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Article

THE INDUS SCRIPT: Recognition as an Alphabet

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Abstract: This paper introduces a ground-breaking approach to deciphering the Indus script, employed by the Indus Valley Civilization (IVC) from c. 3300 to 1900 BCE. Moving beyond previous methods, my research delves into the intricate structure of the script's signs, aiming to definitively settle the debate regarding its categorization. Specifically, I investigate whether the Indus script functions as an alphabet, presenting compelling evidence for the number of primary signs it comprises. My methodology meticulously examines over 400 signs, encompassing the entire corpus rather than relying on limited samples. This holistic approach utilizes a novel grid-based decomposition technique to visually dissect compound signs, identify diacritics with consistent usage patterns, and uncover the underlying principles of sign extraction. Through this rigorous analysis, I successfully isolate the essential primary signs and illuminate their potential phonetic representations within an alphabetic system. However, I acknowledge the intricate variations in writing styles present across the Indus corpus. These stylistic subtleties, encompassing formation, composition, and combination strategies, contribute to the apparent plurality of signs. Nonetheless, my findings reveal a core set of only 40 fundamental signs, suggesting a remarkably concise system beneath the surface complexity. By presenting this new paradigm for understanding the Indus script, I pave the way for further advances in its decipherment. Continued exploration of the identified core signs and their phonetic associations holds immense potential for unlocking the linguistic insights encoded within this enigmatic script, shedding light on a crucial chapter in human history.

Keywords: Indus script; ancient scripts; undeciphered scripts; Indus alphabet; classification of Indus signs; archaic alphabetic scripts

Introduction

Why and How Is the Indus Script an Alphabet?

By decomposing compound signs, modifiers, and potential diacritical marks, we can isolate single basic signs from ligatures. This process allows us to identify the actual number of primary or basic signs, providing reasonable evidence supporting an alphabetic system.

Determining the accurate number of primary signs in the Indus script has long been a challenge, yet it is crucial for unlocking a deeper understanding of this ancient writing system. A significant aspect of this research involves decomposing signs to identify and isolate fundamental or primary signs, enabling us to examine how their combinations result in new designs or formats.

In a study conducted by Yadav et al. (2010), Indus signs were categorized into basic signs (154), provisional basic signs (10), and modifiers (21). Wells, in his extensive collection, classifies signs into different categories: simple signs totaling 127, complex signs totaling 175, compound signs totaling 135, and 146 signs marked with additional markings, along with 18 sets of markings (Wells, 1998). Conversely, Mahadevan categorizes the signs into ideograms, phonograms, conventional signs, numeral signs, and phonetic signs (Mahadevan, 1989), while Fairservis categorizes them into different groups: some from ancient origins, some from local origins, compounds derived from the same local origin, and rare affixes (Fairservis, 1992). Rao's conclusion suggests the existence of only 62 signs and proposes the evolution of graphic variants, a perspective not shared by Mahadevan

(Rao, 1982). The varying concepts of what constitutes a basic sign have led to different counts of Indus basic signs by different scholars, but this particular study identifies only 40 basic signs.

In the Indus writing system, primary or fundamental signs are commonly and independently utilized, while the remaining signs are compounds that can be broken down based on the typology of their allographs. Typically, compound signs consist of two or three composite signs, although some instances may be considered illegible. By decomposing these compound signs, a significant number of primary signs or basic phonemes can be identified. This observation supports the notion of considering the Indus writing system as alphabetic.

Methodology

The process of isolating basic signs involves using a grid structural methodology to visually recognize and separate individual components within compound structures. This approach allows us to identify and distinguish basic signs from complex ligatures. By employing visual recognition techniques, we can isolate modifiers, diacritic marks, and composite signs within the modified signs, enabling analysis of their specific characteristics and contributions to the overall allography. Decomposing these elements provides insights into their function, phonetic value, reading, and meaning, enhancing our understanding of the Indus script’s writing styles and complexity. Further details on isolating basic signs are provided in the following section.

The Grid Structural Methodology categorizes
The Primary Or Basic Sign

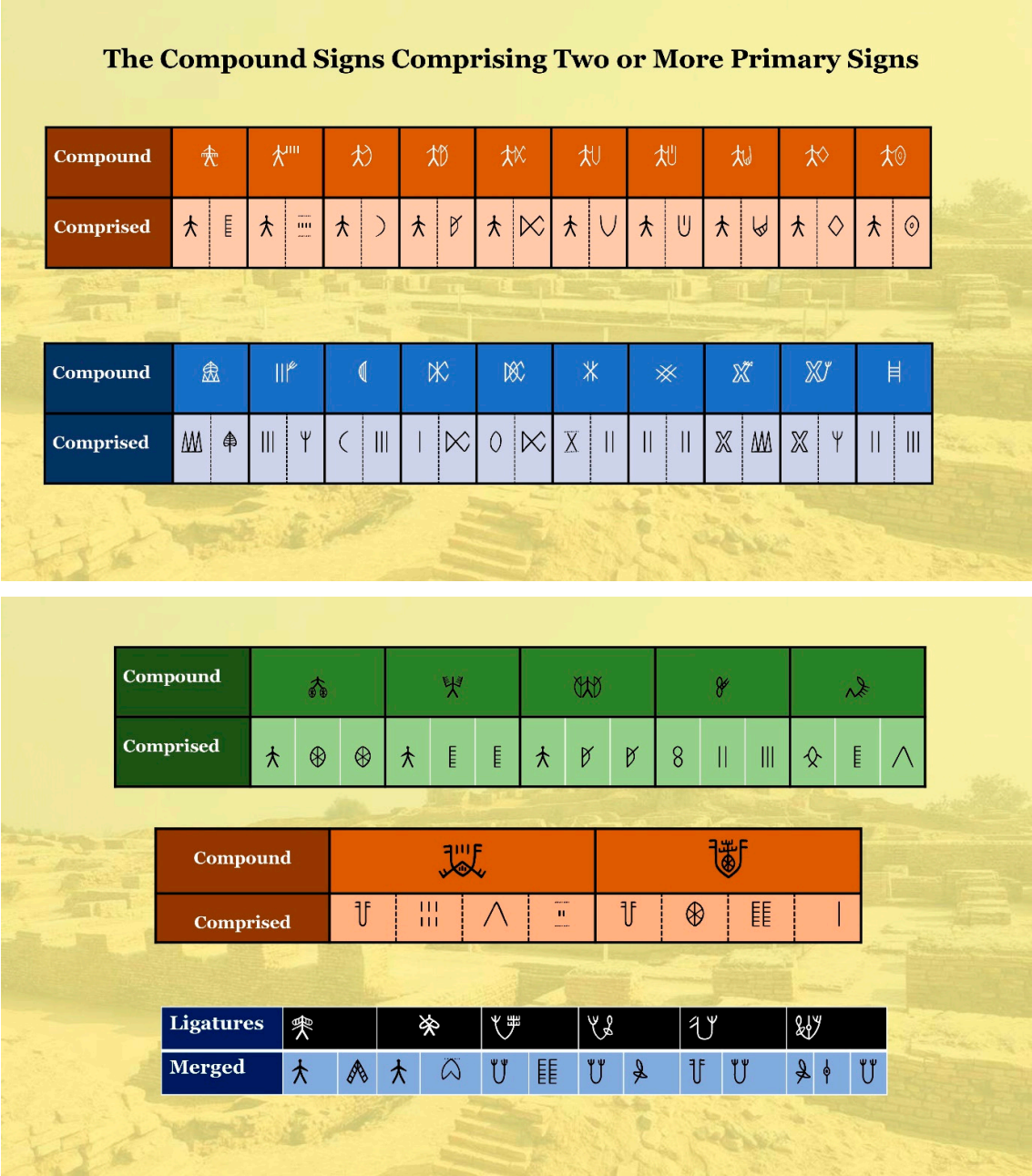
Modified composite signs	Decomposition of the modifiers from Modified Sign	Independent signs status of the compound signs according to concordance	Decomposition of the compound signs
𑀓𑀭 P-250	𑀓 𑀭	𑀓 P-249	𑀓 P-245 + 𑀭 P-129
𑀓𑀭𑀓 P-251	𑀓𑀭 P-173	𑀓 P-249	𑀓 P-245 + 𑀭 P-129
𑀓𑀭 P-252	𑀓𑀭	𑀓 P-249	𑀓 P-245 + 𑀭 P-129

Compositing Primary Signs in Compound Signs (Ligatures)

Currently, 90 compound signs have been identified, though this count may increase with further research. These compound signs are formed by combining two or more basic or primary signs into composite forms. The process of compositing involves merging individual phonemes to create a unified unit. Ligatures serve various purposes, such as enhancing aesthetics, improving readability, and efficiently representing frequently occurring combinations of allographs.

Within the compound signs, compositing brings together phonemes, the smallest meaningful units in the Indus writing system. This amalgamation can take different forms, such as merging allographic shapes or combining constituent parts. By integrating these components, compound signs establish a harmonious connection between the allographic variations of basic phonemes, resulting in a visually cohesive written representation. Notably, the process of combining elements within the Indus script has resulted in approximately 400 signs, many undergoing modifications similar to those observed in Brahmi (Kak, 1994).

The decomposition of compound signs has been conducted meticulously. It is crucial to recognize that compound signs should not be viewed as merely compressed versions of individual basic signs in the Indus texts. This is due to the infrequent occurrence of constituent basic signs appearing as sign sequences. Even when components of a compound sign do appear in certain combinations, the context of their use differs significantly (Yadav et al., 2010). Through careful observation and examination, the basic or primary signs have been isolated and identified.



(FIG- 06) These signs are discussed well in the topic logographic sign Pati. (Muhammad, 2023)

1. (P-01)	2. (P-03)	3. (P-04)	4. (P-05)
------------	------------	------------	------------

Excluding the sign P-05 that has used only one time in the texts, the usage of the rest three signs with the same signs indicates the possibility of having the same value despite having some allographic variation:

2076 (00) 𑀓𑀔 4479 (10) 𑀓𑀔 8013 (00) 𑀓𑀔 1045 (00) 𑀓𑀔

2371 (00) 𑀓𑀔 6209 (00) 𑀓𑀔 6225 (00) 𑀓𑀔 4029 (00) 𑀓𑀔

Three Permanent Modifiers

Examination of the Indus Writing System reveals a system of three distinct modifiers employed with base signs. These modifiers demonstrably alter the phonetic value associated with a base sign, expanding the inventory of phonemic distinctions. Each modifier exhibits consistent application patterns, yet these patterns vary across different base signs, influencing the resulting allographic form. This observation suggests a structured approach to sign modification within the system.

THREE PERMANENT MODIFIERS

The alphabet applies to all characters

Modifiers Vary the graphematic allography in some cases

The wedge Symbol

𑀓 P-200

Horizontal and Vertical Lining or Shedding


𑀓𑀓𑀓𑀓 𑀓𑀓

Equal Or Inclined Signs		
W-02	W-12	W-14
𑀓 𑀓	𑀓𑀓	𑀓 𑀓
𑀓 𑀓	𑀓𑀓	𑀓 𑀓















The Wedge Type Sign















The frequent presence of a distinctive “wedge” sign merits further investigation. While limited to only nineteen characters, it exhibits consistent usage across diverse base signs, defying a strict applying rule. This suggests a potential role in modifying phonetic values across the alphabet. The wedge sign primarily associates with the main sign, typically positioned at the top (e.g., 𑀓𑀓𑀓𑀓𑀓𑀓). However, variations exist based on the underlying sign’s design (e.g., 𑀓𑀓𑀓𑀓𑀓𑀓𑀓).

The wedge Symbol





 P-200








How it is applied to primary signs

Primary Sign							
Modified							

Primary Sign							
Modified							

Double Horizontal and Quadruple Diagonal Modifiers

The usage of two equal signs or the double use of the sign P-127 as a modifier can be observed with signs P-(74, 172, 311, and 288). Furthermore, there are four inclined stroke signs that may function as modifiers and can be seen in association with 18 different basic, modify the combined or two independent single signs, such as the sign , ,  and  . Upon careful analysis, it becomes apparent that the inscriber or engraver occasionally attempted to combine both the two equal signs and the four inclined strokes into a double inclined modifier sign. For instance, the sign P-172 was merged into P-157, albeit with one stroke missing. This practice can also be observed in other signs, including P-92 or P-351. It appears that the two equal signs modify the value, while the inclined signs may serve different functions, as indicated by their simultaneous usage on the two basic signs. These observations suggest that such modifications do not necessarily alter the significance or value of the individual primary signs.

The independent form of the inclined sign can be represented by the signs W-14 and M-105, while its singular form is denoted by W-12 and M-101. The application of the two equal signs as a modifier appears to be a common practice to modify the primary sign, as seen in the example    . However, when attempting to use both the equal signs and inclined signs simultaneously, the engraver deviates from the typical implied approach of the sign, resulting in variations such as     . Nonetheless, the general concept of the design is maintained.

Equal Short Strokes or Signs:

W-02	W-12	W-14
= =		" "
		" "

The middle four short strokes are applied to both primary and compound signs, even when they do not function as modifiers; their application is consistent across all instances.

Primary Sign				
Modified				

Modified Signs										
----------------	--	--	--	--	--	--	--	--	--	--

Primary Sign							
Modified							

The Horizontal and Vertical Lining or Shedding

The observational analysis of the basic signs suggests that both shedding techniques may serve different functions in terms of adding phonetic variations. However, it is important to note that this discussion is not directly relevant to the purpose of classification or decomposition. As a result, the signs with both horizontal and vertical elements are presented together in the same table, regardless of their potential phonetic differences. IIII or ≡ : The vertical and horizontal shedding may have different functions as according to the general behavior in the usage in the texts but sometimes the engraver drops the strictness; ? ?

Horizontal and Vertical Lining or Shedding

Applying way to primary signs

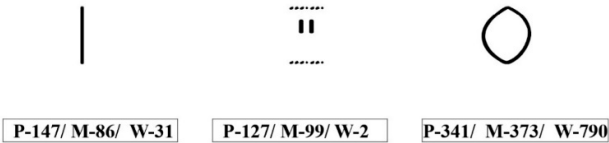
Primary Sign										
Modified										

Indus Script Vowel System: Diacritics and Primary Signs

Analysis reveals eight distinct diacritics potentially influencing the vocalic repertoire of the Indus script. These diacritics likely served a phonemic function, similar to vowel markings used in

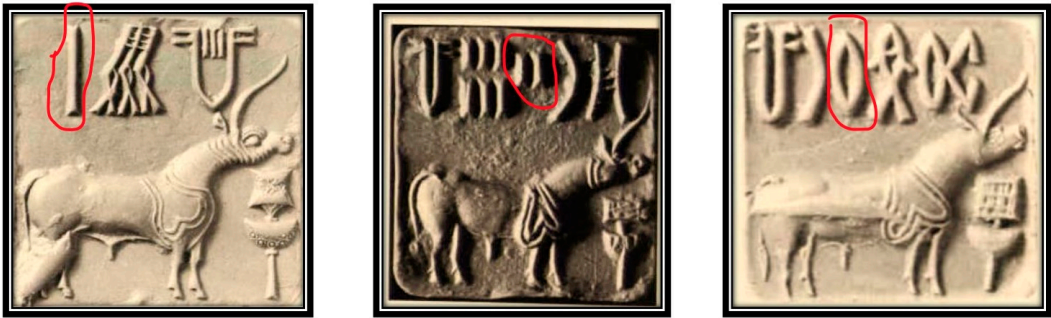
various ancient and modern writing systems. Additionally, the script appears to possess three distinct primary signs potentially representing the vowel “a.” The identification of these signs is based on their resemblance to known vowel markers from other writing systems.

The three unique representations of the 'a' vowel



Dual Functionality of Indus Vowel Signs

The Indus script’s vowel signs exhibit remarkable versatility. Beyond functioning as independent phonetic entities.



These symbols also possess the ability to modify the phonetic values of other primary signs, or graphemes. This suggests a potentially complex interplay between vowels and consonants within the writing system.

P-147

|

The adorned signs, embellished with diacritical mark

Primary Sign	𑀩	𑀪	𑀫	𑀬	𑀭	𑀮	𑀯	𑀰	𑀱	𑀲	𑀳	𑀴	𑀵	𑀶	𑀷
Applied Diacritics	𑀸	𑀹	𑀺	𑀻	𑀼	𑀽	𑀾	𑀿	𑁀	𑁁	𑁂	𑁃	𑁄	𑁅	𑁆

P-127

π

The adorned signs, embellished with diacritical mark

Primary Sign	𑀓	𑀔	𑀕	𑀖	𑀗	𑀘	𑀙	𑀚
Applied Diacritics	𑀓𑀔	𑀓𑀕	𑀓𑀖	𑀓𑀗	𑀓𑀘	𑀓𑀙	𑀓𑀚	𑀓𑀛

P-341

0

The adorned signs, embellished with diacritical mark

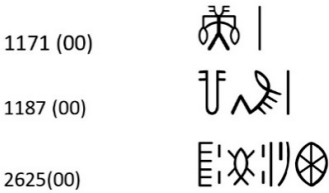
Primary Sign	𑀓𑀔	𑀓𑀕	𑀓𑀖	𑀓𑀗	𑀓𑀘	𑀓𑀙
Applied Diacritics	𑀓𑀔𑀕	𑀓𑀕𑀖	𑀓𑀖𑀗	𑀓𑀗𑀘	𑀓𑀘𑀙	𑀓𑀙𑀚

Beyond three core vowel signs, the Indus script employs a consistent repertoire of diacritics modifying both vowels and consonant graphemes, suggesting a rich vocalic system.

THE DIACRITICAL MARKS								
Assigned Number in the sign list	P-128	P-127	P-147	Supposed	Supposed	P-341	P-129 P-175 P-173	Supposed
INDUS SIGN	𑀓	π		𑀓	/	0	𑀓 𑀔 𑀕	𑀓

From the diacritical marks list, the signs P-128-129-175-173 are also used as independent graphemic characters. Supposed signs are implied as a modifier but not used as independent graphemes.

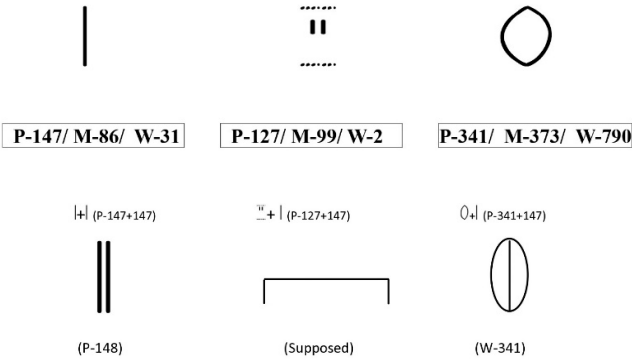
The sign P-147/M-86/W-31 has been used independently, indicating its separate value as a vowel.



and consistently modifying other consonantal graphemes as well

Serial No:	Indus Sign	Basic sign with Diacritical Mark	NFM Unicode PUA	M-1977	W-2015	P-2010
1.			E09-9	25	142	33
2.			E0D-F	185	--	52
3.			E22-2	170	950	99
4.			E22-3	256	611	100
5.			E22-A	171†	415	101
5.			E23-4	173†	416	104
7.			E22-E	172	417	102
8.			E26-1	177†	413	108
9.			E2A-C	326†	384	118
10.			E32-E	93	--	154
11.		ICIT 490	E3A-2	209	500	190
12.			E3A-7	--	--	191
13.			E4D-F	--	647	256
14.			E53-F	--	511	276
15.			E67-E	409	171	334
16.			E70-E	275	868	379

The only sign P-148, with its two vertical line strokes appearing very closely aligned, maybe a self-modification of the aforementioned vowel sign. However, it resembles the other sign P-129, only with the difference of space and therefore, this form does not appear frequently in usage. However, the use of the sign P-147 as a modifier with the other two primary vowel signs P-127 and 341 is evident.



The supposed sign (not included as an independent sign in the Indus Sign lists) is not found in a separate single form but only as a modifier in compound signs.

	P-103
	P-141
	P-193
	P-242
	P-247

The vowel diacritical mark P-127 in the Indus Script exhibits the following allographic variations, with the last one being a dual form.

P-127/ M-99/ W-2	P-?/ M-101/ W-12	P-?/ M-105/ W-14

These three variations have been used as single independent graphemes and possess distinct phonetic values in the Indus Texts.

2645(00)	
1903(00)	
2567(00)	

In its simple modification form, it has been mostly used at the left top of the other primary signs or graphemes.



However, in many cases, when applied to the primary signs or other consonantal graphemes, it alters the allographic shape of the primary sign or grapheme. The first (P-127) and second (M-101/W-12) variations of the two vertical short strokes have been applied according to the allographic formation of the sign. Sometimes, the variation forms extend, but the engraver seems to be attempting to maintain the allographic basics.

Serial No:	Indus Sign	Basic sign with Diacritical Mark π	NFM Unicode PUA	M-1977	W-2015	P-2010
1.	𑀩	𑀩	E04-B	8†	100	7
1.	𑀪	𑀪	E54-6	254†	527	54
1.	𑀫	𑀫	--	--	597	--
1.	𑀬	𑀬	E21-D	174	364	97
1.	𑀭	𑀭	E27-3	397	371	114
1.	𑀮	𑀮	E54-2	253†	510	276
1.	𑀯	𑀯	--	--	525	--
1.	𑀰	𑀰	E5B-1	329	702	297
1.	𑀱	𑀱	E62-E	344	740	313
1.	𑀲	𑀲	E40-0	130†	435	204
1.	𑀳	𑀳	E35-B	--	465	202
1.	𑀴	𑀴	--	--	646	--

The third allographic variation of the sign (M-105, W-14), which consists of four short vertical strokes or two equal marks, functions as a singular form that modifies the other base signs.

Serial No:	Indus Sign	Basic Sign without Diacritical Mark = =	NFM Unicode PUA	M-1977	W-2015	P-2010
1			E13-7	74†	228	74
2			E57-7	194†	585	288
3			E61-6	342†	740	311

Serial No:	Indus Sign	Basic sign without Diacritical Mark " "	NFM Unicode PUA	M-1977	W-2015	P-2010
1			E09-D	26	144	34
2			E10-C	60†	226	61
3			E10-D	61	944	62
4			E11-6	71	232	67
5			E11-C	73†	234	69
6			E12-6	66	236	71
7			E13-4	68†	241	73
8			E27-6	377...?	646	115
9			E32-0	88	--	149
10			E36-1	292†	910	172
11			E3C-8	207	506	194
12			E49-0	220	562	230
13			E55-C	250	592	279
14			E68-8	404	--	338
15			E6B-E	288	804	355
16			E6E-B	392	945	369

If we consider the concept of modification for the below-mentioned signs, it appears that both singular and dual forms are in practice.

P-4b	W-591

Then, we can perceive the same sense of modification for the third allographic variation of the sign (M-105/W-14) in the same way as a dual form.

Serial No:	Indus Sign	Basic Sign with Diacritical Mark " "	NFM Unicode PUA	M-1977	W-2015	P-2010
1			E20-1	164	393	92
2			E33-D	--	926	157
3			E33-E	289†	--	157
4			E36-1	292†	910	172
5			E39-5	308	895	188
6			E3F-C	179	466	203
7			E4C-9	140	680	246
8			E4D-1	143†	689	250
9			E6A-D	264†	853	351
10			E6E-0	384	823	365



P-147/ M-86/ W-31

P-127/ M-99/ W-2

P-341/ M-373/ W-790















Similarly, these sign variations modify the basic vowels.

	P-127-147		W-14		W-829
	P-204				W-830
	W-42				W-835


Among the three basic vowel signs, the third one (P-341/M-373/W-790) is also used as an independent grapheme with a separate phonetic value.

5265 (00)	
4379 (00)	
4099 (00)	

At the same time, it modifies the other consonantal signs or graphemes. However, its implementation is clear, but generally, it alters the shape of the primary signs as compound signs.

Serial No:	Indus Sign	Basic sign without Diacritical Mark	NFM Unicode PUA	M-1977	W-2015	P-2010
1		 any bird	E14-F	82	952	78
2			E6B-2	387	803	354
3			E6C-5	385	811	358
4			E6C-B	148	809	360
5			E6C-C?	813	361
6		ICIT 620 and 	E6D-6?	816	363
7			E6D-D	379+	831	364

In Wells’s sign collection, another form of modification is found.

	W-793
--	--------------

when it modifies the other basic vowel primary signs;





P-147/ M-86/ W-31




P-127/ M-99/ W-2

P-341/ M-373/ W-790

its allographic forms are;

	W-837
	W-829
8	W-200/P-342


























The short stroke sign P-128, M-97, and W-1 exhibits minor variations in size and placement within the text. It is also considered a vowel grapheme, being used independently as a separate character with its own distinct phonetic value.

1424	(00)	
2213	(00)	
1061	(00)	

In its simple form, this sign modifies the phonetic value of other graphemes. It is predominantly used at the left top of other primary signs or graphemes, similar to the usage of the sign P-127.



Simultaneously to the vowel sign P-127, when applied to primary signs or other consonantal graphemes, it alters the allographic shape. The vertical short stroke is applied in accordance with the allographic formation of the sign.

Serial No:	Indus Sign	Basic sign with Diacritical Mark 	NFM Unicode PUA	M-1977	W-2015	P-2010
1			E08-5	18	95	23
2			E11-5	70†	231	66
3		--	E29-4	325	382	117
4			E2F-4	112†	17	134
5			E35-D	302†	252	171
6			E3C-B	--	--	196
7			E4A-7	214†?	542	235
8			E4D-8	158†	--	254
9			E56-6	127†	440	283
10			E62-7	342†	741	312
11			E65-F	350	764	321
12			E6C-4	375†	832	358
13			E71-A	277†	--	381



P-147/ M-86/ W-31 P-127/ M-99/ W-2 P-341/ M-373/ W-790

Similarly, it modifies the basic vowel signs;

P-283/ M-127/ W-440	P-358/ M-375/ W-832	P-143/ M-103/ W-13

There is no example yet of the slanted short-stroke diacritical mark being used independently as a sign or grapheme in the Indus script. However, it may have a separate phonetic value, it is used only as a modifier mark, consistently modifying the consonantal graphemes or primary signs.

Serial No:	Indus Sign	Basic sign with slanty Diacritical Mark /	NFM Unicode PUA	M-1977	W-2015	P-2010
1			E06-3	7	98	10
2			E07-B	40†	137	19
3			E26-4	213†	92	109
4			E0F-1	255	363	55
5			E11-A	72†	233	68
6			E34-0	288	901	159
7			E34-1	--	922	163
8		ICIT 490	E3C-2	205†	491	192
9			E3E-C	129	66	201
10			E44-5	124†	61	216
11			E48-1	222	555	226
12		ICIT 620	E50-B	242	621	270
13			E56-E	128†	444	284
14			E58-E	186†....?	315	292
15			E60-7	191	329	308
16			E6A-4	263	849	347

At the same time, it is applied to the three basic vowel signs and graphemes in the same manner.



P-147/ M-86/ W-31 P-127/ M-99/ W-2 P-341/ M-373/ W-790

P-216/ M-124/ W-61	P-00/ M-00 / W-828	P-00 / M-00 / W-68

For additional vowel sounds, two crossed-slanted strokes are added to the primary sign P-147 to create a new vowel grapheme. These vowel graphemes also modify the consonantal graphemes or signs.

$$\begin{matrix} | + X = \text{X} & \text{or} & \text{X} \\ \text{(P-147)} & & \text{(P-219)} & & \text{(P-225)} \end{matrix}$$

$$\begin{matrix} \text{A} + \text{X} = \text{AX} & \text{E} + \text{X} = \text{EX} & \text{I} + \text{X} = \text{IX} & \text{X} + \text{X} = \text{XX} \end{matrix}$$

$$\text{P-13+225=40} / \text{P-217+225=218} / \text{P-150+225=231} / \text{P-245+219=240}$$

At the same time, it is applied to the three basic vowel signs and graphemes in the same manner.

		--
P-228/ M-221/ W-556	P-229/ M-219/ W-561	--

Similarly, two short strokes added to the primary vowel sign P-341 create a new vowel grapheme. This is the only example found of its application, following the same concept of modification as the previous example.

$$\text{O} + \text{''} = \text{O''} & \text{or} & \text{O''}$$

[P-341+127=88]






























$$\text{I} + \text{O} + \text{Strokes} = \text{IO} & \text{as in} & \text{O''}$$







[P-150+358+St=89]

Indus Script Vowel System: Consistent and Systematic

The Indus script exhibits a remarkably systematic approach to vowel representation. Basic vowel graphemes, whether used independently or combined, demonstrate consistent application. This uniformity facilitates the identification of potential vowels and diphthongs. Furthermore, the consistent use of these graphemes suggests a well-defined system for encoding phonetic elements, crucial for deciphering the script's underlying language.





Modifiers						
Basic Vowel Signs	31	2	790	1	—	550
	 32	 435	 837	 440	 61	 556
	 —	 14	 829	 13	 68	 —
	 837	 829	 200	 832	 828	 561
a	aa	aa	aa	u	i	aii

Note: All these assigned numbers are from Well’s signs collection
Other possible variations of the vowel signs include different orientations, positions, or additional diacritic marks that modify their phonetic values.





					
P-201	P-202	P-222	P-330	P-332	P-350

Indus Script Diacritics: Possible Semi-Vowels

Diacritics positioned on primary signs in the Indus script exhibit unique behavior compared to other composite signs. They seem to act as semi-vowels, modifying the primary sign’s pronunciation without full integration. This suggests a distinct phonetic role, potentially indicating the presence of semi-vowel sounds within the writing system.





			
P-129	P-173	P-175	P-175

These diacritical marks have been utilized on the sides of primary signs.


			
P-15	P-174	P-8	P-8

Mahadevan and Parpola accepted the variation of the sign P-175 as identical and assigned them the same number in their respective sign lists.

However, after meticulous observation, it can be noted that signs P-129 and P-173, as well as modifying signs in P-140, can also be categorized similar based on these variations.

			
P-273	P-273	P-174	P-140

For further clarification, let's consider an example from the texts.

4329(10)	
4306(10)	
1711(10)	
1902(00)	

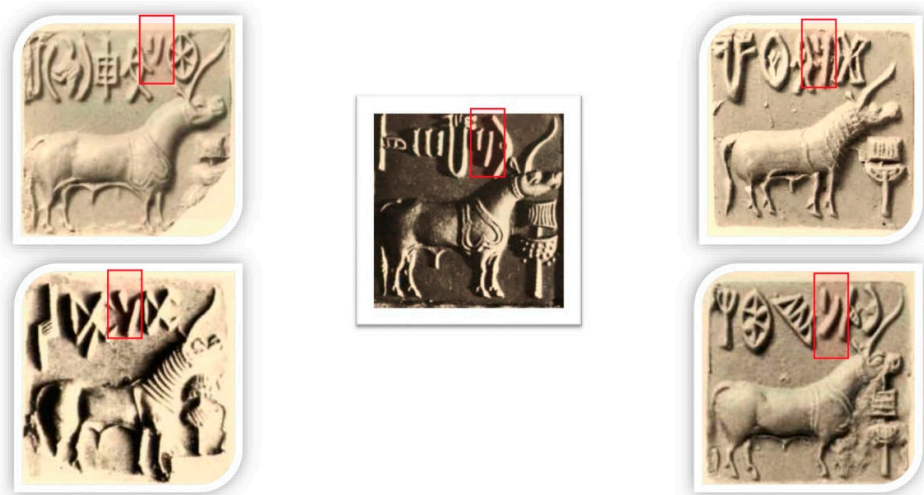
These allographic variations of the sign P-129 have all been used in the same manner with other consonantal graphemes.

Serial No:	Indus Sign	Basic sign without Diacritical Mark ll, 𐀀 or 𐀁	NFM Unicode PUA	M-1977	W-2015	P-2010
1	𐀀𐀁 𐀀𐀁	𐀀	E04-F	9†	103	8
2	𐀀𐀁	𐀀	E07-2	2†	97	15
3	𐀀𐀁	𐀀	E07-7	2†	--	18
4	𐀀𐀁	𐀀	E09-E	2†	143	35
5	𐀀𐀁	𐀀	E0F-B	85	281	57
6	𐀀𐀁 𐀀𐀁	𐀀	E10-E	62	222	63
7	𐀀𐀁	𐀀	E11-0	64	940	64
8	𐀀𐀁	𐀀	E11-3	63	--	65
9	𐀀𐀁	𐀀	E14-3	81†	269	77
10	𐀀𐀁	𐀀	E26-E	401	375	110
11	𐀀𐀁	𐀀	E2B-6	156	75	121
12	𐀀𐀁	𐀀	E30-0	113	48	140
13	𐀀𐀁	𐀀	E31-9	122	57	146
14	𐀀𐀁	𐀀	E36-6	244†	907	174
15	𐀀𐀁	𐀀	E53-5/E53-2	244†	632	273
16	𐀀𐀁	𐀀	E6A-1	416	217	345
17	𐀀𐀁	𐀀	E72-3	--	223	b-1
18	𐀀𐀁	𐀀	E72-4	291	412	b-2
19	𐀀𐀁	𐀀	E59-3	202†	360	50
20	𐀀𐀁	𐀀	E72-6	--	577	b-4
21	𐀀𐀁	𐀀	E13-9	83	244	75
22	𐀀𐀁	𐀀	E1D-4	57†	209	90
23	𐀀𐀁	𐀀	E4E-A	149†	690	260
24	𐀀𐀁	𐀀	E4E-E	149†	--	260
25	𐀀𐀁	𐀀	E4D-3	144	688	251
26	𐀀𐀁	𐀀	E4A-3	214†	540	234
27	𐀀𐀁	𐀀	E68-1	--	170	336


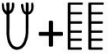





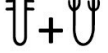

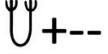
There is another semi-form of the previous sign P-129, used only on the left side of the primary sign.

Serial No:	Indus Sign	Basic sign without Diacritical Mark	NFM Unicode PUA	M-1977	W-2015	P-2010
1			E0D-7	183	321	49
2			E18-9	52	256	84
3			E50-5	--	--	267
4			E65-E	349	765	320
5			E69-D	413	203	343
6			E6F-2	248	627	372
7	--		--	246	616	--

The sign P-126, which is consistently used at the left top of the primary sign, likely functions as a diacritical mark. It also appears to be the semi-form of the sign P-129, with a similar usage but in a different manner.



There are examples of merged signs whose combining process differs from that of traditional compound signs. Therefore, the sign P-319 may have a semi-vowel value.

Serial No:	Indus Sign	Composited signs	NFM Unicode PUA	M-1977	W-2015	P-2010
1			E23-D	348†	772	105
2			E27-0	351	767	112
3			E27-1	372	768	113
4			E64-6	352	750	318
5			E66-4	--	766	325

The Graphemes Adhere to a Systematic and Uniform Process

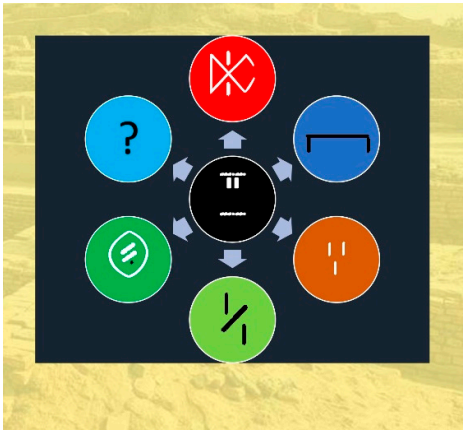
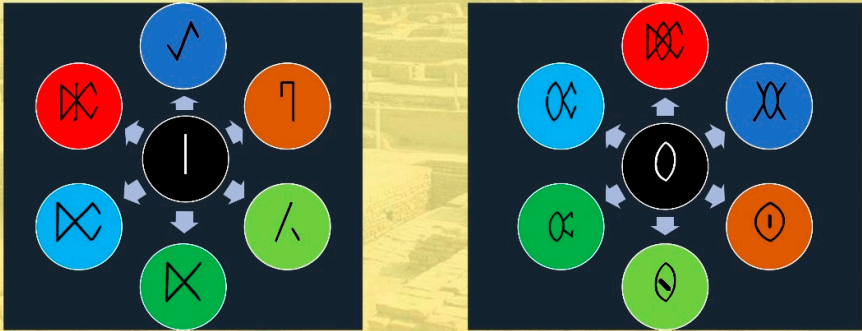
To gain a more comprehensive understanding of primary signs and thoroughly analyze their behavior, it is crucial to focus on potential vowel diacritical marks and principal modifiers. These elements are commonly used in conjunction with multiple signs. While many diacritical marks and the wedge symbol modifier can also be employed independently with the signs, their combined usage introduces variations in allographic position and modifies the sign in distinct allograph and graphic variants.

Likewise, the combination of two or three composite signs results in different sign variants, highlighting the distinct writing styles, that emerges through their arrangement. By studying these variations and combinations, we can delve deeper into the Indus writing system, gaining insights into its complexity and the nuanced ways in which it can be expressed. When examining the primary signs, excluding compound signs, we observe a consistent pattern in their modification, leading to the creation of new graphemes. The process of altering the allography of the fundamental signs is evident, resulting in the formation of different phonemes within the same class. The following section provides a detailed exploration of the variations in the allographic design of the primary signs.

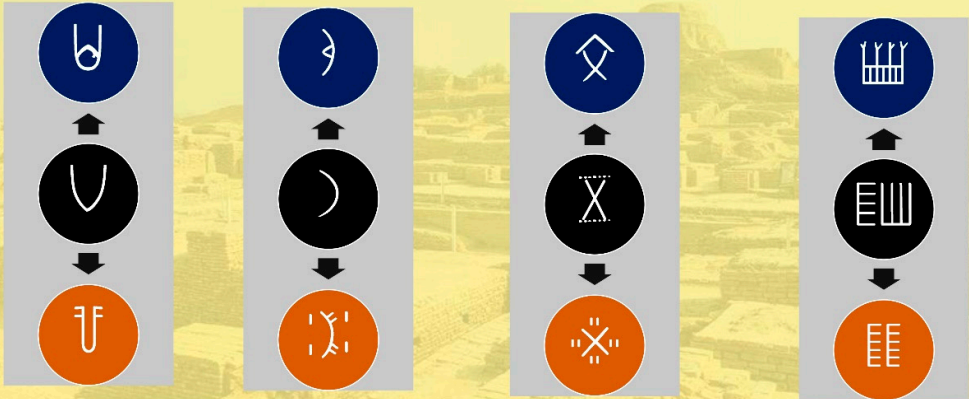
The Diacritical Marks Create New Vowel and Diphthong Graphemes

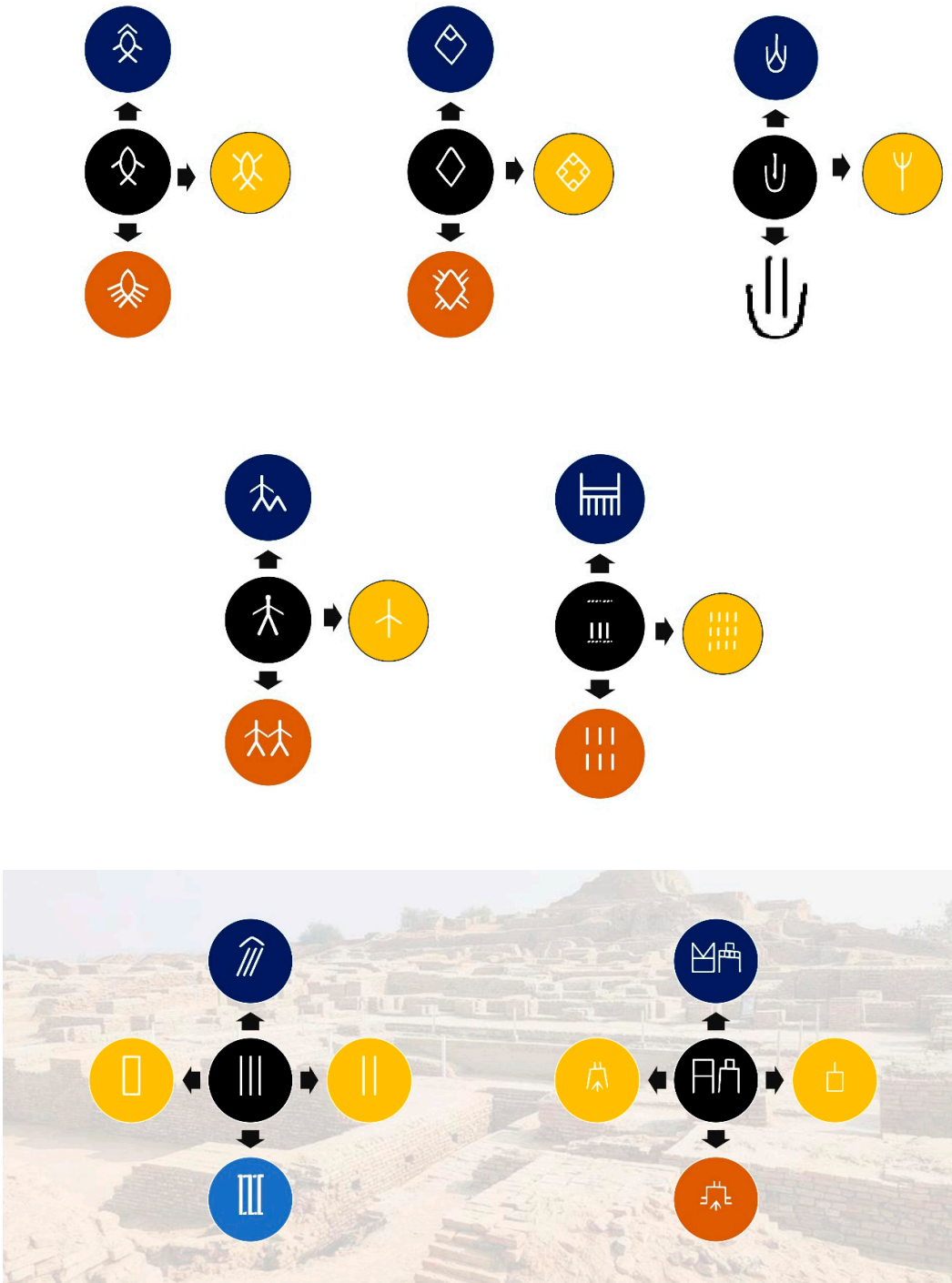
**THE GRAPHEMS ADHERE TO A SYSTEMATIC AND
UNIFORM PROCESS**

The diacritical marks create new vowel and
diphthong graphemes































































The Modifiers create New Consonant Graphemes



















The Perception of Identical Signs: Examining Engraving Style Variation

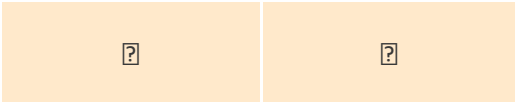
This paper investigates the potential for seemingly distinct signs to represent the same underlying symbol within a particular writing system. While Parpola assigns separate identity numbers to the signs in question, this analysis suggests a reinterpretation. The observed variations appear to be minor and attributable to stylistic choices made by the engraver. These stylistic deviations may reflect the engraver’s artistic expression or inherent variability within the writing system itself. Further investigation into the context and frequency of these variations is necessary to definitively determine if they represent distinct signs or stylistic flourishes.

THE IDENTICAL SIGNS BASED ON ALLOGRAPHIC VARIETY OF ENGRAVING STYLE					
 (P-13)	 (P-17)	 (P-129)	 (P-175)	 (P-200)	 (P-211)
 (P-13)	 (P-120)	 (P-48)	 (P-47)	 (P-225)	 (P-233)
 (P-76)	 (P-79)	 (P-15)	 (P-18)	 (P-272)	 (P-270)
 (P-76)	 (P-80)	 (P-133)	 (P-132)	 (P-272)	 (P-271)
 (P-76)	 (P-81)	 (P-159)	 (P-158)	 (P-287)	 (P-282)
 (P-76)	 (P-82)	 (P-133)	 (P-135)	 (P-287)	 (P-285)
 (P-76)	 (P-83)	 (P-145)	 (P-144)	 (P-289)	 (P-292)
 (P-128)	 (P-125)	 (P-165)	 (P-156)	 (P-368)	 (P-367)
 (P-129)	 (P-148)	 (P-187)	 (P-181)	 (P-314)	 (P-315)
 (P-129)	 (P-172)	 (P-200)	 (P-200)	 (P-107)	 (P-204)

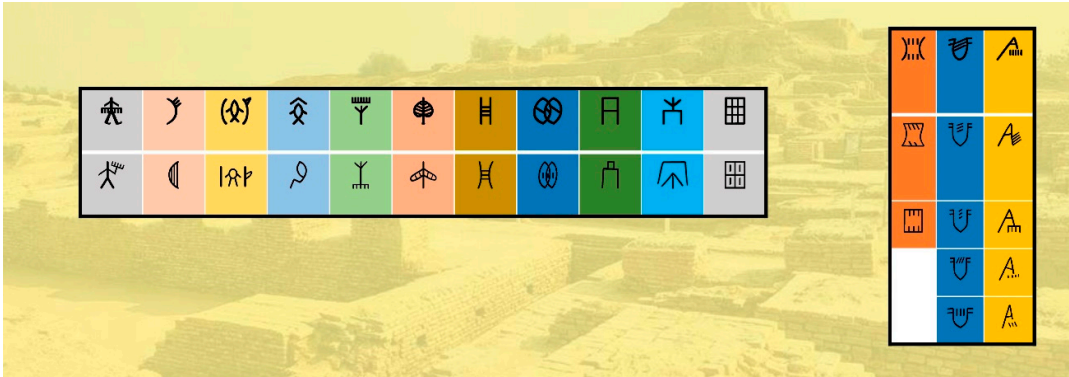
Rethinking Stroke Signs: Beyond Numerical Indicators

The prevailing view of stroke signs within the Indus writing system is that they function primarily as numerical indicators, directly linked to specific values. However, this perspective overlooks a crucial element: their versatility in usage. A closer examination reveals that stroke signs not only participate in grapheme representation but also undergo modifications akin to those observed with core signs. This observation challenges the prevailing classification and suggests that stroke signs may warrant reclassification as a type of primary sign, rather than being solely confined to a numerical role.

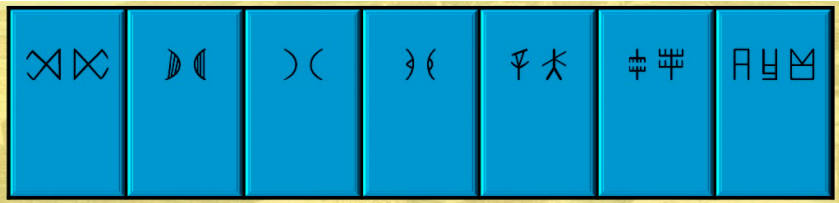


Interplay of Combining Techniques and Allographic Variations



Positional Variability of Primary Signs in the Indus Script

This analysis explores the phenomenon of **positional variability** observed amongst primary signs within the Indus script. Evidence suggests that the placement of these signs can exhibit flexibility, potentially influenced by the engraver's artistic preferences and the available writing space. Notably, this inversion does not appear to impact the phonetic value associated with the sign, nor does it necessarily represent a distinct form of the primary sign itself. The following examples illustrate this concept:



The Paired Primary Signs

In M-77, 30 pairs of signs have been identified. Wells has classified all of them as independent signs in his sign collection. However, only some of these pairs have been given the status of independent signs in the sign collections of Mahadevan and Parpola.



Semi Signs: Two additional signs, P-120 and P-266, appear to have been derived from the basic signs P-13 and P-270/W-620, respectively. These signs may represent a semi-phonetic value associated with the basic signs.








Primary Sign	𑀓	𑀔	𑀕
Semi form	𑀖	𑀗	𑀘

Classification of Primary Signs: A Foundational Approach

The identification of primary signs, also known as core signs, adheres to a systematic methodology centered on categorization and recognition based on inherent properties. The fundamental criteria for this classification lie in the formation and design of these signs themselves. Attempts to decompose these signs visually into smaller, constituent parts have proven to be either ineffective or impractical. Therefore, the classification and identification of primary signs rely primarily on their inherent formation and design. Further decomposition seems to offer diminishing returns in this context. Notably, these primary signs are frequently employed in their most basic form, without any further segmentation. This underscores the fundamental importance and integrity of these signs, akin to the basic phonemes that form the building blocks of language.

Serial No:	Indus Sign	NFM Unicode PUA	M-1977	W-2015	P-2010
1.	𑀓	E06-D	1𑀓	90	13
2.	𑀔	E10-A	59𑀔	220	60
3.	𑀕	E12-D	67𑀕	240	72
4.	𑀖	E13-D	78𑀖	266	76
5.	𑀗	E1B-E	53𑀗	798	88
6.	𑀘	E1E-2	162𑀘	390	91
7.	𑀙	E24-A	176𑀙	400	107
8.	𑀚	E26-9	400𑀚	374	109
9.	𑀛	E2D-6	99	2	127
10.	𑀜	E2D-9	98𑀜	1	128
11.	𑀝	E2D-C	87𑀝	32	129
12.	𑀞	E2D-F	89𑀞	33	130
13.	𑀟	E2E-1	102𑀟	3	130

14.	?	E2F-0	109†	16	133
15.	?	E31-5	121†	18	145
16.	?	E31-A	86†	31	147
17.	? or ?	E33-A or E34-F	287† or 299	900 or 899	156 or 165
18.	? ?	E37-D or E38-F	304 or 307†	890 or 892	181 or 187
19.	?	E3C-2	205†	491	192
20.	?	E3D-B	230†	460	198
21.	? or ?	E3E-8 or E40-9	134 or 135	480 or 482	200 or 209
22.	?	E43-5	402 †	367	214
23.	?	E45-D	180 †	306	217
24.	?	E46-E	225	530	219
25.	?	E47-D	216†	550	225
26.	?	E4A-6	137†	645	245
27.	?	E50-3	237	625	266
28.	? or ?	E51-8 or E6E-E	245† or 247†	615 or 626	272 or 371
29.	?	E55-0	249	590	278
30.	? or ? or ?	E56-1 or E56-F or E57-4	199 or 195 or 194†	570 or 572 or 576	282 or 285 or 287
31.	?	E58-5	197†	575	289
32.	?	E5A-D	328†	700	296
33.	?	E5D-5	336†	706	302

34.		E65-D	347†	760	319
35.		E69-4	261†	850	341
36.		E69-9	373†	790	341
37.		E6E-8	391†	820	368
38.		E6F-4	284†	877	373
39.		E70-8	267†	817	376
40.		--	--	--	--

Analysis of the Indus Script Sigil Inventory

A rigorous examination has been undertaken of the Indus script’s sigil inventory. This analysis builds upon Parpola’s extensive compilation of 391 signs. Each sign underwent meticulous scrutiny to discern its design principles, underlying mechanisms, and stylistic variations across writing samples. For instances requiring further clarification, in-depth investigations were conducted. Additionally, the examination incorporates the updated collections of signs compiled by Wells and Mahadevan, bringing the total number of analyzed signs to over 404.

Despite potential counter-arguments concerning the deconstruction of individual signs, the core proposition of the Indus script functioning as an alphabetic writing system remains well-supported. This exhaustive approach fosters a deeper understanding of the actual number of Indus signs and their specific applications. Consequently, the notion of the Indus script as an alphabet is significantly bolstered by this comprehensive analysis.

Discussion

Indus Sign Variation and Phonological Implications

These insights delve into the specific characteristics exhibited by Indus signs, drawing upon variations observed within Indus texts. The objective is to elucidate the general mechanisms and engraving practices employed in the writing system. Notably, modified or compound signs often exhibit design-related inconsistencies in how they are merged. This analysis prioritizes exploring how variations in engraving styles might influence the perception of distinct allographs (variant forms of the same sign).s

To illuminate the classification, interpretation, and determination of these signs, noteworthy examples are drawn from various scholarly sources, including the works of Parpola, Mahadevan, and Wells. Furthermore, the investigation explores the role of diacritical marks (additional markings) and principal modifiers (elements that alter the meaning of a sign) and their relationship with primary signs. This analysis offers valuable insights into the writing practices employed by Indus script engravers.

While this study does not present individual Indus text examples to explore the nature of each sign, the compiled evidence suggests that specific variations in the application of diacritical marks and principal modifiers are likely attributable to the engraver’s individual style rather than signifying a separate sign form or distinct allograph.

The systematic use of these diacritics underscores the potential sophistication of the Indus script’s phonological system (system of sounds in a language). The presence of multiple vowel signs

and their intricate interactions with consonant signs suggest a spoken language that possessed a rich soundscape, potentially encompassing diphthongs (combinations of two vowel sounds) and semi-vowels (sounds that function as both vowels and consonants).

Conclusions

This study proposes a nuanced approach to deciphering the Indus script. Recognizing the vast Indus Valley and limitations of communication necessitates a more lenient perspective on sign design variations across the region. While the script demonstrates remarkable accuracy, an insistence on extensive sign variations or rigid interpretations hinders progress. Additionally, attributing the script to a specific civilization or existing writing systems creates unnecessary obstacles.

Our analysis identifies a core set of 40 primary signs, 3 principal modifiers, and 8 diacritics, along with potential additional diacritics. Notably, contextual usage allows equivalent consideration of certain illegible signs, depictions, and stroke symbols. These characteristics suggest an Indus system with features of both alphabetic and abugida scripts, potentially influencing later archaic alphabets.

Further research should explore connections with other ancient scripts to decode phonetic values. A standardized approach to extract phonemic characters from fundamental allographs could be valuable. Given its antiquity, the Indus script may be considered the foundation of all archaic alphabetic scripts.

Preliminary readings, based on these findings, confirm a Prakrit language within the Indo-European family, potentially the source of the entire group. Comparison with archaic Vedic documents offers exciting possibilities for understanding the Indus Valley civilization, writing systems, and deciphering unclear texts.

Data Sources

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