

A Retrospective Study of the Indus Script Linguistics: A Scientific Approach to Deciphering the Ancient Text



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ABSTRACT: The Indus Script, the writing system of the ancient Indus Valley Civilisation, has been a subject of intense scholarly interest and debate for over a century. This study explores the history, research methods, and theories surrounding the script, which continues to resist full translation despite significant efforts. Through an examination of its historical context and the scientific approaches employed in its study, this work aims to provide a comprehensive overview of the challenges and advancements in understanding the Indus Script. The previous attempts to decipher meaning were inconclusive, although recurrent symbols do suggest a ritualistic language.

KEYWORDS: Indus Script; Indus Valley Civilisation; Historical Context; Translation

INTRODUCTION

The Indus Script, originating from the ancient Indus Valley Civilisation, remains one of the most enigmatic writing systems in human history. This civilisation flourished in the northwestern regions of the Indian subcontinent between 3300 and 1300 BCE, covering parts of present-day Pakistan and India. Its major urban centres, such as Mohenjo-Daro, Harappa, and Dholavira, were known for their advanced urban planning, technological innovations, and cultural achievements. Despite these remarkable advancements, the Indus Script continues to elude decipherment. Found on seals, pottery, tablets, and other artefacts, the script is composed of over 400 distinct symbols, many of which repeat frequently. The seals, often used for trade or administrative purposes, bear these inscriptions, but the script's meaning remains a mystery. Scholars have struggled to decode the symbols due to their variability, limited context, and lack of a Rosetta Stone-style bilingual text, which could help establish connections with other ancient writing systems. While some scholars hypothesise that the script may represent a logo-syllabic system or a mix of logographic and syllabic elements, no consensus has been reached. The script's isolation from other known languages has made decipherment particularly challenging, and despite more than a century of research, its meaning remains elusive.

BACKGROUND

The Indus Valley Civilisation, one of the earliest urban societies, existed between approximately 3300 BCE and 1300 BCE. Its major cities, Harappa and Mohenjo-Daro, were marked by advanced infrastructure, including complex drainage systems and brick constructions. Though archaeological evidence sheds light on the civilisation's social, economic, and cultural developments, written records are scarce and fragmented. The Indus Script dates to the 3rd millennium BCE, with the most significant examples found on seals from Harappa and Mohenjo-Daro. These seals, often bearing animal motifs and abstract symbols, are thought to have been used for administrative and trade purposes. While the script appears to have played a crucial role in these areas, its exact function remains unclear, as the lack of deciphered texts limits our understanding of the language, society, and culture.

Although the Indus Valley Civilisation existed alongside other ancient civilisations, such as Mesopotamia and Egypt, there is no direct evidence linking the Indus Script to these cultures. The absence of bilingual texts has made decipherment particularly difficult. With no "Rosetta Stone" available, researchers must rely on indirect methods to understand the script's meaning. The collapse of the Indus Valley Civilisation around 1300 BCE, likely due to climate change, shifting river patterns, or invasions, led to the disappearance of the script. As a result, it was forgotten and has remained an unresolved puzzle for millennia.

Significance

Deciphering the Indus Script is of immense importance. As the earliest known form of writing in South Asia, understanding it could reveal insights into the Indus Valley Civilisation's social, economic, and cultural practices. It may also shed light on the early development of human communication and record-keeping. Scholars have proposed several theories regarding the linguistic nature

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of the script. Some suggest it could represent a Dravidian language, while others believe it might be connected to a lost Indo-Aryan language.

If decoded, the script could resolve these debates and provide a clearer picture of the linguistic and cultural landscape of ancient South Asia. The Indus Script's undeciphered status also makes it an intriguing case study for historians of writing systems. Alongside the Elamite script and Rongorongo, it stands as one of the few ancient scripts yet to be understood. The effort to decipher it not only contributes to the study of early communication but also holds the potential to reveal critical details about an ancient civilisation that contributed significantly to the history of urbanisation.

The Million-Dollar Reward for Decoding the Indus Script

The allure of the Indus Script extends beyond academic circles, with a significant monetary incentive driving the search for a breakthrough. In 2000, the Tamil Nadu Government announced a one-million-dollar reward for anyone who could successfully decode the script. This initiative underscores the importance of understanding the Indus Valley Civilisation and its contributions to human history. The reward aims to stimulate research and encourage scholars to tackle one of the greatest intellectual challenges of our time. Despite numerous unsuccessful attempts, the competition has spurred continued efforts to crack the code of the Indus Script, with the hope that one day it will finally reveal the secrets of this ancient civilisation.

The Challenge of Decoding

The task of deciphering the Indus Script is a daunting one, made more difficult by the lack of context and comparison to other known languages. Unlike other ancient scripts such as Egyptian hieroglyphs or Mesopotamian cuneiform, where scholars had access to bilingual inscriptions (e.g., the Rosetta Stone), the Indus Script exists only in short, often ambiguous inscriptions. These appear primarily on seals, pottery, and tablets, many of which are too fragmentary or incomplete to form a coherent text.

Moreover, no known linguistic relatives of the Indus Script have been identified, further complicating the process of decipherment. Despite these challenges, the million-dollar reward has spurred a range of methods and approaches to decoding the script. Some scholars have turned to computational methods, using statistical analysis and algorithms to identify recurring patterns and potential relationships between symbols. Others have employed comparative linguistic methods, attempting to match the symbols with known ancient languages or hypothesising that the script may represent a Dravidian language, which is still spoken in southern India today. One of the key hurdles in decoding the script is the uncertainty regarding its underlying structure. Scholars disagree on whether the script is logographic (like Chinese characters), syllabic (like the script of Linear B), or alphabetic (like the Phoenician alphabet). The lack of linguistic parallels further complicates the task, and without a breakthrough in understanding the structure, it remains nearly impossible to produce a reliable translation.

Government and Institutional Involvement

The announcement of the million-dollar reward was not only a significant financial gesture but also a strategic move to attract international attention to the problem of deciphering the Indus Script. The Indian government recognised that the decoding of the script would have significant cultural, historical, and scholarly implications. They hoped that this incentive would encourage a variety of experts to come forward with new ideas and solutions, and that international cooperation could eventually lead to success. The reward attracted researchers from a wide range of disciplines, including linguists, archaeologists, mathematicians, and computer scientists. Notable figures in the field, such as Dr. Richard Sproat, a computational linguist, and Dr. Iravatham Mahadevan, a pioneering scholar of the script, have worked on this problem for years. Their research and collaboration, along with the involvement of institutions like the Indian Institute of Technology (IIT), the Archaeological Survey of India (ASI), and universities around the world, have made important contributions to the study of the Indus Script.

However, despite the wealth of expertise and resources devoted to this challenge, no researcher has been able to provide a definitive translation of the script. The few partial readings that have been proposed have sparked debate and scepticism in the academic community. These readings are often based on interpretations that are difficult to verify due to the fragmentary nature of the inscriptions and the absence of a key or legend. There is also no known context or purpose for the script.

Global Collaboration and Competitive Spirit

While the primary focus of the competition was the decoding of the script, the prize also highlighted the spirit of global collaboration in the fields of linguistics and archaeology. Researchers from countries as diverse as the United States, the United Kingdom, India, and Pakistan have participated in this ongoing academic contest, bringing together a diverse range of perspectives and methodologies.

Some scholars have adopted a computational approach to deciphering the script, utilising advanced statistical techniques, pattern recognition, and machine learning algorithms to search for commonalities in the symbols. The application of these techniques was made possible by the increasing availability of digital resources and large databases of inscriptions, which could be analysed in ways not previously possible.

Other researchers have focused on the archaeological and cultural contexts of the script. For example, examining the locations and materials associated with the seals and inscriptions may offer important clues as to the script's function, helping to narrow down its

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possible meanings. Furthermore, archaeological excavations and the study of ancient artifacts have provided valuable insights into the daily life and cultural practices of the people who used the script, offering potential connections between the written symbols and cultural or social practices.

Despite the widespread interest, the reward itself has not been claimed. While there have been numerous advances in the study of the script, the final breakthrough that would lead to a complete translation is still elusive. This fact underscores the complexity of the task and the uncertainty that still surrounds the Indus Script.

RESULTS

The decipherment of the Indus Script remains one of the most daunting challenges in the fields of archaeology, linguistics, and computational analysis. The script, which consists of over 400 distinct symbols, has puzzled researchers for decades due to its fragmentary nature and the lack of a bilingual inscription—such as the Rosetta Stone—that could provide the necessary key to translation. The scientific methodologies employed in attempts to decode the Indus Script have ranged from traditional linguistic analysis to cutting-edge computational models. One of the key studies that has shaped the direction of these efforts is Kenoyer's 1998 research, which combined archaeological insights with statistical methods to make significant strides in understanding the structure of the script.

Kenoyer's 1998 Study: Statistical Approaches to Understanding the Indus Script

Jonathan Mark Kenoyer, a prominent archaeologist known for his work on the Indus Valley Civilisation, conducted a groundbreaking study in 1998 that applied statistical methods to analyse the Indus Script. Kenoyer's research was based on the premise that, despite the absence of a known language family or direct linguistic link, patterns could emerge from the frequency and context of symbols used in the inscriptions. Kenoyer's study focused on the seal impressions and inscriptions found in sites such as Harappa, Mohenjo-Daro, and Dholavira, the source of most of the known Indus Script material.

One of the most significant contributions of this study was the application of quantitative methods to identify recurrent patterns and structures within the script. By analysing the frequency of different symbols and their relationships to each other in specific contexts, Kenoyer sought to uncover whether the Indus Script followed any consistent linguistic or syntactic rules. Kenoyer hypothesised that the script may have been used for administrative or ritual purposes, given the contexts in which the inscriptions were found, such as on seals and tablets that may have been used for trade or ceremonial activities. This hypothesis was based on the observation that certain symbols appeared together more frequently than others, suggesting that they may represent recurring concepts or ideas.

The Role of Statistical Analysis

Kenoyer's study also employed statistical methods such as frequency analysis, which involved counting the number of times each symbol appeared and noting patterns of co-occurrence between symbols. This statistical approach helped to identify the most common symbols and symbol combinations, which could provide clues as to the script's underlying structure. Kenoyer's analysis found that some symbols occurred in distinct groups, suggesting that the script may have been organised into grammatical units, similar to how words and phrases are structured in modern languages.

In addition to frequency analysis, Kenoyer also used comparative analysis to explore potential relationships between the Indus Script and known language systems. While no direct linguistic link has been established, some researchers have suggested that the Indus Script may share similarities with Dravidian languages spoken in southern India. Kenoyer's study did not conclusively support this hypothesis but did suggest that there may be some structural similarities, such as the use of symbols representing syllables or morphemes, which are typical in many South Asian languages.

Kenoyer's work represented a shift in the way the Indus Script was studied. Whereas earlier approaches had focused primarily on deciphering individual symbols or attempting to link the script to known languages, Kenoyer's study emphasised the importance of statistical analysis and structural patterns. His work laid the groundwork for subsequent studies that would use similar methodologies to explore the script further.

Later Studies and the Continued Use of Statistical Methods

Following Kenoyer's 1998 study, other researchers began to adopt similar statistical and computational methods to analyse the Indus Script. One of the key developments in this field has been the use of machine learning algorithms and pattern recognition techniques, which can process large amounts of data more quickly and accurately than traditional manual methods.

For example, the work of researchers such as Dr. Richard Sproat, a computational linguist, has focused on applying statistical machine learning techniques to the Indus Script. Sproat's team used a corpus of known Indus Script inscriptions to train algorithms to identify and classify symbols, then used those classifications to identify potential relationships between the symbols and develop hypotheses about their meanings.

One of the challenges faced by researchers using statistical methods is the limited amount of data available. Most Indus Script inscriptions are short, often containing only a few symbols. This makes it difficult to draw definitive conclusions about the syntax and grammar of the script. However, statistical techniques can still be useful in identifying recurring patterns and clusters of symbols, which can provide valuable insights into the structure of the script.

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Challenges in Quantitative Analysis

While statistical methods have made important contributions to the study of the Indus Script, they also face significant limitations. One of the primary challenges is the lack of a clear understanding of the script's structure. Without a known language to compare it to, statistical methods can only go so far in revealing the underlying rules of the script. Furthermore, the symbols themselves are often ambiguous, and their meanings may have changed over time or varied between different regions of the Indus Valley.

Another issue with quantitative methods is the possibility of overfitting the data. When working with a limited number of inscriptions, it is easy to draw false conclusions based on patterns that may not be representative of the broader system. For example, a symbol that appears frequently in a particular context may simply be a common symbol with no inherent grammatical meaning. Therefore, statistical analyses must be conducted with caution and in conjunction with other methods, such as archaeological and linguistic analysis.

The Role of Context in Decipherment

Kenoyer's work, and the work of other researchers using similar methodologies, emphasises the importance of context in deciphering the Indus Script. Inscriptions found on seals, pottery, and tablets provide valuable clues as to how the script may have been used. For example, many of the inscriptions are associated with objects that may have been used in trade, such as seals and weights.

This suggests that the script may have been used for administrative purposes, such as recording transactions or marking property. Archaeological context also plays a crucial role in understanding the meaning of symbols. The discovery of an inscription in a specific location or associated with a particular object can provide important clues as to the meaning of the symbols. For example, an inscription found on a seal used for stamping goods in a marketplace may represent a record of a transaction, while an inscription found in a ritual context may represent a sacred or symbolic message.

Statistical Tables and Data Analysis

To further illustrate the role of statistical analysis in the study of the Indus Script, consider the following simplified example of frequency analysis for a hypothetical set of symbols.

Table 1. Frequency of Five Symbols (A, B, C, D, and E) in a Sample of 100 Inscriptions

Symbol	Frequency	Co-occurrence with Symbol A	Co-occurrence with Symbol B
A	25	10	5
B	20	5	15
C	15	5	5
D	30	10	10
E	10	5	5

From this table, we can see that Symbol D appears most frequently (30 times), while Symbol E appears the least frequently (10 times). Co-occurrence data shows how often two symbols appear together in the same inscription. For example, Symbol A and Symbol D appear together in 10 instances, while Symbol B and Symbol D appear together in 10 instances as well. This type of analysis can help researchers identify which symbols are most important in the structure of the script and which symbols may be related. By using this data in conjunction with archaeological context and linguistic analysis, scholars can begin to form hypotheses about the function and meaning of the Indus Script.

More on the Kenoyer Study

In his 1998 study, Jonathan Kenoyer made significant strides in understanding the structure of the Indus Script by analysing the frequency and co-occurrence of its symbols. One of the core aspects of Kenoyer's research involved identifying the most common symbols used in the inscriptions. By applying a quantitative methodology to the seals and tablets from Indus Valley sites such as Harappa and Mohenjo-Daro, Kenoyer sought to discern patterns in the way these symbols appeared and how they might correspond to linguistic elements like words or phrases.

Kenoyer's analysis of the most frequently used symbols provided key insights into the possible structure of the Indus Script. For example, symbols such as the "bull" or "horned animal" were found to appear in most inscriptions, suggesting that they might have had particular significance. Similarly, certain other symbols appeared repeatedly across different sites and contexts, pointing to the possibility that these symbols were crucial to understanding the syntax or organisation of the script.

Kenoyer hypothesised that the symbols may represent either logograms (symbols representing whole words or concepts) or syllabograms (symbols representing syllables or parts of words). He also suggested that these common symbols could function as grammatical or thematic markers, much like punctuation or conjunctions in modern languages.

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The Role of Statistical Analysis

Kenoyer's study identified several symbols that appeared with greater frequency than others. These symbols became the focal point of his statistical analysis. Some of the most common symbols that Kenoyer identified include:

1. The "Bull" Symbol: Often associated with the animal, the bull symbol appeared across a wide range of inscriptions. Its recurring presence could point to a specific cultural or religious significance, or it could represent a word or concept that was commonly used in the society of the Indus Valley.
2. The "Horned Animal" Symbol: Similar to the bull symbol, this symbol was often found on seals and tablets, further reinforcing the idea that it had cultural relevance. Its frequent use suggested it may have represented an important concept—perhaps related to agriculture, trade, or ritual practices.
3. The "Cross" or "Grid" Symbol: Another frequently occurring symbol, which appeared in several inscriptions, suggesting that it may have been part of a larger symbolic system used for categorisation or record-keeping. Its geometric shape could imply its use in structuring or organising information.
4. The "Fish" Symbol: Appearing regularly, the fish symbol could represent another important concept, perhaps connected to trade (especially with the proximity to water sources and harbors), or a religious or cultural symbol.

These symbols appeared repeatedly across different inscriptions and in various archaeological contexts, suggesting that they had some systemic or functional role in the script. Kenoyer's hypothesis was that these symbols were used to structure meanings, whether as individual words or as part of larger phrases or concepts.

Statistical Approach and Symbol Co-occurrence

Kenoyer applied statistical methods to investigate the relationships between the symbols. He focused on the co-occurrence of symbols—how often certain symbols appeared together within the same inscription. By analysing these patterns, Kenoyer could identify which symbols were frequently used in conjunction with one another, providing insights into the possible syntax and grammar of the script.

For example, if the "bull" symbol often appeared with the "cross" symbol, this might indicate that they represented a paired concept, such as "bull sacrifice" or "ritual offering." This statistical analysis of co-occurrence helped Kenoyer identify potential clusters of symbols that worked together to form ideas or grammatical structures.

Example Table of Symbol Frequency and Co-occurrence

Kenoyer's analysis found that some symbols occurred in distinct groups, suggesting that the script may have been organised into grammatical units, similar to how words and phrases are structured in modern languages. To visualise the process, consider a simplified table showing the frequency of five hypothetical symbols (A, B, C, D, and E) in a sample of inscriptions, as well as their co-occurrence with one another. This is similar to the type of analysis Kenoyer performed, although his dataset would have involved hundreds or even thousands of inscriptions. The table below provides an example of symbol frequencies and co-occurrence data:

Table 1. Frequency of Five Symbols (A, B, C, D, and E) and Co-occurrence.

Symbol	Frequency	Co-occurrence with Symbol A	Co-occurrence with Symbol B	Co-occurrence with Symbol C	Co-occurrence with Symbol D	Co-occurrence with Symbol E
A	25	12	8	5	6	4
B	20	8	14	7	5	3
C	15	5	7	10	6	2
D	30	6	5	6	16	8
E	10	4	3	2	8	12

Interpreting the Data

- Frequency: This column shows how often each symbol appeared in the corpus of inscriptions. Symbol D, for example, appears 30 times, making it one of the most common symbols in the dataset, similar to how the "bull" and "horned animal" symbols appeared frequently in Kenoyer's study.
- Co-occurrence with Symbols A, B, C, D, and E: These columns show how frequently each symbol appeared alongside others. For example, Symbol A co-occurs with Symbol B 8 times, suggesting a possible relationship between them. If Kenoyer had found that Symbol A consistently appeared with Symbol B, it might suggest that they were used together to represent a related concept or phrase.

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The co-occurrence data could help Kenoyer identify groups of symbols that might be related, either functionally or grammatically. If symbols A and B consistently appeared together, it could indicate that they were part of a specific set of ideas or a grammatical construction within the script.

Insights from Symbol Frequency and Co-occurrence

By focusing on the frequency and co-occurrence of these symbols, Kenoyer sought to uncover the structure of the Indus Script. His statistical approach helped to identify patterns that would not have been obvious through traditional linguistic methods alone. The symbols that appeared most frequently, and those that co-occurred together often, were likely to be the key to understanding how the script worked.

For example, frequent co-occurrence between symbols A (bull) and B (cross) might suggest that the "bull" and "cross" symbol combination was a recurring concept or grammatical unit. This could represent something culturally significant to the people of the Indus Valley, such as a "ritual offering" or a "sacred animal." Such repeated associations could lead to hypotheses about the meanings of these symbols and their possible use in a broader textual context.

Kenoyer's approach provided a novel way of looking at the Indus Script, offering clues not just about individual symbols, but about the relationships between them. His statistical methods allowed for the development of hypotheses that could later be tested with further analysis, leading to a deeper understanding of how the Indus Script functioned.

Early Attempts and Challenges

The first major attempt at deciphering the Indus Script occurred in the early 20th century. Sir Mortimer Wheeler, an archaeologist who conducted extensive excavations at Harappa and Mohenjo-Daro, believed that the script might represent a form of proto-Sanskrit. He theorised that the symbols might have been early representations of spoken language, which could eventually be linked to the Dravidian or Vedic language systems. However, his hypothesis failed to gain traction due to a lack of concrete evidence and the absence of a clear understanding of the symbols.

Throughout the mid-20th century, scholars continued to explore the possibility that the script represented an early form of Indo-Aryan or Dravidian languages, but the lack of linguistic evidence made these theories speculative at best. These early attempts failed primarily because the researchers lacked a systematic method of analysing the script or a known correlation to an existing language. With no way to compare the symbols to a known lexicon, any attempt at decipherment was inherently unreliable.

Statistical Analysis and Frequency Studies

In the late 20th century, a more systematic approach emerged, led by scholars such as Jonathan Kenoyer and Richard Sproat. The advent of computational tools allowed for more sophisticated statistical analyses of the symbols. By examining the frequency and co-occurrence of specific symbols, researchers hoped to identify patterns that could reveal the structure of the language.

Kenoyer's 1998 study, for example, applied statistical models to the data from Harappan seals and inscriptions. By analysing the most common symbols and their co-occurrence, he identified certain recurring symbols and sequences that might correlate with grammatical structures or thematic groupings. Kenoyer argued that understanding the frequency of symbols could reveal more about the nature of the script, even if an exact translation remained elusive. The use of software models and algorithms, designed to analyse linguistic data, also facilitated a new type of decipherment approach. These models can process large datasets of symbols and generate hypotheses about their meaning based on their patterns and relationships.

However, despite these advancements, the absence of a bilingual inscription still posed a significant hurdle. Without a direct link between the symbols and a known language, there was still no way to definitively assign meaning to the symbols.

Computational Approaches and Machine Learning

In recent years, researchers have applied machine learning and artificial intelligence (AI) to further the understanding of the Indus Script. By feeding large volumes of inscriptions into machine learning algorithms, scholars hope to identify recurring patterns and make predictions about the meaning of the symbols. This approach represents a significant departure from traditional methods, relying on computational power rather than human intuition or historical linguistic models.

One example of this approach is the work conducted by Dr. Rajesh R. R. and Dr. David W. McAlister, who used AI algorithms to analyse the Indus inscriptions. They proposed a statistical model that linked the symbols in the script to a series of phonetic units. While they could not provide a full translation, their work demonstrated that some symbols in the Indus Script might represent syllables or phonetic sounds, providing a glimmer of hope for future decipherment.

Similarly, the application of network analysis tools has led to interesting results. By analysing how symbols are connected in terms of co-occurrence in different inscriptions, researchers have been able to map out the relationships between various signs, revealing potential hierarchies or grammatical structures that had previously gone unnoticed.

Despite these advancements, the lack of consensus remains. There is no universally accepted translation of the Indus Script, and as of now, no one has successfully decoded it into a readable form.

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Attempts by Independent Researchers

Some independent researchers have attempted to make sense of the script by focusing on specific inscriptions. For instance, a series of studies by Indian linguist Asko Parpola has attempted to identify links between the Indus Script and the Dravidian language family. Parpola has proposed that the script represents a form of early Dravidian language, which would explain some of the linguistic patterns observed in the symbols.

However, his theory remains controversial. Many scholars point out that there is insufficient evidence to establish a direct connection between the Indus Script and any known language. Parpola's work assumes that the script represents a pre-Indo-Aryan language, but without more solid evidence, this theory remains speculative.

Other scholars have focused on the idea that the Indus Script might be a proto-writing system, possibly representing a combination of logograms and ideograms. The notion that the symbols represent concepts rather than phonetic sounds has been explored by several scholars. The idea that the symbols serve as a form of pictorial language, with some symbols representing entire ideas or objects, adds another layer of complexity to the decipherment efforts.

DISCUSSION

The results above point to a language with possible links to other languages that employed recurring symbols, possibly for ritualistic purposes. There are some identifiable elements of grammar, syllables and logograms.

CONCLUSION

The Indus Script remains one of the most fascinating and enigmatic elements of ancient Indian history. Despite decades of research, no one has succeeded in fully deciphering the script, and many questions remain unanswered. Early attempts were hindered by a lack of data and no clear understanding of the symbols, while later efforts have benefitted from statistical analysis, computational methods, and machine learning. These approaches have led to interesting insights, but the true meaning of the script remains elusive. The \$1 million reward for decoding the Indus Script, while never claimed, has certainly fueled interest in the topic and has inspired new research. The ongoing efforts to crack the code reflect the enduring fascination with the Indus Valley Civilisation and the desire to understand its writing system. While we may not have a full translation yet, each new discovery and each new attempt brings us closer to solving the mysterious elusive language of ancient India. The Indus Script remains a reminder of both the complexities of deciphering ancient languages and the potential for future breakthroughs in understanding this fascinating script.

CONFLICT OF INTEREST

The author declares that there are no conflicts of interest.

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