whole-word signs standing for titles or divine names incorporated in human names.[16] But the finding that most high-frequency signs in a body of inscriptions as diverse as those in the Indus corpus rarely if ever repeat in single inscriptions by itself suggests that those inscriptions contained little if any phonetic coding.

Figure 3. M-314 a, a seal impression of the longest Indus inscription found on one surface. The catalog numbers, as in other illustrations provided below unless otherwise noted, refer to the *Corpus of Indus Seals and Inscriptions*. The inscription is typical of Indus inscriptions in consisting largely of non-repeating high-frequency signs. Like most objects carrying Indus symbols, **M-314 a** is surprisingly small, according to its excavators (in the 1920s) measuring a scant 1 x .95 inches (2.54 x 2.41 cm) in size. Proponents of the Indus-script thesis often claim that the three 'fish' symbols clustered in the center of the top row are ligatured versions of a single sign, despite the fact that the signs closely resemble fish painted on Indus pottery; none of these three signs shows up twice on any known inscription. The symbol on the far right of the second row (an apparent ard or primitive plow surrounded by four sets of double marks) is known on firmer grounds to be a complex sign. For suggestions of the symbolic sense of some of these signs, cf. **Fig. 12**.

A long line of researchers stretching back to the 1920s has suggested that phonetic information may have been partly incorporated in the inscriptions by means of 'ligatures', or small graphic modifications of signs, similar to those used in later Indian scripts (Marshall 1924; 1931: I, 40; Hunter 1929; Parpola, Koskenniemi, Parpola, and Aalto 1969; Mahadevan 1986; Fairservis 1992; Parpola 1994; etc.). The best-known case of claimed ligaturing shows up in the three high-frequency 'fish' symbols clustered at the top of the inscription in **Fig. 3**, which have often been represented as ligatured variants of a single sign (cf., e.g., Hunter 1929: 71 ff.; Parpola 1994: 275). Whatever the case — suspiciously similar-looking fish show up in pictures on Indus pottery (see Farmer 2004a: 65) — even putative ligaturing factors in few high-frequency Indus signs, and in all these cases (including these three 'fish' symbols) those signs again have zero or near-zero repetition rates in single inscriptions. The result is that while so-called ligatures undoubtedly did alter the symbolic meanings of Indus signs, it is hardly plausible to claim that they factored in some generalized phonetic code. The same is true of all real or claimed 'complex' or 'compound' Indus signs, all of which also have zero or near-zero repetition rates in single inscriptions.

To explain these low sign-repetition rates, Wells has suggested (oral communication, 2001) that sign repetition in single inscriptions may have been avoided for aesthetic reasons, leading when needed to scribal substitutions of alternate symbols that encoded the same sound

[16] Thus in a famous name list of 438 Habiru soldiers, written in Hurrian cuneiform in the mid second millennium, every name starts with a male gender determinative, which not surprisingly shows up only once in each name. For photos and transcriptions of this text, see Salvini 1996; on calculating sign-repetition rates in transcribed cuneiform texts like this, which mask sign polyvalencies in the original documents, see n. 19 below.

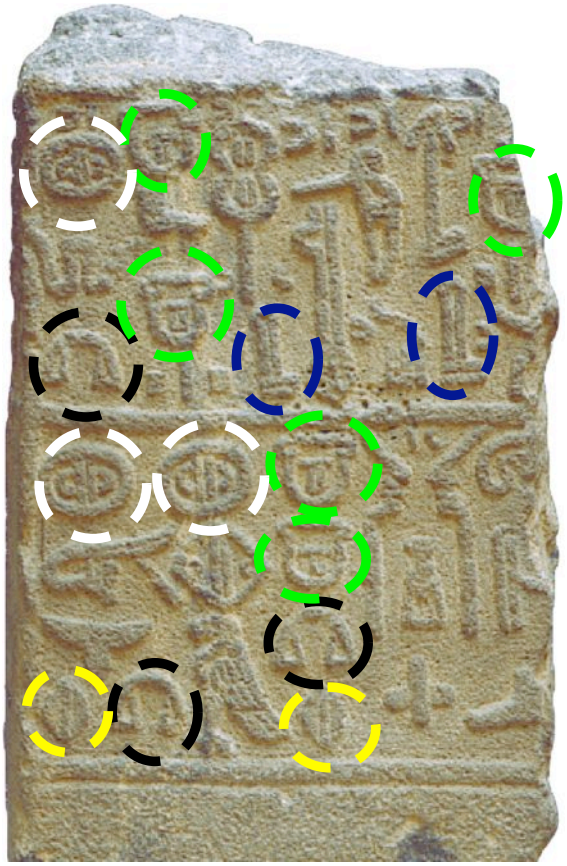
(homophonous signs). Some ancient scripts did contain many homophonous signs, but no evidence exists that they were used for such systematic purposes, and internal evidence suggests that practices like this were especially improbable in the Indus case. It is first of all difficult to imagine that many homophonous signs could have existed among the small set of high-frequency signs that dominate in Indus inscriptions; that improbability is increased by the fact that these signs tend to appear in sign clusters that often exhibit close pictographic affinities, as exemplified by the three high-frequency 'fish' signs seen in **Fig. 3** and by the many Indus symbols that appear to depict seeds, sprouts, plants, and agricultural instruments, etc. (see, e.g., **Fig. 12**; cf. Farmer and Weber, forthcoming). Finally, as already noted, some Indus signs do repeat in single inscriptions, sometimes including many repetitions in a row, which is difficult to reconcile with speculation that sign repetition was supposedly avoided as part of a 'scribal' canon of stylistic elegance.

Comparison of sign-repetition rates with those in ancient scripts

The combination of high general sign frequencies and low repetition rates in single inscriptions is inconsistent with what we expect from fully enabled scripts. In **Fig. 4**, we illustrate more typical findings using a fragmentary text written in the Luwian hieroglyphic script. The first inscriptions in this logosyllabic (partly whole word, partly syllabic) system appeared in the mid-second millennium in the Hittite Empire period; the latest show up in the Neo-Hittite era, which extended down to c. 700 BCE. The degree to which the script in its earliest forms was tied to spoken language remains controversial (cf. Hawkins 2000: Vol. 1, pt. 1, 4 ff.; Woudhuizen 2004: 12-3 and *passim*) due to the many non-phonetic symbols that show up in early inscriptions. (These signs are typically characterized as 'logograms', although their links to any one language remain unproven). But while its developmental course remains uncertain, the evidence is clear (as it is not in the Indus case) that the Luwian system possessed a fully syllabary at an early date, although the inscriptions continued to contain many logograms up until the script disappeared. Despite the complexities of the Luwian system, which includes many homophonous signs, a crude statistical analysis of sign-repetition rates in the Neo-Hittite Hama stones performed by Hyde Clarke in the early 1870s suggested that the system contained significant levels of sound encoding, and hence qualified as a fully developed script.[17] The random-appearing distributions of repeating signs in the short inscription shown in **Fig. 4** is consistent with what we expect of logosyllabic scripts.

Similar patterns of repeating signs also show up in Egyptian hieroglyphs, which similarly consist of a mix of phonetic and non-phonetic elements. Due to the close overlap in general sign frequencies that we earlier found in large bodies of Egyptian and Indus inscriptions (**Fig. 2**), it is especially interesting to compare sign-repetition rates in single Egyptian and Indus inscriptions of similar sizes and types. To facilitate such a comparison, we started with a set of 67 Egyptian cartouche texts, including all inscriptions of this class available from the same digital archive from which we drew our longer samples of Egyptian texts. Cartouches refer to oval enclosures that contain the names or titles of Egyptian kings; they are close to ideal texts to compare with

[17] In Burton 1872: I, Appendix 4. It is noteworthy that despite the fact that the Hama stones carry hundreds of signs, Clarke felt it was necessary to test the inscriptions statistically before convincing himself that they encoded speech. In contrast, in the same period (the first Harappan seal inscription was discovered in 1872-3), Cunningham felt confident based on the finding of one Harappan seal carrying six signs that he was dealing with a fully developed script (cf. Cunningham 1877).



Ashmolean Museum, Oxford, no. 1913.914.

Figure 4. Part of a fragmentary Luwian inscription from the Neo-Hittite era; we have circled a few of the inscription's many repeating signs; the majority of these are syllable signs, but we have also marked one determinative that repeats three times; other sign repetitions not circled include additional syllabograms and function signs that mark word beginnings or logograms. Despite the fact that the Luwian system was a highly decorative and monumental script, none of these sign repetitions contains any of the odd symmetries or duplications many times in a row typical of the relatively small number of Indus signs that repeat in single inscriptions.

For a transliteration and translation of the inscription, see Hawkins 2000: 1, pt. 1, 156-7 and pt. 3, Plate 46.

Harappan seal inscriptions, which Indus-script proponents often represent as including similar data. The 67 Egyptian cartouches contain 465 signs, with an average length of 6.94 symbols per inscription; as in our sample of longer Egyptian texts, the most common signs in the cartouches are phonetic symbols rather than logograms, determinatives, or function words.

For the purposes of our comparison, we prepared a matched corpus of Indus inscriptions by taking the first 67 legible seal texts in the *Corpus of Indus Seals and Inscriptions* that include 7-8 signs; all of these inscriptions, which average 7.39 signs in length, come from Mohenjo-daro. As a control, we included a similar matched set of seal inscriptions from Harappa, following slightly different procedures to compensate for the smaller number of seals available from that site; our second sample ranges from 6-13 signs in length, averaging 7.36 signs per inscription.[18]

The results of our comparison are shown in **Table 1.** As expected of largely phonetic inscriptions, the Egyptian cartouches contain high levels of sign repetition; in contrast, less than

[18] To make up this second sample, we began by including all seal inscriptions from Harappa that we were reasonably confident originally contained 7-13 signs and that were legible enough to show whether or not they had sign repetitions; we identified 43 inscriptions in Vols. I and II of the *Corpus* that met these criteria. To complete the 67 inscriptions needed for the matched sample, we then added in the first 24 inscriptions from Harappa in the *Corpus* that carry 6 signs and meet similar criteria; these 24 inscriptions were drawn from seals **H-6** to **H-592**.

	Egyptian cartouches	Mohenjo-daro seals	Harappan seals
Number of inscriptions and signs	67 inscriptions, 465 signs (average length = 6.9 signs)	67 inscriptions, 495 signs (average length = 7.39 signs)	67 inscriptions, 493 signs (average length = 7.36 signs)
Total repeating signs in single inscriptions	48	8	7

Table 1. Sign repetitions in Egyptian and Indus inscriptions closely matched by size and type. Overall sign frequencies in large samples of Egyptian and Indus inscriptions are nearly identical, but sign repetition-rates in single inscriptions differ sharply, again contradicting suggestions that significant levels of sound coding existed in the Indus system.

1/6 as many repetitions show up in the Indus inscriptions, despite the fact that the total and average number of signs in those inscriptions are slightly larger than those in the Egyptian sample.

These results once again clash with the standard view that the Indus system contained a full syllabary or any other systematic type of sound coding. Similarly dramatic results show up in every class of Indus inscriptions that we have tested, including most importantly in Indus bar-seal inscriptions, which superficially look more like 'writing' than any other Indus inscription type (see **Fig. 5**). The 78 bar inscriptions from Harappa included in the first two volumes of the *Corpus of Indus Seals and Inscriptions* (**H-129** to **H-162** and **H-639** to **H-682**) contain a single isolated example of sign repetition, and that shows up in a short inscription that few observers would be tempted to claim encoded sound (see **H-150 a** in **Fig. 6**). A larger number of repetitions show up in bar seals from Mohenjo-daro — due mainly to duplications of a single commonly doubled sign (illustrated in **Fig. 6** in **M-382 A**) — but the repetition rates are still far lower than those expected in contemporary scripts (the numbers are similar to those in **Table 1**, which includes data from some of these inscriptions). The evidence against phoneticism in Indus bar inscriptions is especially important, since recent stratigraphical work from the Harappa Archaeological Research Project (HARP) (Kenoyer and Meadow 1997) and Dholavira (Bisht 1998-9: 23) both date these seals exclusively to the end of the civilization, which suggests that the Indus system was not even evolving in linguistic directions after at least 600 years of use. Since we know that Indus elites were in trade contact throughout those centuries with Mesopotamia, if the Harappans really had a script, by this time we would expect it to have possessed significant phoneticism, as always assumed. (The usual claim is that the system was a 'mixed' script made up of sound signs, whole-word signs, and function signs, like the Luwian system, cuneiform, or Egyptian hieroglyphs.)

The implication is that the Indus system cannot even be comfortably labeled as a 'proto-script', but apparently belonged to a different class of symbols: it is hardly plausible to argue that a proto-script remained in a suspended state of development for six centuries or more while its users were in regular contact with a high-literate civilization.

In theory, one could argue that the Indus symbol system was a primitive whole-word or logographic script, adopting a model briefly proposed (but quickly dropped) in the most famous claimed decipherment of the system, announced by Parpola and his coworkers in 1969. One of the many problems with this approach lies in the small number of signs that dominate in the system: even if we took into account the hundreds of rare signs that that show up only once or twice in thousands of Indus inscriptions, on a whole-word model the system's semantic range would be smaller than that of a typical three-year-old child, or even of chimpanzees taught to sign words in

Figure 5. M-375-A. A typical bar seal from Mohenjo-daro (flipped horizontally to illustrate how it would appear as a seal impression). Following normal definitions of Indus signs, the inscription contains 7 non-repeating symbols, 6 of which are among the 20 highest-frequency signs in the Indus corpus. This class of inscriptions, from the late-mature Harappan period (Harappa period 3C), includes some of the longest and most sophisticated inscriptions from the Indus Valley.

the laboratory (Gardner and Gardner 1998). That range could be extended a bit by the use of systematic punning or so-called 'rebus' writing, which has factored in one way or another in the Indus-script thesis since the 1920s (cf., e.g., Hunter 1929; Heras 1953; Parpola, Koskenniemi, Parpola, and Aalto 1969; Fairservis 1992; Parpola 1994; Possehl 1996; etc.). Punning played a large role in all premodern civilizations, and it is reasonable to assume that free word play or 'casual phoneticism' of some sort may have factored in the day-to-day interpretation of Indus symbols. But the fact that those symbols exhibit far lower sign-repetition rates in single inscriptions than those normally found in contemporary scripts, all of which already depended heavily on punning to extend their linguistic range, suggests that comparable results in the Indus case could only be achieved by unprecedented use of that method, resulting in such high sign polyvalencies that the system could hardly qualify as an even halfway unambiguous 'script'.[19] A further argument against the thesis that the system made extensive use of punning lies in the high level of pictographic coherence already noted in the system, which suggests that the pictographs were chosen for their iconic and not sound values.

It is sometimes claimed that any oddities in Indus sign frequencies might simply reflect the 'specialized' nature of the surviving inscriptions: a more reasonable range of frequencies might be expected if a 'normal' range of texts had survived (Kak 1988; Possehl [citing John Baines] 1996: 93; 2002a: 135). But in the absence of 'lost' Indus manuscripts, no grounds exists for assuming that the dozen or more different types of surviving inscriptions do not represent a reasonable cross-section of Indus symbol use. Different high-frequency symbols do show up more often in some types of inscriptions than others, but this only provides further proof that the symbols did not encode speech, since while we expect frequencies of whole-word or non-linguistic signs to vary in different types of inscriptions, radical variations of this type are not a normal feature of largely phonetic scripts (above, p. 28 and n. 13).

Finally, it should be noted that none of the relatively small percentage of Indus inscriptions that do repeat signs contain any suggestions of sound encoding. The most common types, illustrated in **Fig. 6**, involve duplications of the same sign up to four (and occasionally more) times in a row (cf.,

[19] The high levels of polyvalency typically found in third-millennium scripts are highlighted by the problems that you face when trying to calculate sign frequencies from transliterated cuneiform texts, in which some signs may be rendered a dozen or more ways depending on the transcriber's interpretation of those signs' intended sound or whole-word values. (This is not a problem when working with Egyptian hieroglyphs, which are normally transliterated into modern signs in a one-to-one fashion.) The result is that accurate sign frequencies can only be calculated from transcribed cuneiform when sign lists are made available that allow correction for symbol polyvalency; we used such a list in correcting for polyvalency in the Sumerian texts used in **Fig. 2** (see n. 12).

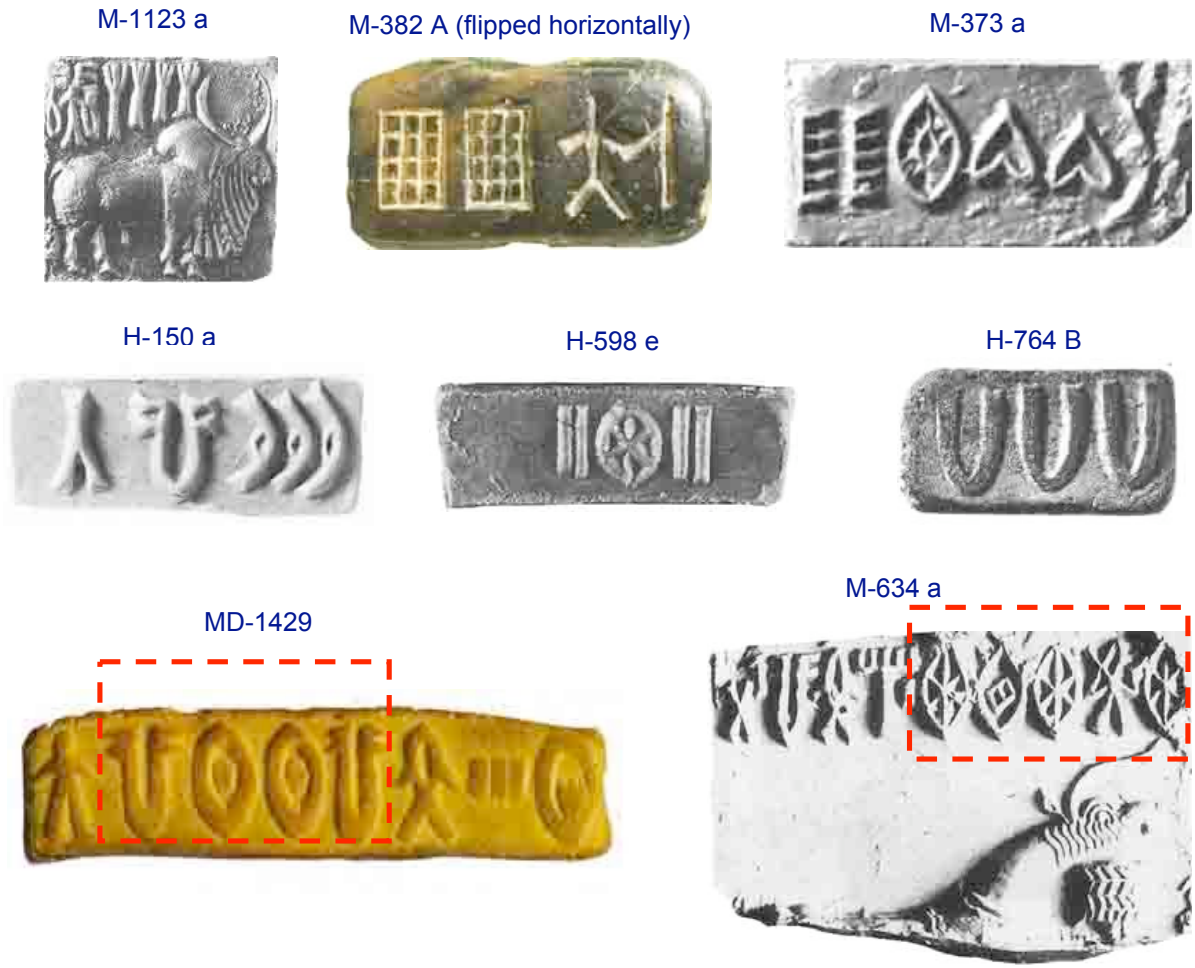


Figure 6. Examples of the most common types of Indus sign repetition. The photos are not all to scale. The most frequent repeating Indus symbol is the doubled sign illustrated in **M-382 A**, which is sometimes claimed to represent a field or building, based on Near Eastern parallels. The sign is often juxtaposed (as here) with a human or divine figure carrying what appears to be one (or in several other cases) four sticks. **M-634 a** illustrates a rare type of sign repetition that involves three duplications of the so-called wheel symbol, which other evidence suggests in some cases served as a sun/power symbol; the sign shows up no less than four times on the badly deteriorated Dholavira signboard (not shown), which apparently once hung over (or guarded?) the main gate to the city's inner citadel. The color photo of **MD-1429** is reproduced from M. Kenoyer, *Ancient Cities of the Indus Valley Civilization*, Oxford University Press, Oxford 1998), p. 85, exhibition catalog number MD 602. The sign on either side of the oval symbols in the inscription is the most common symbol in the Indus corpus, making up approximately 10% of all symbol cases; despite its high general frequency, repetitions of the symbol in single inscriptions, of the kind seen here, are relatively rare.

e.g., **M-1123 a**, **H-764 B**) that at times imply some type of quantification.[20] A less common type involves symmetrical sign placements that appear to be decorative or symbolic in nature (e.g.,

[20] This can be demonstrated in the case of the tripled sign in **H-764 B**, which is known to represent a sacrificial bowl. The identification is confirmed by studies of mass-produced inscriptions (e.g. **M-478 A**, not shown) in which we find the sign in both abstract and pictorial forms in unambiguous sacrifice scenes.

M-373 a, **H-598 e**), which are similar to the symmetries that led Maurice Pope long ago to question the linguistic nature of Cretan hieroglyphic seal inscriptions (Pope 1968; Olivier 1996). An even rarer type involves duplications of a small subset of signs apparently to emphasize their magical or political power; the most extreme case of this type shows up (surely not coincidentally) on the giant Dholavira 'signboard', which repeats what some inscriptions suggest is a sun/power symbol four times. Finally, suggestions exist that a small number of longer inscriptions that repeat signs or groups of signs may have been formed by combining two originally separate but similar inscriptions in a cartouche-like fashion, possibly involving some sort of social alliance.[21] Whatever the origins of these different types of duplications, all that is critical for our purposes is to note again the lack of any suggestions in them of the random-looking repetitions typical even of monumental scripts like Luwian or Egyptian hieroglyphs.

Unique signs ('singletons') and low-frequency signs

Further evidence that clashes with the Indus-script thesis shows up in the large number of unique symbols (or 'singletons') and other rare signs that turn up in the inscriptions (cf. Simpkins 1997). 27% of the 417 signs in Mahadevan's concordance occur only once in 13,372 sign occurrences; 52% show up five times or less. There are reasons to suspect that even these often repeated figures (cf., e.g., Parpola 1994; Possehl 1996) are too low, since Mahadevan groups a number of rare signs of doubtful identity and counts every inscription mass-produced in molds separately, masking any singletons or low-frequency signs found in those inscriptions.[22] Counts of singletons and rare signs are even higher in Wells' 1999 catalog. Wells distinguishes over 600 distinct signs in 7,165 sign occurrences, 50% of which show up only once; 75% show up five times or less. Since Wells 'clumps' far fewer variants than earlier researchers, we would expect these percentages to rise to even less plausible heights if his catalog included more inscriptions.

Some rare Indus symbols can be legitimately classified as 'complex' signs, which in principle could have allowed their sense to be deduced from their more basic components. But the majority do not belong to this class, and their forms are normally too abstract to expect that their meanings could have been guessed from pictographic clues. A number of inscriptions also contain more than one singleton in addition to other rare signs, making it difficult to imagine how those signs could have possibly functioned in a widely disseminated 'script' (**Fig. 7**). Even odder than their absolute numbers is the way that new singletons and other rare signs keep cropping up with each new batch of discoveries. If Indus symbols were part of a genuine script, we would expect the percentages of singletons and other rare signs to drop as new examples of those signs showed up in new inscriptions. Paradoxically, those percentages appear to be rising instead over time, suggesting that at least some Indus symbols were invented 'on the fly' only to be abandoned after being used once

[21] Cf. the fragmentary **M-682** as one example of this rare type of repetition.

[22] In one case over three dozen inscriptions have survived from a single mold (**H-252** to **H-277** and **H-859** to **H-870**), which presumably represents only a small part of the original number. Most in this case were recovered from a single test trench in Harappa Area G by Vats in 1929, outside city walls in a context reminiscent of the outdoor sacrifice scenes depicted on many ritual inscriptions (see, e.g., **Fig. 13** below). Less than 140 feet away, at about the same levels in the trench, Vats found twenty human skulls "tightly packed together" along with what he interpreted as bones of sacrificial animals and ritual vessels (Vats 1940: I, 192-202 and II, Plate XXXIX). For discussion of the significance of this find, and the need to reexcavate Area G, see Farmer 2004b: 23-7.

or a handful of times. Our studies of large numbers of new inscriptions scheduled to be published in the third volume of the *Corpus of Indus Signs and Inscriptions* suggest that the percentage of singletons and other rare symbols will continue to rise in the future, which is the reverse of what is expected from a genuine 'script'. [23]

Recent studies have shown that large percentages of singletons and other rare signs also characterized proto-cuneiform (Damerow 1999) and the largely derivative proto-Elamite accounting system (Dahl 2002), which was abandoned centuries before the first Indus inscriptions appeared. But these findings only reinforce the conclusions of our study, since these same statistical anomalies have been claimed as evidence that proto-cuneiform at least (and we would extend the same claim to proto-Elamite) was itself largely decoupled from spoken language (Damerow 1999). One obvious difference from the Indus case lies in the fact that proto-cuneiform (but not the short-lived proto-Elamite system) did eventually give birth to a largely phonetic script.[24] The evidence presented above that no similar development occurred in Indus inscriptions over at least six centuries supports other suggestions, including those found in the brevity of the inscriptions, that Indus symbols belonged to a different class of signs not only from fully developed writing systems but likewise from these older 'proto-scripts'.

Evidence of the growth of singletons and other rare signs further contradicts the old view that the Indus system was a 'frozen' or even 'perfected' script, as it has been frequently characterized even in recent decades (cf., e.g., Fairservis 1992; Parpola 1994; Possehl 1996). Convincing parallels in ancient writing systems are again difficult to come by. It is well-known that thousands of new signs were added to Egyptian hieroglyphs in the Greco-Roman era, but by that time the script was in a degenerate state, and it is not clear how many of the new signs could or were even meant to be understood; many may have been introduced for esoteric reasons (Davies 1987; Houston, Baines, and Cooper 2003). In principle, the sense of even the rarest of Indus signs could have been 'fixed' through the general distribution of word lists; lexical lists of this type written on tablets and potsherds are among the most common surviving texts from the ancient Near East. But

[23] As we were editing the final version of this paper, we received reports that Wells, who is deeply committed to the script thesis, has apparently abandoned his earlier sign definitions that led to such huge counts of rare signs (50% of the over 600 symbols in his catalog show up only once) and has gone to the opposite extreme, now claiming that nearly all 'singletons' are complex signs. Our studies of rare signs in published and unpublished sources make us more than skeptical of his newest claim, but Wells' reported about face underlines how dependent counts like this are on easily shifted sign definitions. In the absence of an exhaustive sign-by-sign analysis, arguments that the symbols were nonlinguistic involving such counts can be considered secondary to more easily confirmed arguments, including those involving the brevity of the inscriptions, the missing markers of manuscript production, the system's anomalous sign-repetition rates, the odd symmetries in sign placements, and the many parallels between Indus and Near Eastern symbol systems discussed below. Studies of rare symbols on our view are critical to future Indus studies, since such studies shed light on how the symbol system functioned and was controlled, and since shifts in symbol usage can yield insights into developments in Indus society (cf. below and Farmer and Weber, forthcoming). But the discovery of high numbers of rare signs is not central to proofs that the society was illiterate, since some premodern sign systems (including many involving religious symbols) remained fairly 'closed' to the production of new signs while others remained 'open' (as, *pace* Wells, our own research and all published data strongly suggest was true in the Indus case).

[24] The old assumption (found, e.g., in Scheil, Meriggi, Hinz, Vallat, etc.) that proto-Elamite and the much later Linear Elamite system were linked has been largely abandoned since the groundbreaking work of Damerow and Englund (1989); cf. on this issue Potts 1999 and Dahl 2002.

K-15 a

M-899 a

MS 2645

Figure 7. Examples of apparent unique signs or 'singletons' in three inscriptions. A minimum of two singletons (using Mahadevan's criteria) and at least several others (using Wells' 1999 standards) show up in **K-15 a**. Mahadevan's concordance masks the problem by classing the two singletons as variants of one another; Wells' catalog omits the inscription entirely. **MS 2645,** from the Schøyen collection in Oslo, contains two singletons in a unique cylinder seal from Afghanistan that apparently mixes Indus signs with Akkadian iconography; it is shown here in a modern impression. The three rows of four lines seen in the inscription is a well-known Indus sign; the pointed hoe-like or spear symbol shows up in both Indus and Mesopotamian symbol systems; it is conceivable that the two 'singletons' in the blown-up section of the impression (arrow) may have parallels among non-linguistic Akkadian signs, but this is not currently known. Claims that the two signs reflect attempts to adjust the 'Indus script' phonetically to an unknown language — a claim often made in such cases (e.g., Parpola 1994; Kenoyer 1998: 72) — are highly improbable, given the strength of the evidence against phoneticism in Indus inscriptions in general.

given the evidence against 'lost' Indus manuscripts, and the total lack of inscribed clay tablets or genuine potsherd texts in the region, it would be difficult to argue that school texts like this ever existed in the Indus Valley.

A comparison with other ancient symbol systems

How did Indus symbols function if they were not even part of a proto-script? Important suggestions can be found in a wide range of ancient symbol systems that predated or in some cases existed side-by-side with writing for millennia. The earliest example roughly comparable to the Indus case shows up in the so-called Vinča complex and associated cultures in southeastern Europe, whose earliest inscriptions predated both writing and Indus symbols by several thousand

years (Winn 1973, 1981, 1990) (**Fig. 8**). Inscribed Indus objects were considerably more sophisticated than Vinča inscriptions, but a number of parallels suggest that both belonged to the same general class of non-linguistic signs. Some of those parallels include the relative standardization of a small core of signs over large geographical areas; the inclusion beyond that core of hundreds of unique or rare symbols; evidence in both systems of apparent ligaturing and sign clustering; suggestions of ritual uses of some classes of symbols; and the sudden disappearance of both systems, after centuries of relative stability, in periods of apparent social upheavals. Some Vinča inscriptions also exhibit a kind of linearity that is not dissimilar from the sort found on some (but by no means all) Indus inscriptions.

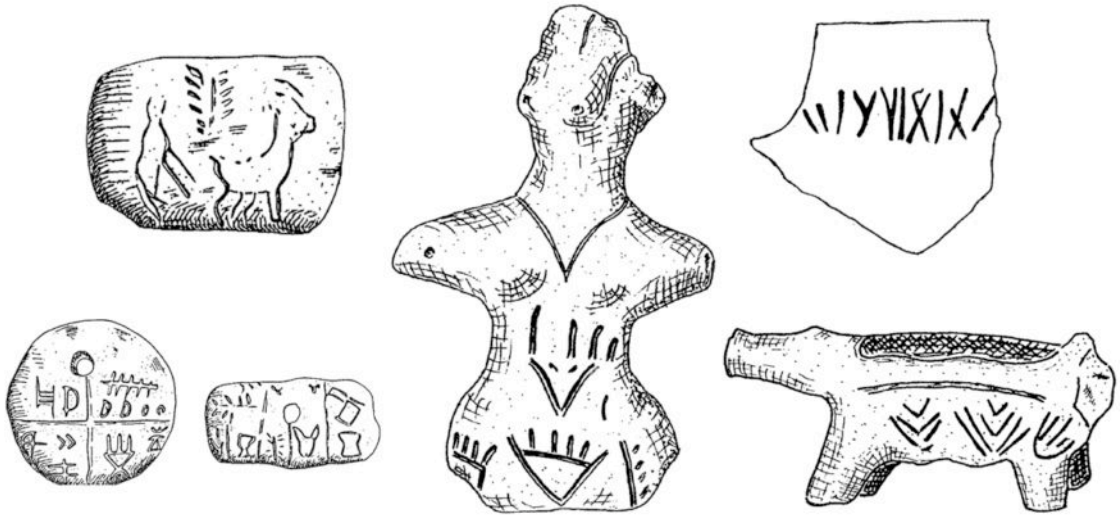


Figure 8. Examples of so-called Vinča inscriptions, from southeastern Europe (after Winn 1973). Claims by Gimbutas (1989), Haarmann (1996), and their followers that the symbols were part of a pre-Sumerian 'Old European script' in a linguistic sense can be safely dismissed, but the signs did have some features in common with Indus symbols, including relative stability over long periods, evidence in some types of inscriptions of ritual functions, and cases of apparent ligaturing and sign clustering.

Even closer to the Indus case were a broad family of Near Eastern symbol or emblem systems whose development can be traced at a minimum from the fourth millennium to the Hellenistic era (Green 1995; Seidl 1989; Black and Green 1992).[25] Near Eastern emblem inscriptions carried from one up to 2-3 dozen symbols, making some of them significantly longer than any Indus inscriptions. Examples show up on seals, stelae, plaques, boundary stones (*kudurru*s), cliff walls, friezes, amulets, and many other media from Egypt to Eastern Iran, appearing separately or in conjunction with writing. Most Near Eastern artifacts of this type carry a complex mixture of abstract symbols and iconography, but we also find symbols in some cases laid out in neat linear patterns, with a result not dissimilar to that seen in pictographic scripts (cf. **Fig. 9**). As in the Vinča and Indus cases, a handful of high-frequency signs dominate in these inscriptions, supplemented by hundreds of rare signs. With the help of written sources, we can identify some of the basic

[25] Remnants of these systems also survived in the middle ages in the symbols or attributes of divine powers or saints in Zoroastrian, Manichaean, and Christian traditions, etc.

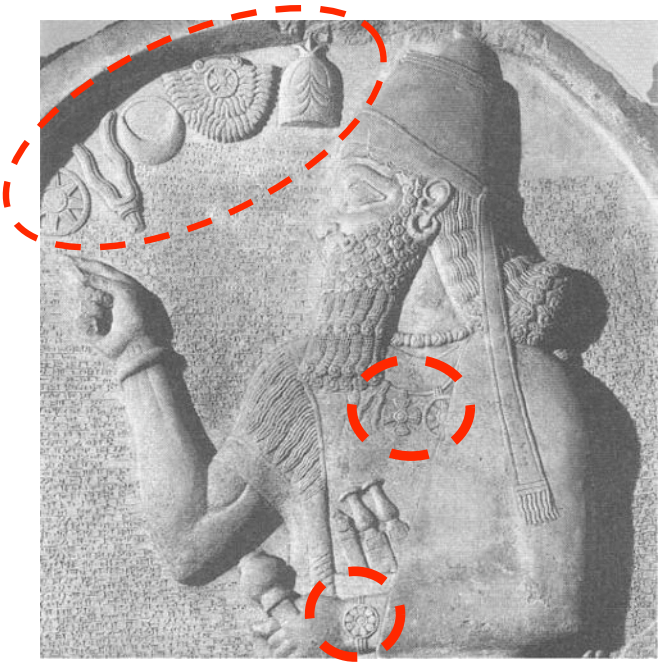


Figure 9. A stela carrying a five-sign emblem inscription found at the entrance to the temple of Ninurta at Nippur. The stela shows Aššurnaṣirpal II (9th century BCE) pointing to the abstract symbols of his major gods. Some of the same signs also show up on magical talismans on Aššurnaṣirpal's necklace and bracelet. Left to right in the inscription: Ištar = eight-pointed star; Adad = forked lightening; Sīn = the crescent moon; Šamaš = a winged disk; Aššur = a horned crown (which also show up in different contexts as a symbol for other deities; see **Fig. 10**). A second symbol for Šamaš shows up on the cross on Aššurnaṣirpal's necklace, along with the signs of Adad and Ištar, given this time in a different order. Cuneiform writing, difficult to see at this scale, fills most of the stela. After Black and Green, 1992.

referents of these symbols, but many ambiguities remain, reflecting in part an inherent plasticity in the meaning of the symbols themselves. Thus, to give just one example, even the high-frequency omega (or inverted omega) symbol (arrows in **Fig. 10**) has been claimed at different times to refer to "weighing-scales, the yoke of a chariot-pole, a comet, a large-horned quadruped, a head-band, a wig, the bands used to swaddle a baby or as the uterus", which in turn have been identified as symbols of at least a half dozen different Mesopotamian gods (Black and Green 1992: 146; cf. Green 1995: 1839). As in the case of the omega sign, most Near Eastern symbols are typically characterized as symbols of deities, although a few (including the common rhomb sign) could also apparently represent fairly abstract concepts. Even numbers regularly served as symbols for deities or celestial forces in these systems (Black and Green 1992: 144-5), distinguishing them from the more conventional numbers found in Near Eastern accounting systems or proto-scripts (e.g., Nissen, Damerow, and Englund 1993); many suggestions of the symbolic use of apparent numbers also turn up in the Indus system (**Fig. 11**).

Just as important as their basic meanings were complex networks of associations that linked deity signs to celestial, terrestrial, and social phenomena, reflecting similar 'correlative' bonds (or *bandhu*s, in Vedic terms) typical of premodern cosmologies in general (Farmer, Henderson, and Witzel 2002). Depending on the mythological, social, or ritual contexts in which they were used, signs of particular gods might similarly stand for particular stars or star clusters, planets, constellations, seasons, months, days, hours, cities, clans, professions, administrative offices, plants, animals, colors, and similar phenomena. Questions of narrative-mythological precedence or temporal or celestial position (including those found in later zodiacal systems; cf. Wallenfels 1993) resulted in sign clustering and positional regularities in these signs of the same types observed in Indus inscriptions (cf. **Fig. 10**). The meanings of symbols also frequently changed as deities rose or fell in status or were replaced by or merged with other gods; thus the agricultural spade or hoe (*marru*) that symbolized the Babylonian god Marduk was sometimes reinterpreted by the Assyrians as the spear of Aššur; similarly, the winged disk that was one of several signs of Šamaš

Figure 10. **At top:** Forty (out of a much larger number) of the most common Mesopotamian deity signs, adopted from Green 1995. **Below:** Second millennium BCE *kudurru* or boundary stones (for overviews, see King 1912, Seidl 1989) that carry these and rarer symbols on successive lines or registers; red arrows in these illustrations (and the one above) point to three variations of the high-frequency omega sign. *Kudurru*s share a number of important features with Indus inscriptions, including mixtures of high-frequency and rare symbols and similar levels of regularity and variability in sign order (compare the top registers in the two inscriptions). Other properties for which parallels may be reasonably anticipated in the Indus system include cases of the same sign standing for different gods (e.g., the horned cap, which in the Akkadian inscription in **Fig. 10** stood for Aššur, shows up in doubled form near the top of both these *kudurru*s as symbols of Enlil and Anu) and more than one sign standing for a single god (e.g., the 'goat-fish' to the right of the horned caps in the *kudurru* on the left and the turtle next to the horned caps in the *kudurru* on the right are alternate symbols for the god Ea). Left, Louvre Sb 22; right, British Museum, ANE 102485.

(another was the cross shown in **Fig. 9**) was later transformed into the transport vehicle of the Persian high god Ahuramazda, whose signs fused with those of the older deity.[26] Similar mergers of signs, which have typically been claimed as evidence of linguistic compounding, show up often in Indus inscriptions, especially in the final centuries of the civilization.[27]

Fig. 11. Illustrations of some of the ways that apparent numbers show up in Indus inscriptions. This class of Indus symbols has many problematic features, including the fact that many 'numbers' have nothing to qualify except other 'numbers'. Studies of the highly uneven frequencies of these signs (Farmer 2004a: 53-6) solve the problem by suggesting that apparent Indus number signs typically had symbolic values, as they often did in Mesopotamia, standing on a basic level for deities or celestial forces; hence the apparent numbers in **K-49 a** refer most probably not to the abstract numbers '7' and '3', but to 'The Seven' and 'The Three', whatever these further symbolized. No evidence supports the common claim (e.g., Kinnier Wilson 1974) that apparent Indus numbers were employed for accounting purposes, although small numbers may have been used to quantify sacrificial offerings on ritual inscriptions that may have factored in the Indus economy (for illustrations, see Farmer 2004b: 28-32).

Parallels in Near Eastern sign systems suggest that we can never fix the sense of Indus symbols with anything approaching the precision expected of linguistic signs. Some of the basic referents of Indus symbols and their broader associations can be inferred from study of all variants of those symbols, especially when these survive in pictorial as well as abstract form; from study of all signs with which these symbols tend to cluster; and from analysis of any closely related iconography. But the plasticity of ancient symbols warns us against the old assumption that the Indus system was a simple 'code' waiting to be broken: on the Near Eastern model, the probabilities are high that in different regions and periods the same Indus sign may have represented different gods or concepts, or that more than one sign (even in the same inscription) sometimes stood for the same god or concept. As suggested by brevity alone, Indus inscriptions were neither able nor intended to encode detailed 'messages', not even in the approximate ways performed by formal mnemonic systems in other nonliterate societies. Their most likely function, as suggested by Near Eastern parallels, was to associate individuals, families, clans, offices, cities, festivals, or professions, etc.,

[26] Similar exchanges of symbols between Vedic, Buddhist, and Jains deities were common in India in ancient and medieval times.

[27] One implication of this is that studies of the levels of sign compounding in the inscriptions can be useful dating tools (Farmer and Weber, forthcoming).

with specific gods or their celestial correspondents, partly for identification purposes and partly to draw down whatever magic was accessible through those gods' symbols. The same evidence suggests that some Indus symbols may have been copied for centuries and in later eras combined out of deference for their antiquity or magical power with little understanding of their original sense. The tendency to conserve symbols for such purposes provides a simple explanation for why the longest inscriptions show up in later periods, mirroring similar processes of cumulative growth found globally in manuscript traditions (Farmer 1998; Farmer, Henderson, and Witzel 2002). In regard specifically to seal inscriptions, we know from Near Eastern sources that the use of a series of symbols to identify a person, profession, clan, or office, did not depend on the exact sense of those symbols being understood, any more than this was true in the case of royal emblems or medieval heraldic signs; moreover, although a tendency within families or professions may have existed to conserve symbolic motifs over long periods (Wallenfels 2000: 349), the fact that flourishing markets existed in some regions for second-hand seals (Larsen 1977; Teissier 1994: 45-50) suggests that the sign sequences on Indus seals may not always have necessarily had any close ties to the seal users.[28] It is reasonable to assume that Indus inscriptions mass-produced in molds, which frequently carry ritual iconography and have no known Near Eastern parallels, when used in communal rituals (as suggested by the discovery of many duplicates in single find spots; see above, n. 22) probably included exegeses of the mythological sign sequences seen on those inscriptions. But it would be naïve to assume that the same signs were interpreted at all times in the same way, any more than this was true of the Christian cross in medieval Europe — which in different contexts could serve as a political-military symbol, a magical talisman, a sign of a profession, a mystical aid, or a symbol of death. Far more than linguistic signs, non-linguistic symbols tend to be highly 'multivocal' in their referents (Turner 1967; Barth 1987), warning us against the temptation to attach too narrow a sense to any one Indus symbol or inscription.

Discussion

Effects on our views of Indus civilization

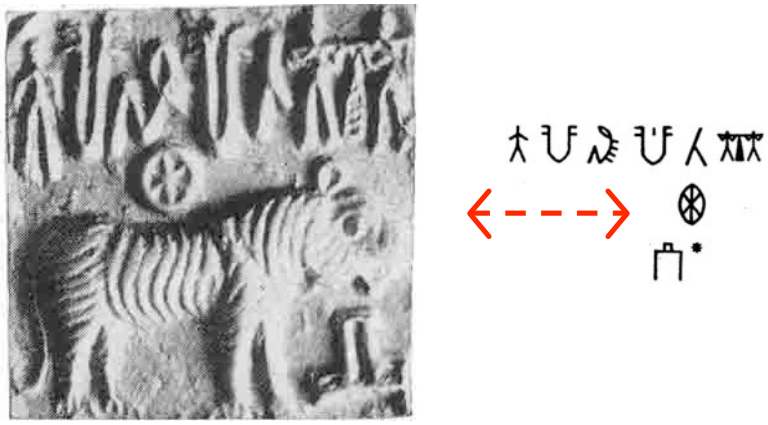
Paradoxically, evidence that Indus inscriptions did not encode speech increases and does not decrease the symbols' historical value. We know a great deal about literate civilizations, but far less about premodern societies that rejected writing for other types of sign systems. Indus

[28] Wallenfels suggests in the discussion following an important conference paper (2000: 349 ff.) that in Hellenistic Babylonia, at least, individuals who changed seals tended to retain motifs found on their earlier seals, although some variation might occur with "whatever fashions were current." He refers in particular to one "rather large extended family" that he tracked over six generations that included astrologers, incantation priests, and followers of related professions who tended "to use certain preferred motifs, especially the figure with bucket and sprinkler, either the anthropomorphic figure like that or the 'fishman' figure." Wallenfels' findings support our general thesis that most signs on Indus seals were abstract symbols of deities or related celestial or mythological figures tied by tradition to specific families, clans, professions, or offices, etc. Abstract signs of seasonal or agricultural gods or associated celestial forces can similarly be expected on ritual Indus inscriptions involving planting or harvesting festivals, etc., and so on for each class of Indus inscriptions. Indus seals and seal inscriptions appear to have been significantly more standardized than those in the Near East (cf. Farmer 2004b: 33 ff.), suggesting that tighter controls may have existed over their use — and perhaps by inference over local populations — than in other ancient societies. Nevertheless, before drawing any far-reaching conclusions concerning links between the symbols on Indus seals and their users, the problems raised by Larsen and Teissier involving second-hand seals in the Near East must be taken into account.

inscriptions are the product of the largest Old World civilization of this type known, providing us with a unique window on this poorly understood (and often unacknowledged) class of civilizations. The realization that Indus inscriptions did not encode speech also opens up novel statistical means of exploiting their evidence: fluctuations in sign frequencies in scripts are largely accidents of sound encoding; but studies of similar fluctuations in non-linguistic symbol systems may provide sensitive measures of religious, political, and economic developments that are otherwise impervious to historical analysis, even when the meaning of most signs remains uncertain (Farmer and Weber, forthcoming). We are fortunate that statistical studies of this type are just getting underway as new stratigraphical findings from the Harappa Archaeological Research Project (HARP) have begun to provide the first reliable dates for different classes of inscriptions, including most importantly the long bar inscriptions (Kenoyer and Meadow 1997) and miniature steatite tablets (Meadow and Kenoyer 2000) — the latter known now as relatively late and not the earliest inscriptions, as had been assumed since the time of Vats (1940). Paleographical studies of sign variations allow us to extrapolate these findings to other classes of inscriptions whose stratigraphy is less certain, including the magnificent oversized unicorn seals, which can be shown on paleographical grounds to date like the bar seals to the last centuries of the civilization. Statistical studies combining non-linguistic models of the signs with our increased ability to date inscriptions are capable of providing insights not only into Indus religious and political developments but even into regional variations in agricultural practices, in part exploiting the fact that large numbers of inscriptions appear depict complex mythologies involving animated seeds, sprouts, plants, farm tools, and other symbols linked to seasonal rituals, some apparently involving human sacrifice; the significance of these data was previously obscured in linguistic transcriptions that transformed even the liveliest mythopoeic symbols into lifeless 'fonts' (**Fig. 12**). Ironically, the insights into Indus civilization gained from such studies promise to exceed anything hoped for from the long-awaited but quite impossible 'decipherment', since few serious adherents of the Indus-script thesis ever claimed that the surviving inscriptions contained much more than the names or titles of the Harappans or their gods (e.g., Parpola 1994; Kenoyer 1998: 81, 83-4).

The critical question remains of why the Harappans never adopted writing, since their trade classes and presumably their ruling elite were undoubtedly aware of it through their centuries of contacts with the high-literate Mesopotamians. One possibility consistent with all known evidence is that the oddly shamanic-looking elites often seen on mass-produced ritual inscriptions (**Fig. 13**) opposed writing due to the threats it posed to whatever control the symbols gave them over Indus populations. The hypothesis of a Harappan writing blockade provides one plausible explanation for an odd imbalance in artifacts that has long puzzled archaeologists: significant numbers of Indus seals and seal impressions have been found in the Gulf region and far into modern Iraq, but no Mesopotamian inscriptions have ever turned up at any Indus site (Tosi 1993; Parpola 1994; Possehl 2002b). Studies of foreign artifacts in the Indus Valley in general suggest that until shortly before the symbol system disappeared the civilization remained unusually well-insulated even from its nearest cultural neighbors. Suggestive parallels show up in the last half of the first millennium BCE in the resistance of Vedic priests to the literate encoding of their ritual traditions, and in Roman times to the rejection of writing by Celtic priests; it is interesting to speculate whether similar motives explain why writing was never adopted by the Harappans' neighbors in the Bactria Margiana Archaeological Complex (BMAC) to the northwest, which

C-23 a



M-288 a

Figure 12. The mythological side of Indus inscriptions has been badly obscured in standardized transcriptions that omit signs, transpose their positions, or linearize sign sequences to force-fit them to the Indus-script model. **Left:** Examples of these problems show up in detailed comparisons of photos of two inscriptions with the transcriptions in the standard concordance (Mahadevan 1977); similar problems turn up often in the secondary literature. In the inscription at the top, cf. especially the second row of the inscription with its transcription. It is worth noting that at least five and possibly six of the signs in **C-23 a**, many of them highly animistic, show up in more abstract form (and in a different order) in **M-314 a** (cf. **Fig. 3**). Evidence from many inscriptions links all of these signs to agricultural motifs.

arose from a sophisticated fusion of cultural elements from the Near East, Eastern Iran, and Central Asia (Francfort 1994).

Issues of social cohesion may also have been factors. Studies of loan words in the earliest strata of Vedic texts (Witzel 1999, 2003) suggest that just like northwest South Asia today, Indus territories may have been intensely multilinguistic, undermining over eight decades of heated debates over 'the' Indus language. In a giant multilinguistic society, a relatively simple system of religious-political signs that could be reinterpreted in any language may have provided greater opportunities for cultural cohesion than any language-based 'script' — as suggested in a different way in our own global age of highway and airport symbols. The adoption of such a system may even help explain why the Harappans apparently managed to expand over a wider geographical area than any literate civilization of the era (cf., e.g., Kenoyer 1998). The fact that Indus symbols were tied to a pan-Indus ideology of some type is suggested by the apparent suddenness with which the symbol system vanished early in the second millennium, which is not typical of the ways that fully enabled scripts disappear (Simpkins 1997; Houston, Baines, and Cooper 2003). One implication of this finding is that the Indus civilization may have enjoyed a higher level of political integration than typically assumed and that the disappearance of the symbols involved a sudden shift in the society's religious-political guard. Many questions remain concerning the nature of this shift, which was accompanied by the first large-scale appearance in the Indus Valley

Fig. 13. M-488 C, one face of a worn Indus ritual inscription of the type mass-produced in molds, in this case showing a shamanic-looking priest in a typical Indus sacrifice scene. Evidence suggests that the circled object on the stool behind the priest is a human head, recalling a similar outdoor sacrifice shown on the famous seal **M-1186** (on the latter, cf. Parpola 1994: 260; Kenoyer 1998: 119 and Fig. 6.1). The god in the tree altar on the right and the horned animal to the left of the tree (in many other inscriptions identifiable as having a human face) show up often in Indus sacrifice scenes. Further on possible human sacrifice in the Indus Valley, see n. 22 above.

of intrusive artifacts. Many of these can be suggestively linked to Central Asian iconography, but the significance of this finding, which was not accompanied by obvious signs of large-scale invasion, is not currently understood; internal rather than external forces may have been decisive in the sudden disappearance of the symbol system.

It should finally be noted that recognition that the Indus civilization was not literate helps explain a number of well-known features of the society that distinguish it sharply from third-millennium literate civilizations (D.P. Agrawal 2001, personal communication). A few of these include the lack of monumental architecture, large temples, massive standing armies, and clear evidence (besides the tantalizing suggestions in the inscriptions) of large-scale bureaucratic organization. The paradox remains that despite their lack of writing, and perhaps in part because of it, the Harappans exhibited a surprisingly high level of cultural unity over a vast area for centuries. One of the biggest challenges of future Indus research lies in discovering what role the symbols played in maintaining that cohesion and in possibly contributing to its decline.

Implications for studies of ancient writing and civilizations in general

The collapse of the Indus-script myth has implications that extend far beyond ancient India. Writing is still often considered a requirement of large-scale urban civilizations — as Possehl (2002a: 127) has recently expressed it, it is "as symptomatic of the size and complexity of ancient urban systems, be it the archaic state or a more corporate organization such as the Indus Civilization." The result is that the discovery of early traces of writing is often taken for a holy grail by the public, archaeologists, and the agencies that fund them. It is not a gross exaggeration to suggest that the first reaction of archaeologists who stumble on a cache of unknown symbols is to call in the press and announce the discovery of a new script, or in one alternate scenario the earliest traces of an old one. This story has played out repeatedly in the last half decade alone in respect to discoveries in Central Asia, Egypt, Sri Lanka, Europe, Central America, and most recently southeast Iran. Often the finds triggering these announcements consist of little more than a single seal or seal impression or a handful of ambiguous scratches on pottery sherds. In most cases, after a brief period of excitement, the claims quickly recede from the public eye, only to be replaced soon after by similar claims from some other cultural region.

These tendencies originated in the nineteenth century, when the links between writing and urbanization were repeatedly reinforced by finds from civilizations in the Mediterranean, Near East, and Mesoamerica. When the first large-scale excavations at Harappa and Mohenjo-daro turned up hundreds of inscriptions in the early 1920s, it was assumed from the start that the same relationship existed between writing and urban life in ancient India as in Egypt, Mesopotamia, and Elam. Hints in the extreme brevity of the inscriptions that something was amiss were brushed aside in favor of myths of 'lost' Indus manuscripts that went unchallenged for decades. Repeated claims of decipherment, aided by the many ambiguities in the ways that speech maps to texts, resulted in a long line of pseudo-decipherments that, while easily repudiated in detail, on a superficial level seemed plausible enough to reinforce the assumption that the inscriptions encoded speech, which had gone unquestioned since the 1870s. Once nationalistic politics were tossed in the mix, by the final decades of the twentieth century the Indus-script thesis had carved such deep path dependencies in studies of Indian history that it was difficult to observe let alone discuss the many obvious suggestions that Harappan civilization could not possibly have been literate.[29]

The fact that ancient civilizations could not only exist but flourish without writing has been known for decades, but the persistence of the Indus-script myth suggests that the full implications of that fact have not taken deep root in archaeological theory. Urban civilizations in the Near East predated writing by thousands of years, and when the technology became available it was adopted or rejected depending on how well it fulfilled specific cultural needs. Massive cities in Central Asia contemporary with those of the Harappans have been excavated that have not yielded credible traces of local writing, while cities in Eastern Iran at best suggest brief flirtations with restricted accounting scripts that originated far to the West. In South America, the giant Andean civilizations never developed writing, making due with abstract symbols and their mnemonic *khipu* system; similarly, in Mesoamerica, neither the Aztecs nor the Mixtecs ever developed full scripts, although they knew from the Maya that they existed. It has been argued that one reason why these vast Mexican civilizations, whose cities dwarfed those of the Indus Valley in size and sophistication, preferred 'picture writing' to fully equipped scripts arose from the fact that non-linguistic symbols enhanced social cohesion among their multilinguistic populations (Boone and Mignolo, 1994: e.g., 301) — much as we have hypothesized was true in the case of the radically different type of symbols developed by the Harappans.

Controversies over early writing can be expected far into the future. To the west of the Indus Valley, excavations began in 2003 of urban ruins around Jiroft on the southeast Iranian plateau. One of the most common claims of its excavators (cf. Lawler 2003, 2004) is that evidence from seal impressions suggests that those sites may contain the earliest writing known. The results of our research suggest that claims like these in the future should be viewed with far deeper skepticism than they have received in the past. Writing was not a necessity of ancient urban civilizations, not even those as massive as that of the Harappans or as apparently rich as the one being excavated on the Iranian plateau. The collapse of the Indus-script thesis suggests that the

[29] The ways in which even the most obvious evidence of this type has been ignored since Marshall's day make the Indus-script myth a useful case study of the ways that path dependencies take shape in cultural traditions in general. For an overview of this theoretical concept, which first emerged in economic theory, see Arthur 1999; for a discussion of path dependencies in traditional religious, philosophical, and cosmological thought, see Farmer, Henderson, and Witzel 2002.

discovery of a handful of unknown symbols can no longer be claimed as evidence of 'writing' — indeed, not even finds of 4-5,000 short inscriptions may be enough. The fact that the Harappans did not possess writing and may have even actively rejected it suggests that ancient urban civilizations may have been considerably more diverse than suspected in the past.

A Note on Falsifiability

It will probably surprise many readers to discover that the standard view that the Indus civilization was literate has been an assumption and not a conclusion of previous studies. While debate over the language of Indus inscriptions has had a long and acrimonious history, not one of the thousands of articles or books written on the topic since the 1870s included any systematic justification for the belief that the inscriptions were in fact linguistic.

The claim that historical fields follow methods different from those of other sciences is still frequently repeated. Given the political abuses to which history is subject, we consider this to be a dangerous claim, and believe that the same rigor must be demanded in history as in any other scientific field. With this in mind, in closing we would like to acknowledge the heuristic nature of our work and briefly consider some conceivable conditions under which it might be overturned.

Specifically, we would consider that our model of Indus symbols was falsified, or at least subject to serious modification, if any of the following conditions were fulfilled:

1. If remnants were discovered of an Indus inscription on any medium, even if imperfectly preserved, that contained clear evidence that the original contained several hundred signs;
2. If any Indus inscription carrying at least 50 symbols were found that contained unambiguous evidence of the random-looking types of sign duplications typical of ancient scripts;
3. If any bilingual inscription were discovered that carried a minimum of 30 or so Indus symbols juxtaposed with a comparable number of signs in a previously deciphered script;
4. If a clear set of rules were published that allowed any researcher, besides the original proposer of those rules, to decipher a significantly large body of Indus inscriptions using phonetic, syntactic, and semantic principles of no greater number or complexity than those needed to interpret already deciphered scripts;
5. If a 'lexical list' were discovered that arranged a significantly large number of Indus signs in ways similar to those found in Near Eastern school texts.

Due to the long record of doctored evidence and forgery that is part of the Indus-script story (cf., e.g., Witzel and Farmer 2000, Farmer 2003), any discoveries of this type would have to be accepted by a broad consensus of Indus researchers before we would consider our model to be falsified or subject to major modification.

We would like to conclude that while we consider it highly improbable that any of these five discoveries will ever be made, we would welcome them if they were, since when considered alongside the many anomalies in the Indus symbol system, any of those discoveries would necessarily trigger a radical rethinking of current views of early writing systems.

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