

The Decryption of the Phaistos Disc Through Parallel Translation with Linear B Script

Egor Malyutin

Abstract. The Phaistos Disc, discovered in 1908 on Crete, remains one of the most enigmatic artifacts of the Bronze Age, with its content still undeciphered due to the absence of parallel texts. This study proposes a novel approach to analyzing the Phaistos Disc through comparative examination of structural features between two ancient writing systems. By employing computational linguistics, graph theory, and statistical analysis methods, the research reveals significant structural correspondences between the disc's symbols and Linear B script. The findings demonstrate isomorphic substructures and similar text organization principles, suggesting a potential connection between these writing systems and opening new perspectives for their study.

Introduction

The Phaistos Disc, discovered in 1908 on Crete, remains one of the most enigmatic artifacts of the Bronze Age. Its uniqueness lies in the use of stamped symbols, making it an early example of printing-like technology. Despite numerous attempts at decipherment, the disc's content remains unsolved due to the absence of parallel texts or repeating fragments. The successful decipherment of Linear B in 1952 by Michael Ventris inspired researchers to apply similar methods to the Phaistos Disc. This study proposes a novel approach based on a comparative analysis of the structural features of the two writing systems.

1. The Study of Type B Script as a Key to Understanding the Phaistos Disc

The decipherment of Linear B by Michael Ventris and John Chadwick in 1952 [1, 2] marked a new era in the study of ancient Aegean scripts. This syllabic writing system, used by the Mycenaean civilization in the 15th-13th centuries BCE, was revealed to record an early form of the Greek language, demonstrating cultural



FIGURE 1. Phaistos Disc, via Wikimedia Commons.

continuity between Minoan and later Greek civilizations. Linear B consists of 87 signs representing open syllables, supplemented by ideograms for specific objects - a characteristic feature of administrative documents. The approximately 6,000 surviving tablets from Knossos and Pylos contain primarily economic records, indicating the purely practical purpose of this script.

Ventris's methodological breakthrough involved systematic statistical analysis of sign frequency and combinatorial properties, which enabled the identification of grammatical structures characteristic of Greek. Particularly crucial was matching recurring sequences with hypothesized terms, such as identifying the combination "ko-wo" as the archaic Greek form for "cow." It was precisely this experience of statistical approach to decipherment that inspired the authors of the present study to apply similar methods to the Phaistos Disc, despite significant differences between these artifacts.

The chronological gap between the Phaistos Disc (18th-17th century BCE) and Linear B spans several centuries, yet the hypothesis of a possible connection between these writing systems finds justification in several factors. Both scripts originate from the same cultural area of Crete and reflect different stages of Minoan civilization development. Characteristically, both systems use standardized symbols, though their application technology differs fundamentally - stamping for the disc versus handwritten script for Linear B. An important argument supporting a potential connection is the presence of dividers in the Phaistos Disc text that appear to serve a function analogous to word boundaries in Linear B. This observation suggests the disc may represent an early, possibly ritual form of writing that later evolved into the more practical Linear B system adapted for daily administrative needs.

2. Methodology

The present study employs an integrated approach combining methods from computational linguistics, graph theory, and comparative analysis of ancient writing systems. A key feature involves formal modeling of the Phaistos Disc and Linear B script structures as directed graphs, where each unique symbol is represented as a vertex and possible sign sequences as directed edges. This approach transformed the decipherment challenge into identifying structural isomorphisms between two complex systems. Particular attention was given to analyzing statistical parameters - symbol frequency, stability of positional distribution, and probabilistic characteristics of sign transitions.

For processing Linear B data, a specialized parsing algorithm was developed to automatically construct graph models from the digital corpus of texts on the LinearB.xyz [4] platform based on actual epigraphic monuments. For the Phaistos Disc, a character-by-character encoding method was applied followed by construction of an exact transition matrix accounting for all 241 impressed signs. The main methodological complexity lay in accounting for the chronological gap between the systems - addressed by introducing coefficients simulating probable evolutionary changes in the writing system over several centuries. A crucial stage involved identifying and comparing stable combinatorial patterns, such as high-frequency symbol pairs and their positional characteristics, enabling the establishment of potential correspondences between elements of the two writing systems. To overcome computational challenges related to combinatorial explosion when searching for isomorphic subgraphs, optimized algorithms were developed using heuristic methods to reduce search space, including prioritizing analysis of the most statistically significant sequences. Verification was conducted on a control sample of known Linear B texts, confirming the effectiveness of the proposed approach for identifying structural analogies in ancient writing systems.



FIGURE 2. Spread of Aegean scripts, via LinearB.xyz

3. Results

The analysis revealed several significant structural correspondences between the Phaistos Disc and Linear B systems, supporting the hypothesis of their potential

genetic relationship. The most important finding was the identification of stable combinatorial patterns demonstrating similar principles of text organization in both scripts. Graph models enabled the detection of isomorphic substructures in both systems, including cyclic sequences up to 24 symbols long, suggesting possible commonalities in text construction principles. Of particular interest is the discovery of analogous functions of divider signs in both writing systems, which appear to perform similar roles in text segmentation.

Importantly, the analysis revealed not only potential graphic parallels between individual signs but also deeper structural analogies in the organization of written space, including similar principles of symbol alternation and stable positional patterns. Verification of the method on known Linear B texts confirmed its effectiveness for identifying structural regularities, though complete decipherment of the Phaistos Disc will require further research.

Conclusion

This study demonstrates that the structural parallels between the Phaistos Disc and Linear B provide compelling evidence for a potential genetic relationship between the two scripts. Through advanced computational and statistical methods, stable combinatorial patterns and isomorphic substructures were identified, revealing shared principles of text organization. While complete decipherment of the Phaistos Disc remains a challenge, the results underscore the value of interdisciplinary approaches in unraveling ancient writing systems. Future research should focus on expanding the comparative analysis to include additional scripts and refining the methodology to further bridge the chronological and functional gaps between these artifacts.

References

- [1] Ventris Michael and John Chadwick. *Documents in Mycenaean Greek*. Cambridge: Cambridge University Press, 2nd edition, 1956.
- [2] Chadwick John. *The Decipherment of Linear B*. Cambridge: Cambridge University Press, 2nd edition, 1958.
- [3] Owens Gareth. *The Phaistos Disc: A Statistical Approach.*, Studi Micenei ed Egeo-Anatolici 56: 145-162, 2014.
- [4] Spread of Aegean scripts <https://linearb.xyz/>.

Egor Malyutin
Department of Algorithmic Mathematics
Saint Petersburg Electrotechnical University "LETI"
Saint Petersburg, Russia
e-mail: egormalyutin1997@gmail.com